

# COURSE DESCRIPTIONS

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Embry-Riddle Aeronautical University course offerings are listed in alphabetical order, according to the course designations below. Courses which may be offered at specific campus locations are notated as follows:

AAS	Aeronautical Science	EP	Engineering Physics
ACET	Aircraft Engineering Technology	ES	Engineering Science
AE	Aerospace Engineering	FA	Flight - Academic
AED	Aviation Education	HF	Human Factors
AEL	Aerospace Electronics	HU	Humanities
AET	Avionics Engineering Technology	IT	Information Technology
AF	Air Force Aerospace Studies	LET	Logistical Engineering Technology
AS	Aeronautical Science	MA	Mathematics
AT	Air Traffic Control	MET	Mechanical Engineering Technology
AVT	Avionics Technology	MFE	Manufacturing Engineering
BA	Business Administration	MY	Military Science Army ROTC
CE	Cooperative Education	NSC	Naval Science
CEC	Computer Engineering	PS	Physical Science
CIV	Civil Engineering	PSY	Psychology
COM	Communication	RS	Regional Studies
CS	Computer Science	SE	Software Engineering
DET	Drafting Engineering Technology	SF	Safety Science
EC	Economics	SP	Space Studies
EE	Electrical Engineering	SS	Social Sciences
EET	Electrical Engineering Technology	STG	Science, Technology & Globalization
EGR	Engineering	UNIV	College Success
EL	Electronics	WX	Applied Meteorology

Courses numbered 001–099 are basic skills courses and do not apply toward degree requirements. Courses numbered 100–200 are lower-division courses and are generally taken in the freshman and sophomore years. Many lower-division courses serve as prerequisites for other course work, and students are urged to plan ahead to meet necessary prerequisites. Courses numbered 300–400 are upper-division courses, reflecting advanced levels of technical skills and disciplinary knowledge. Upper-division work is generally taken in the junior and senior years. Only the responsible college deans, or his/her designee, may waive corequisites and prerequisites.

Course numbers ending in 95 designate time-limited offerings, such as those taught by a visiting lecturer. Course numbers ending in 96 or 97 identify special sequential courses. Those ending in 98 provide students with a unique, collective program of learning activities supervised by a professor. Courses ending in 99 denote individual study between professor and student.

Numbers in parentheses, immediately following course titles and numbers, indicate lecture and laboratory hours that a class meets each week. For example, (3,3) signifies that the course consists of three lecture hours and three laboratory hours weekly.

The following courses are not necessarily offered every term, nor are they necessarily offered at all campus locations.

# Course Descriptions

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## Aircraft Engineering Technology

### ACET 301

**Manufacturing Processes, Materials, and Testing with Laboratory (3,3)**

**4 Credits**

The nature of production processes, materials, and non-destructive testing and their influence on design decisions. Prerequisite: MET 211.

### ACET 302

**Applied Aerodynamics I (3,0)**

**3 Credits**

An introduction to aerodynamics. Airflow measurement, airfoil theory, and aircraft performance. Prerequisite: MET 212.

### ACET 311

**Aircraft Drafting and Design (2,3)**

**3 Credits**

Aircraft structural, hydraulic, and electrical layout, detail and assembly drawings with design applications. Prerequisite: ACET 301.

### ACET 312

**Applied Aerodynamics II with Laboratory (2,3)**

**3 Credits**

Aircraft performance is evaluated with emphasis on all phases of the flight envelope. Equilibrium performance in cruise, climb, descent, as well as take-off and landings are evaluated. Concepts of aircraft stability and control are introduced and evaluated. Prerequisite: ACET 302.

### ACET 314

**Aircraft Structural Analysis (4,0)**

**4 Credits**

Load analysis of space frames and semi monocoque structures. Prerequisite: MET 211.

### ACET 402

**Applied Instrumentation Laboratory (2,3)**

**3 Credits**

Selection and operation of standard instrumentation components to measure and record force, strain,

temperature, and pressure. Analysis of test data. Prerequisites: ACET 314, EET 225.

### ACET 403

**Aircraft Performance and Design (2,3)**

**3 Credits**

Aircraft static performance, introduction to stability and control. Application of aerodynamics through aircraft preliminary design project, including performance specification, general arrangement, weight and balance, and drag estimation. Prerequisites: ACET 312, ACET 314. Corequisite: ACET 406.

### ACET 404

**Aircraft Composites with Laboratory (1,3)**

**2 Credits**

An introduction to advanced composite aircraft structures. Prerequisite: ACET 314.

### ACET 405

**Aircraft Internal Combustion Engines (2,1)**

**2 Credits**

A study of internal combustion engine fundamentals including combustion and exhaust gas analysis for aircraft engine applications. Engine test and analysis projects will be conducted. Prerequisite: MET 210.

### ACET 406

**System Analysis and Design (3,0)**

**3 Credits**

An introduction to system concepts, analysis and design with application to aircraft. Prerequisites: ACET 311, ACET 312, ACET 314. Corequisite: ACET 403.

### ACET 407

**Aircraft Engines and Gas Turbines (3,1)**

**3 Credits**

A study of gas turbine fundamentals, including various gas turbine cycles, components and component efficiency, thrust, specific fuel consumption, duct flow and inlet diffuser, centrifugal and axial compressors, combustion chambers and jet nozzles for aircraft propulsion. Engine test and analysis projects will be conducted. Prerequisites: ACET 312, MA 242.

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## ACET 410

### Applied Structural Dynamics (3,0)

#### 3 Credits

An introduction to multi-DOF systems to predict mode shapes and transient response. Prerequisite: ACET 406.

## ACET 412

### Aircraft Structures Test Laboratory (0,3)

#### 1 Credit

Introduction to structural test engineering technology. Scenarios include all aspects of the test program from the proposal through the final report. Prerequisites: ACET 402. Corequisite: ACET 415.

## ACET 415

### Aircraft Detail Design (2,3)

#### 3 Credits

Design of aircraft load bearing structures, supporting stress analysis and production drawings. Prerequisites: ACET 403 or permission of instructor, ACET 311, ACET 314, ACET 404.

## ACET 299, 399, 499

### Special Topics in Aircraft Engineering Technology

#### 1-3 Credits

Lectures on specialized topics or independent design and/or laboratory project. Prerequisite: Permission of Program Chair.

## Aerospace Engineering

A grade of C or better is required in MA 241, MA 242, and either PS 150, PS 160 or PS 215, PS 216, PS 250 for entry into all AE courses except AE 101. A passing grade in all prerequisite courses or department consent is required for entry into all AE courses.

## AE 101

### Introduction to Aerospace Engineering (2,0)

#### 2 Credits

An overview course on aerospace engineering, the science and the profession. Discussions are provided regarding methods to ensure successful careers. An introduction to the basic physical laws and engineering sciences associated with atmospheric and space

flight. Conceptual exercises in aircraft and spacecraft design are presented.

## AE 301

### Aerodynamics I (3,0)

#### 3 Credits

The atmosphere. Incompressible and compressible one-dimensional flow. Airspeed measurement. Two-dimensional potential flow. Circulation theory of lift. Thin airfoil theory. Viscous flow. Boundary layers. Finite wing theory. Drag in incompressible flow. Wing-body interactions. Prerequisites: ES 204, ES 206, MA 243. Corequisite: ES 305.

## AE 302

### Aerodynamics II (3,0)

#### 3 Credits

Laminar and turbulent flows, transition point, determination of skin friction drag on an airfoil. Obtaining equations for streamline, for particle path, and for streakline in a flow field. Compressible flow, shock waves, thermodynamics of gas flow. Reversible and irreversible processes. Changes in pressure, density and temperature across shock waves. Isentropic duct flow and flow through a nozzle. Static performance and maneuvers in flight. Propeller theory. Prerequisite: AE 301.

## AE 304

### Aircraft Structures I (3,0)

#### 3 Credits

Space structures. Introduction to fuselage truss analysis and wing structural analysis. Inertia force and load factor computation for various flying and landing conditions. Elasticity and combined stress analysis. Beam bending. Area moment of inertia tensor. Shear flow in thin-walled sections. Materials considerations. Finite-element modeling and computer-aided analysis. Prerequisite: ES 202.

## AE 309

### Experimental Aerodynamics (1,3)

#### 2 Credits

This laboratory consists of a series of aerodynamic experiments using the wind tunnel, simple and multiple manometer, and a strain gage force balance. Experiments concerning closed duct flow include pitot-static air speed measurement and flow quality assessment. Pressure measuring experiments consist of boundary layer velocity profiles, airfoil pressure

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coefficients, and momentum drag. Tests using the force balance include plain and flapped wing performance and complete airplane model tests. Prerequisite: COM 221. Corequisite: AE 301.

## AE 313

### Space Mechanics (3,0)

#### 3 Credits

This course presents the vector-based solution of the two-body problem and the solution for the position and time problem (Kepler's equations). These are used to analyze orbits, satellite launch, ground tracks, orbit transfer, interplanetary trajectories, and interception and rendezvous. Using three dimensional vector dynamics, the motion and stability of rigid and semi-rigid spacecraft are studied as are the means for controlling spacecraft orientation. Prerequisites: ES 204, MA 345.

## AE 320

### Experimental Space Systems Engineering (1,3)

#### 2 Credits

Laboratory for the fundamentals of spacecraft systems. A lab covering each of the major subsystems of spacecraft, which may include propulsion, attitude control, power, telemetry and command, communications, structures and vibrations, materials and mechanisms, thermal control, and mass properties. Prerequisite: ES 402. Corequisite: EP 394.

## AE 350

### Project Engineering (3,0)

#### 3 Credits

Role of the engineer in project management with emphasis on systematic evaluation of the benefits and costs of projects involving engineering design and analysis. Proposal preparation and presentation, engineering contracts, negotiation techniques. Value engineering. Prerequisite: junior class standing or consent of instructor.

## AE 401

### Advanced Aerodynamics I (3,0)

#### 3 Credits

An advanced-level presentation of the theory and applications of incompressible aerodynamics. Kinematics and dynamics of fluid flow. Flow about a body. Shock tube flow. Thin airfoil and finite wing theory. Approximation techniques; numerical meth-

ods. Introduction to compressible flow. Prerequisites: AE 302, MA 441.

## AE 404

### Aircraft Structures II (3,0)

#### 3 Credits

Deflection analysis of structural systems by means of virtual work principles and their energy counterparts. The Rayleigh-Ritz method. Redundant truss, frame and stiffened web structures. Thermal loads. Shear lag. Load transfer at fuselage frames and wing ribs. Cutouts in wing and fuselage members. Shear flow in multicell wing structures. Buckling considerations. Prerequisite: AE 304.

## AE 407

### Matrix Structural Methods (3,0)

#### 3 Credits

Virtual work methods for elastic media. Rod, beam and shear panel elements. Matrix formulation and solution procedures for structural analysis. Finite elements. Substructures. Free vibration. Prerequisite: AE 404 or consent of the instructor.

## AE 408

### Turbine and Rocket Engines (3,0)

#### 3 Credits

A study of the gas turbine and rocket engines. Topics include control volumes, the conservation equations, combustion processes, efficiencies, fuel consumption, nozzle flow, diffusers, ideal and real ramjets, gas turbine engines, performance of rocket vehicles, and solid and liquid propellant rocket motors. Prerequisite: AE 302.

## AE 409

### Aircraft Composite Structures (3,1.5)

#### 3 Credits

Introduction to reinforced plastic composite structural materials and their use in modern aircraft. Discussion of basic material properties, testing procedures, design and analysis using classical lamination theory, and fabrication techniques, including some hands-on demonstrations. Prerequisites: ES 202, ES 307.

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## AE 411

### Advanced Experimental Aerodynamics (2,3)

#### 3 Credits

This course consists of a series of advanced experiments using the wind tunnel. Topics include model design and construction, testing procedures, control surface testing, propeller testing, the use of wind tunnel data, scale effects, complete model testing, and an introduction to supersonic testing. Prerequisite: AE 309.

## AE 413

### Airplane Stability and Control (3,0)

#### 3 Credits

Development of longitudinal, lateral and directional stability and control equations. Control surface design. Control effectiveness and size requirements. Dynamic control theory. Handling characteristics and maneuvering stability of aircraft. Prerequisite: MA 345. Corequisite: AE 302.

## AE 415

### In-Flight Laboratory (3,1.5)

#### 3 Credits

Development of longitudinal and lateral-directional, static and dynamic stability and excess power, rate of climb, turn rate, and load factor performance theory, with laboratory concept validations. Prerequisite: AE 413.

## AE 420

### Aircraft Preliminary Design (2,4)

#### 3 Credits

Airplane conceptual design principles are developed to meet modern aerodynamic, propulsion, structural and performance specifications. A complete airplane is designed, resulting in a design package consisting of specifications, aerodynamic calculations, inboard profile drawing, weight and balance, general arrangement drawing, aerodynamic drag analysis and complete performance report. Prerequisites: AE 309, AE 413.

## AE 421

### Aircraft Detail Design (2,4)

#### 3 Credits

Principles of aircraft detail and component part design, manufacture and production are covered along with projects to give actual experience in the design of aircraft components. Carries the design of

an airplane from the general layout to the design of its detail parts and the design of necessary tools. Prerequisites: AE 404, AE 420.

## AE 425

### Aircraft Acoustics and Noise Control (3,0)

#### 3 Credits

Sound wave characteristics, levels and directivity. Hearing and psychological effects of noise. Noise control criteria and regulations. Instrumentation. Noise sources. Acoustics of walls, barriers and enclosures. Acoustical materials and structures. Noise characteristics of jet and propeller aircraft, including helicopters. Prerequisite: AE 301.

## AE 426

### Spacecraft Attitude Dynamics and Control (3,0)

#### 3 Credits

Fundamentals of spacecraft attitude dynamics: 3 dimensional rigid body kinematics, stability and dynamics of symmetric and tri-inertial bodies, attitude, nutation and spin control maneuvers for spin stabilized spacecraft, effects of energy dissipation, momentum biased spacecraft dynamics and stability, modeling and simulation of spin stabilized and momentum biased aircraft, elements of 3-axis stabilized spacecraft, effects of gravity gradient, solar radiation pressure, atmospheric drag and magnetic torque on spacecraft attitude. Prerequisites: AE 313, MA 345.

## AE 427

### Spacecraft Preliminary Design (2,4)

#### 3 Credits

Spacecraft preliminary design principles are developed to meet mission objectives. A complete spacecraft is designed, resulting in a design package consisting of specifications; calculations; CAD drawings; weight and various subsystem budgets; and a series of trade studies, reviews and design reports. Prerequisites: AE 313, EP 394 or instructor consent. Corequisite: AE 426 or instructor consent.

## AE 430

### Control Systems Analysis and Design (3,0)

#### 3 Credits

Modeling, analysis, and control of dynamical systems with aerospace applications. Transfer functions, block diagram algebra. Routh Hurwitz stability criteria. Introduction to system design using root locus, Bode and Nyquist diagrams. Prerequisites: ES 402, MA 441.

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## AE 433

### Aerodynamics of the Helicopter (3,0)

#### 3 Credits

The development of rotating-wing aircraft and the helicopter. Hovering theory and vertical flight performance analysis. Auto-rotation, physical concepts of blade motion and control, aerodynamics and performance of forward flight. Blade stall, stability and vibration problems. Design problems. Prerequisites: AE 302, MA 441.

## AE 435

### Air-Breathing Propulsion Preliminary Design (2,4)

#### 3 Credits

This course is concerned with the preliminary design, subject to specifications, of an air-breathing engine for aircraft propulsion. A complete engine is designed, and presented with proposed engine layout, cycle calculations, installed performance and engine sizing information. Calculations demonstrating that the proposed engine satisfies requirements are also presented. Corequisite: AE 408, or permission of the instructor.

## AE 440

### Air-Breathing Propulsion Component Design (2,4)

#### 3 Credits

This course is concerned with the design of the various components of an airbreathing engine, starting with the general layout. The students are grouped into teams and each team is charged with the design of a major component (inlet, fan, compressor, combustor, turbine, nozzle, support systems). The components are then integrated to verify that they function together. Prerequisite: AE 435, or permission of the instructor.

## AE 445

### Spacecraft Detail Design (2,4)

#### 3 Credits

Principles of spacecraft detail and subsystem design, analysis, modeling, manufacture and test are covered and incorporated into projects to give actual experience in the detail design and integration of spacecraft subsystems and systems. Integration of multiple subsystems into a single functional model is a key component of the course. Prerequisites: AE 304, AE 426, AE 427, AE 430 or consent of instructor.

## AE 299, 399, 499

### Special Topics in Aerospace Engineering

#### 1-6 Credits

Individual independent or directed studies of selected topics in aerospace engineering. Prerequisite: Consent of instructor and the department chair. May be repeated with a change of content.

## Aviation Education

## AED 451

### Mathematics with Aviation Applications

#### 3 Credits

An applications course that provides educators who have an in-depth background of mathematics with the opportunity to experience real-world applications using aviation and aerospace concepts. This applications course also provides knowledge, strategies, and techniques to facilitate the use of aviation/aerospace applications in mathematical instruction in the classroom. There will be two tracks designed to meet the needs of elementary and secondary teachers. This course is available to certified educators and track placement is based on the recommendation of the teacher.

## Aerospace Electronics

## AEL 311

### Airborne Pulse Systems (3,0)

#### 3 Credits

A technical study of airborne pulse systems to include distance measuring equipment and secondary radar to include their operation and support. Prerequisites: EL 301, EL 303, and EL 307 Corequisite: AEL 313.

## AEL 312

### Airborne Communications and Navigation Systems (3,0)

#### 3 Credits

A technical study of communications and navigation systems to include their operation and support. Prerequisites: EL 301, EL 303 and EL 307 Corequisite: AEL 313.

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## AEL 313

**Airborne Electronics Maintenance Operations (0,6)**

**2 Credits**

A practical application of theory to the test, evaluation, and support of airborne electronics systems.

Prerequisites: EL 301, EL 303, and EL 307.

Corequisites: AEL 311 and AEL 312.

## AEL 315

**Linear Systems and Signals Analysis (3,0)**

**3 Credits**

An intensive study of linear electronic circuits and signals using practical, theoretical and mathematical approaches. Topics include time and frequency domain analysis of discrete and continuous time systems, and the use of the Fourier, Laplace and Z-transforms to analyze and design these systems for communications and aerospace electronics applications. Prerequisites: MA 245, PS 250, and EL 307.

## AEL 316

**Elements of Engineering Design and Laboratory Procedures (2,3)**

**3 Credits**

This course is intended to familiarize the student with various theoretical and empirical design procedures including CAD/CAE to translate these designs into laboratory breadboard hardware; and to observe and practice acceptable laboratory investigative procedures. The student will be required to provide and utilize an engineering laboratory notebook throughout this course. Project documentation will include a final, scholarly written, engineering report. Prerequisite: EL 307. Corequisite: AEL 315.

## AEL 321

**Advanced Communications Systems Analysis (4,0)**

**4 Credits**

An advanced course in communications techniques. Topics include modulation, filtering, distortion, spectral density and correlation, digital coding, random processes, noise, and optimization with aerospace applications. Prerequisites: AEL 315 and AEL 316.

## AEL 322

**Advanced Communications, Microwave and Control Systems Analysis Laboratory(0,3)**

**1 Credit**

The practical application of communications, microwave, and control system theory using applicable hardware and software. Corequisites: AEL 321, AEL 323 and AEL 324.

## AEL 323

**Applied Control System Analysis (2,0)**

**2 Credits**

An intensive study of linear feedback control systems using established analytical approaches. Topics include system designation, response, stability, and compensation techniques with electronic and aircraft applications. Prerequisite: AEL 315. Corequisite: AEL 321.

## AEL 324

**Microwave and Radar System Analysis (2,0)**

**2 Credits**

An advanced course in microwave theory and radar with application to airborne systems. Prerequisite: AEL 315. Corequisite: AEL 321.

## AEL 401

**Airborne Surveillance Systems (3,0)**

**3 Credits**

A technical study of airborne surveillance systems to include their operation and support. Prerequisites: AEL 321 and AEL 324.

## AEL 402

**Airborne Electronics System Integration (3,0)**

**3 Credits**

A technical study of airborne system integration to include system operation and support. Prerequisites: AEL 321 and AEL 322. Corequisite: AEL 401.

## AEL 403

**Advanced Space and Airborne Electronics Systems (3,0)**

**3 Credits**

A technical study of space and airborne electronic systems to include their operation and support. Prerequisites: AEL 311, AEL 312, AEL 314.

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## AEL 404

### Airborne Electronics Maintenance Operations II (0,6)

2 Credits

An advanced study of support operations for airborne electronics systems to include practice, installation, regulation, and maintenance techniques. Prerequisite: AEL 313. Corequisites: AEL 401 and AEL 402.

## AEL 411

### Communication and Navigation Systems (3,0)

3 Credits

A comprehensive study of airborne electronics communications and navigation systems to include their design and operation. Prerequisites: AEL 321, AEL 323, and AEL 324.

## AEL 412

### Surveillance and Control Systems (3,0)

3 Credits

A comprehensive study of airborne surveillance and control systems to include their design and operation. Prerequisites: AEL 321 and AEL 324.

## AEL 413

### Satellite Communications and Navigation Systems (4,0)

4 Credits

A comprehensive study of satellite navigation and communication systems to include their design, operation, and application. Prerequisite: AEL 321.

## AEL 414

### System Test and Evaluation Laboratory (0,3)

1 Credit

A familiarization with state of the art test systems used in the evaluation of airborne electronic components and systems. Corequisites: AEL 411 and AEL 412.

## AEL 421

### Aerospace Electronic System Integration and Design (3,0)

3 Credits

Design applications in aerospace electronic system integration in current airborne vehicles. Subjects include: package design, vehicle mainframe effects

on design, FAA regulations and certification, agencies involved in the design, licensing and standardization of aerospace systems, and manufacturers specifications. Prerequisites: AEL 411, AEL 412 and AEL 413.

## AEL 422

### Integrated Logistics Support (3,0)

3 Credits

An intensive study of logistics engineering in aerospace. Study to include reliability, maintainability and product support engineering. Prerequisite: MA 412.

## AEL 423

### Test System Development Laboratory (0,3)

1 Credit

A familiarization with test and evaluation system development for airborne systems using industry applicable generic test hardware and software. Prerequisites: AEL 411, AEL 412, and AEL 414. Corequisite: AEL 421.

## AEL 424

### Senior Project (2,2)

3 Credits

Capstone project that includes the use of theory and practice learned to design and implement a space or airborne electronic system. Pre or corequisites: AEL 402 or AEL 421.

## Avionics Engineering Technology

## AET 311

### Advanced Communications Systems Analysis with Laboratory (4,3)

5 Credits

An advanced course in communications techniques. Topics include modulation, filtering, distortion, spectral density and correlation, digital coding, random processes, noise, and optimization with aviation applications. Prerequisites: EET 301 and EET 302.

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## AET 406

### Avionics Analog Systems Design Considerations with Laboratory (3,3)

#### 4 Credits

An intensive study and investigation of both linear and non-linear avionics analog systems and components, using a theoretical and mathematical approach. Special topics of current or future avionics interest may be discussed and studied. Prerequisites: AET 311, AET 312, and AET 313.

## AET 407

### Avionics Digital Systems Design Considerations with Laboratory (3,3)

#### 4 Credits

An intensive study and investigation of avionics digital and microwave systems using a theoretical and mathematical approach. Special topics of current or future avionics interest may be discussed and studied. Prerequisites: AET 311, AET 312, and AET 313.

## AET 399, 499

### Special Topics in Avionics Engineering Technology

#### 1-6 Credits

Individual independent or directed studies of selected topics in avionics engineering technology. Prerequisite: Consent of instructor and the department chair. May be repeated with a change of content.

## Air Force Aerospace Studies

## AF 101

### The Air Force Today (General Military Course) (1,0)

#### 1 Credit

A survey course designed to introduce students to the United States Air Force and Air Force Reserve Officer Training Corps. Featured topics include: mission and organization of the Air Force, officership and professionalism, military customs and courtesies, Air Force officer opportunities, group leadership problems, and an introduction to communication skills. Leadership Laboratory is mandatory for Air Force ROTC cadets, and complements this course by

providing cadets with followership experiences. Corequisite: AF 101L.

## AF 102

### The Air Force Today (1,0)

#### 1 Credit

Continuation of AF 101. A weekly Leadership Laboratory is mandatory. Corequisite: AF 102L.

## AF 101L/AF 102L

### Leadership Laboratory (0,2)

#### 0 Credit

Consists of Air Force customs, courtesies, health, physical fitness, field training orientation, drill and ceremonies. These courses are graded Pass/Fail.

## AF 201

### The Air Force Way (General Military Course) (1,0)

#### 1 Credit

The AF 201 course is designed to examine the general aspects of air and space power through a historical perspective. Utilizing this perspective, the course covers a time period from the first balloons and dirigibles to the space-age global positioning systems of the Persian Gulf War. Historical examples are provided to extrapolate the development of Air Force capabilities (competencies), and missions (functions) to demonstrate the evolution of what has become today's USAF air and space power. Furthermore, the course examines several fundamental truths associated with war in the third dimension: e.g. Principles of War and Tenets of Air and Space Power. As a whole, this course provides the cadets with a knowledge level understanding for the general element and employment of air and space power, from an institutional, doctrinal and historical perspective. In addition, the students will continue to discuss the importance of the Air Force Core Values, through the use of operational examples and historical Air Force leaders, and will continue to develop their communication skills. Leadership Laboratory is mandatory for AFROTC cadets and complements this course by providing cadets with followership experiences.

## AF 202

### The Development of Air Power (General Military Course) (1,0)

#### 1 Credit

Continuation of AF 201. A weekly Leadership Laboratory is mandatory. Corequisite: AF 202L.

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## AF 201L/AF 202L

### Leadership Laboratory (0,2)

#### 0 Credit

Consists of Air Force customs, courtesies, Air Force environment, drill, ceremonies, and field training orientation. These courses are graded Pass/Fail.

## AF 301

### Air Force Leadership and Management (Professional Officer Course) (3,0)

#### 3 Credits

A study of leadership, management fundamentals, professional knowledge, Air Force personnel evaluation systems, leadership ethics, and the communication skills required of an Air Force junior officer. Case studies are used to examine Air Force leadership and management situations as a means of demonstrating and exercising practical applications of the concepts being studied. A mandatory Leadership Laboratory complements this course by providing advanced leadership experience in officer-type activities, giving students the opportunity to apply the leadership and management principles of this course.

## AF 302

### Air Force Leadership and Management (Professional Officer Course) (3,0)

#### 3 Credits

Continuation of AF 301. A weekly Leadership Laboratory is mandatory. Corequisite: AF 302L.

## AF 301L/AF 302L

### Leadership Laboratory (0,2)

#### 0 Credit

Provides advanced leadership experience in officer-type activities, giving students the opportunity to apply leadership and management principles. These courses are graded Pass/Fail. Prerequisites: Completion of the General Military Course or Two-Year Program selection and/or approval of the Professor of Aerospace Studies.

## AF 401

### Preparation for Active Duty (Professional Officer Course) (3,0)

#### 3 Credits

Examines the national security process, regional studies, advanced leadership ethics, and Air Force doctrine. Special topics of interest focus on the mili-

tary as a profession, officership, military justice, civilian control of the military, preparation for active duty, and current issues affecting military professionalism. Within this structure, continued emphasis is given to the refinement of communication skills. An additional Leadership Laboratory complements this course by providing advanced leadership management principles. Corequisite: AF 401L.

## AF 402

### Preparation for Active Duty (Professional Officer Course) (3,0)

#### 3 Credits

Continuation of AF 401. A weekly Leadership Laboratory is mandatory. Corequisite: AF 402L.

## AF 401L, AF 402L

### Leadership Laboratory (0,2)

#### 0 Credit

Provides advanced leadership experiences in officer-type activities. These courses are graded Pass/Fail. Prerequisites: Completion of the General Military Course or Two-Year Program selection and/or approval of the Professor of Aerospace Studies.

## Aeronautical Science

## AAS 101

### College Success Seminar (1,0)

#### 1 Credit

A course for incoming freshmen majoring or planning to major in Safety Science, Air Traffic Management, or Applied Meteorology in which students assess and develop the personal, interpersonal, intellectual, and social skills necessary to succeed in college. This course is for freshmen only and is Pass/Fail.

## AS 120

### Principles of Aeronautical Science (3,0)

#### 3 Credits

An introductory course in Aeronautical Science designed to provide the student with a broad-based aviation orientation in flight related areas appropriate to all non-Aeronautical Science degree programs. Subjects include historical developments in aviation and the airline industry, theory of flight, airport operations, aircraft systems and performance,

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elements of air navigation, basic meteorology theory, air traffic principles, flight physiology and aviation regulations and safety. Available for freshman/sophomore students without their private pilot certificate.

## AS 132

### Basic Aeronautics I (3,0)

#### 3 Credits

This course examines the basics of pilot certification, aircraft systems and instrumentation, aerodynamics, aircraft performance, VFR cross-country navigation techniques as it applies to single-engine operations and weather reports and forecasts. This course includes the Federal Aviation Regulations, the NTSB, elements of resource management, hazardous attitudes and aviation physiology.

## AS 133

### Basic Aeronautics II (3,0)

#### 3 Credits

This course includes the Federal Aviation Regulations, the NTSB, elements of resource management, hazardous attitudes and aviation physiology. Multi-engine operations will be covered including aerodynamics, performance, certification and emergency considerations. At the completion of this course the student will have received the aeronautical knowledge necessary for certification as a private pilot with the single and the multi-engine land ratings. Prerequisite: AS 132 or Private Pilot Certificate.

## AS 213

### Resource Management - An Aviation Human Factors Perspective (1,0)

#### 1 Credit

An introduction to the basics of crew resource management based on established concepts of crew resource management with direct applications to dual instructional flight and both solo and solo cross-country flight training. Additionally, the course includes classroom team exercises allowing student demonstration and practice of basic crew resource management theory.

## AS 232

### Intermediate Aeronautics (3,0)

#### 3 Credits

This course will examine instrument flying in the

National Airspace System below 18,000 feet, Federal Aviation Regulations, single-engine complex and light multi-engine aircraft performance, instrument approach procedures, weather related to instrument flying and the elements of resource management. The student will also receive preparation to take the FAA Instrument rating written test. Prerequisite AS 133.

## AS 246

### Basic Navigation (3,0)

#### 3 Credits

An introduction to basic navigation for Aeronautical Science students. The course content includes aircraft instrument and system theory, aircraft performance, navigation theory, and solution methods, all weather application of electronic navigation systems, precision flight control principles, navigation information sources and planning procedures, and special problems in navigation. Prerequisite: FA 110 or Private Pilot Certificate.

## AS 254

### Aviation Legislation (3,0)

#### 3 Credits

Aviation legislation is a study of the evolution of federal civil aviation regulations in the United States. This course examines the past and present problems prompting regulation of the industry, the resultant safety legislation, airport development funding legislation, and international aviation legislation.

## AS 272

### Advanced Aeronautics (2,0)

#### 2 Credits

This course examines multi-engine flying in the IFR environment including the high altitude enroute structure, turbo-charged piston twin-engine airplane and turbo-prop airplane performance, winter flying phenomena, mountain flying, effective resource management and safe flying practices. The student will also receive preparation to take the FAA Commercial Pilot written test. Prerequisite: AS 232.

## AS 305

### Aircraft Engines-Reciprocating (3,0)

#### 3 Credits

Mechanical relationships, components, construction, power calculations, carburetion, induction, fuel-air requirements, and federal regulations. Prerequisite: PS 103.

# Course Descriptions

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## AS 309

### Aerodynamics (3,0)

#### 3 Credits

Incompressible flow airfoil theory, wing theory. Calculation of stall speed, drag and basic performance criteria. Configuration changes, high and low speed conditions. Special flight conditions. Introduction to compressible flow. Corequisite: PS 104.

## AS 310

### Aircraft Performance (3,0)

#### 3 Credits

Aerodynamic performance of aircraft powered by reciprocating, turboprop or jet turbine engines. Stability and control, weight and balance and operating data. Prerequisite: AS 309. Corequisite: AS 311.

## AS 311

### Aircraft Engines-Turbine (3,0)

#### 3 Credits

A comprehensive study of aircraft gas turbine engine fundamentals and theory at the technical level. Areas of study include: background, types, variations and applications; engine theory; construction and design; systems and accessories; representative engines. Corequisite: PS 104.

## AS 313

### Resource Management-An Instrument Pilot Perspective (1,0)

#### 1 Credit

A review of the fundamentals of resource management followed by application to the single-pilot IFR environment. Includes classroom exercises allowing student demonstration and practice of basic resource management theory. Includes preview/perspective of future resource management training. Prerequisites: AS 213, FA 251. Corequisite: FA 304.

## AS 320

### Commuter Aviation (3,0)

#### 3 Credits

This course acquaints the student with the development, administrative policies, and operational factors peculiar to commuter aviation, especially since passage of the Airline Deregulation Act of 1978. The

impact of mergers and acquisitions, profiles of passenger and cargo carrying commuters, and analysis of commuter successes and failures are discussed. Emphasis is placed on the establishment of a new commuter airline which includes market and financial analysis, the company plan, aircraft selection and acquisition, route structure and timetable, marketing strategy and pertinent regulatory requirements. The course culminates in a formal proposal soliciting for venture capital to start a commuter airline. Prerequisite: BA 201.

## AS 340

### Instructional Design in Aviation (3,0)

#### 3 Credits

The application of the method of scientific inquiry to the process of instruction in aviation is presented. This means the systematic design of instruction, based on knowledge of the learning process, taking into account consideration as many factors about the particular situation as possible. Special emphasis will be placed on examining instructional problems and needs in aviation, setting a procedure for solving them, and then evaluating the results.

## AS 346

### Advanced Navigation (3,0)

#### 3 Credits

This course continues the flight planning and navigation procedures started in AS 246. It brings the student into long range, IFR operations. Planning, FAR Part 121 regulations, routes, oceanic air traffic control procedures, instrument approach procedures, and emergency considerations are applied to United States and international operations. The student is introduced to ground-based radar surveillance and the Global Positioning System. Prerequisites: AS 246, AS 310.

## AS 356

### Aircraft Systems and Components (3,0)

#### 3 Credits

A comprehensive study of aircraft systems and components at the technical level. Areas of study include aircraft electrical, hydraulic, fuel, propeller and auxiliary systems including theory of operation, calculations and related Federal Aviation Regulations. Prerequisite: PS 104.

# Course Descriptions

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## AS 357

### Flight Physiology (3,0)

#### 3 Credits

Aeromedical information. Causes, symptoms, prevention and treatment of flight environment disorders. Altitude effects, spatial disorientation, body heat imbalance, visual anomalies and psychological factors are included as they relate to pilot performance and survival effectiveness. Prerequisite: sophomore standing.

## AS 358

### Advanced Avionics (3,0)

#### 3 Credits

The student will be taught the electronic characteristics of communications, navigation and surveillance equipment both on the ground and in the aircraft. This will include historical information leading to the current systems. Systems and concepts taught will include: ADF, VOR, INS, IRS, GPS, ILS, VHF and UHF Communications, SATCOM, ACARS, TCAS, EGPWS, Transponders (Mode A, C and S), ADS and ADS-B, TLS, Free Flight and Weather Radar. Since this area is very dynamic, new systems will be introduced as they are designed and perfected. Prerequisites: PS 104 and AS 232 or Instrument Rating.

## AS 380

### Pilot Career Planning and Interviewing Techniques (1,0)

#### 1 Credit

A course in which students will discuss and develop short-term and long-term job and career goals, conduct career research using various University and industry resources, prepare a personal job search portfolio, prepare resumes and letters of application, gain insights and proficiency in interviewing skills so they are better prepared to enter the job market upon graduation. Students will participate in simulated interview scenarios, will be expected to correspond with at least one company, and will be involved in the evaluation of letters, resumes and interviews. This course will be graded pass/fail. Prerequisite: junior standing.

## AS 386

### Domestic and International Navigation (4,0)

#### 4 Credits

This course will study FAR Part 121 domestic and flag regulations and evaluate their impact on long-range domestic and international flights. The student will be able to use ICAO, JAA and FAA operational requirements and typical air carrier Ops SPECS to plan domestic and transoceanic flights. CBT simulation programs may be utilized as necessary to demonstrate actual flight scenarios. High altitude airspace, navigation and approach procedure chart interpretation will be examined in detail. Students will study and utilize the concepts of MNPS and RVSM airspace, dispatch procedures, ETOPS, ETP, Driftdown, Track Messages, LRN accuracy checks, Oceanic Air Traffic Control clearances, International METARs and TAFs and emergencies and contingencies while on oceanic tracks. Communication systems requirements and methodology will be examined to include satellite, digital and analog devices. Prerequisite: AS 310 and AS 232 or Instrument Rating.

## AS 387

### Crew Resource Management (3,0)

#### 3 Credits

A capstone course designed to develop a detailed understanding of the organizational behavior, interpersonal relationships skills, and other critical behavioral dynamics of professional flight crews. The course builds upon the knowledge of Crew Resource Management (CRM) acquired during the student's private, instrument, and commercial pilot certification training. The history of CRM, CRM concepts of Communication Processes, Problem Solving, Group Dynamics, Workload Management, and Situational Awareness will be investigated. Aircraft incidents and accidents related to the evolution of CRM training programs and FAA regulations will be analyzed. Intrapersonal and Psycho-Motor skills will be addressed as they relate to safe, legal, and efficient flight operations. Prerequisite: AS 386.

# Course Descriptions

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## AS 402

### Airline Pilot Operations (3,0)

#### 3 Credits

A study of the scope and function of a major air carrier's organizational structure and the specific relationships of the operations department with those of marketing, maintenance and safety are discussed. A study of corporate issues including the industry in general, market structure, certification, FAR Part 121 Regulations, economic issues, mergers, corporate culture and international topics will be included. From an operational perspective, topics include flight operations employment policies, domiciles, operating specifications, types of services provided, training, passenger considerations, decision making, communications and pertinent FARs.

## AS 405

### Aviation Law (3,0)

#### 3 Credits

Chronological development, federal and state regulatory functions, rights and liabilities of pilots and operators. Case histories, liens and security interest in aircraft. International conferences, bilateral and multilateral agreements, criminal statutes. Prerequisite: AS 254.

## AS 408

### Flight Safety (3,0)

#### 3 Credits

A capstone course designed to assist the student in developing an attitude and philosophy for accident prevention. The course includes: Ideal and practical, personal and organizational safety procedures and goals; safety philosophies; aircraft accident reports; human factors; principles of accident investigation, accident prevention programs and accident statistics; current events; NTSB special studies. Prerequisite: senior standing.

## AS 410

### Airline Dispatch Operations (3,0)

#### 3 Credits

This capstone course includes a review of pertinent Federal Aviation Regulations, navigation systems and procedures, manual flight planning, emergency and abnormal procedures, the general operating manual, aircraft systems and performance development, human factors and practical dispatching appli-

cations. Prerequisite: AS 310. Corequisites: AT 300 (AT 300 is only applicable for those students in the Dispatcher Program.), WX 352.

## AS 411

### Jet Transport Systems (3,0)

#### 3 Credits

This course will provide the student with detailed knowledge of jet transport category aircraft systems. The student will learn how to operate typical jet transport category aircraft systems in both normal and emergency situations. Prerequisite: AS 356.

## AS 412

### Corporate and Business Aviation (3,0)

#### 3 Credits

Operation of a corporate flight department. Value of management mobility. Aircraft and equipment evaluation, maintenance, flight operations, administration, fiscal considerations.

## AS 413

### Resource Management-The Crew Perspective (1,0)

#### 1 Credit

A brief historical overview of crew resource management followed by a study of recent major and regional carrier accidents and direct application of crew resource management fundamentals that were utilized or not utilized. This followed by classroom team exercises allowing student demonstration and practice of basic resource management theory, specifically applied to the three-person crew of a Boeing 727. Additionally, students are challenged with crew resource management theory applications by the major carriers today and applications to each student's private lives and careers. Prerequisites: AS 313, FA 418. Corequisite: FA 420.

## AS 420

### Flight Technique Analysis (3,0)

#### 3 Credits

Application of aerodynamic principles to the development of optimal pilot techniques and procedures. Uniform procedures applicable to all airplanes and special procedures for large, high performance and transport aircraft are analyzed, including principles of flight deck resource management. Prerequisite: AS 310.

# Course Descriptions

## AS 425

### Autopilots and Flight Management Systems (3,0)

#### 3 Credits

Principles, systems analysis, operations of flight directors with mechanical, CRT, LCD, and head up displays, autopilots, automatic flight control systems with auto throttle, auto land, go-around functions, stability augmentation devices, and flight management systems. Prerequisites: AS 346, AS 358.

## AS 426

### Electronic Flight Management Systems (2,0)

#### 2 Credits

This course teaches the theory and principles governing flight with autopilot and flight management systems. Students will apply the theory and principles by demonstrating good decisions and thought processes in autopilot and FMS/PC simulators. Prerequisites: AS 310, AS 358.

## AS 199, 299, 399, 499

### Special Topics in Aeronautical Science

#### 1-3 Credits

Individual independent or directed studies of selected topics in general aviation. Prerequisites: Consent of instructor and approval of department and program chairs. May be repeated with a change of subject. Special topics courses involving flight training are offered in selected areas for the purpose of gaining proficiency in required pilot operations for various certificates and ratings. Prerequisite: approval of chief flight instructor and department chair.

## Air Traffic Control

## AT 300

### Air Traffic Management I (3,0)

#### 3 Credits

AT 300 is the entry-level course in the Air Traffic Management (ATM) degree sequence. It is also the first of the courses required in the FAA's Collegiate Training Initiative (CTI) program that the FAA is using to meet ATC staffing requirements. This course provides students with a fundamental knowledge of the US air traffic control system and develops content knowledge in the following areas: (a) the

Federal Aviation Administration, its mission, organization, and operation, (b) the air traffic control career, (c) navigational aids, current and future, (d) airspace, (e) communications, (f) federal aviation regulations, (g) ATC procedures, (h) control tower operations, (i) non-radar operations, (j) radar operations, and (k) future air traffic control systems. The course also provides essential information that is useful for pilots and other aviation professionals.

## AT 302

### Air Traffic Management II (3,0)

#### 3 Credits

Air Traffic Management II provides the student with an introduction to the manuals, procedures, maps, charts, and regulations used by pilots and air traffic controllers in the National Airspace System (NAS). Included is an examination of FAA Orders, the Aeronautical Information Manual (AIM), and Federal Air Regulations (FARs). Students will also acquire basic knowledge about SIDs, STARs, En Route IFR Charts, and Instrument Approaches. Search and Rescue, Special Operations, NOTAMS, and Teamwork in the ATC environment are also studied in this course.

## AT 305

### Air Traffic Management III (3,0)

#### 3 Credits

This course covers the basic Air Traffic Control (ATC) procedures for Instrument Flight Rules (IFR) in the Enroute and Terminal ATC facilities in the National Airspace System (NAS). Knowledge and skill requirements for air traffic control specialists (ATCS) in the current ATC system are studied in the classroom and practiced in a realistic, performance-based laboratory environment. Duties and responsibilities of the air traffic control, Tracon, Enroute Center, and Flight Service Station are integrated into an understanding of how the total ATC system works. Classroom delivery is augmented by practical laboratory problems using an air traffic control simulation of terminal radar operations. Prerequisites: AT 300.

## AT 401

### Air Traffic Management IV (2,3)

#### 3 Credits

This course integrates the knowledge of traffic control gained in previous air traffic control courses with an opportunity to actually "work" in air traffic con-

# Course Descriptions

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rol operating positions. Using a realistic air traffic control simulation (TRACON/ProTM) students issue instructions to aircraft, make hand-offs, coordinate with other controllers, solve aircraft confliction problems, and do the other controller tasks. The ability to make “real-time” decisions, determine strategies for controlling aircraft, and working with a dynamic scenario are features unique to this learning experience. This course combines classroom discussion, group and team coordination, with various forms of evaluation for course credit. Student competency in the performance phase of the course is determined by computer scoring. Prerequisites: AT 300, AT 305.

## AT 405

### Air Traffic Management V (2,3)

#### 3 Credits

A capstone course in the ATC Minor that expands on the skills, knowledge, and abilities the student has acquired in previous ATC classes. This course presents more demanding and complex traffic scenarios requires higher level performance and decision-making skills and prepares the student for initial training in any ATC specialization. Students will also gain an appreciation for the challenges of implementing large-scale changes in the National Airspace System. Upon successful completion of this course, students will demonstrate the knowledge and technical aptitude required for entry-level qualification as an air-traffic control specialist. Prerequisites: AT 300, AT 305, AT 401.

## Avionics Technology

## AVT 301

### Introduction to Avionics (3,0)

#### 3 Credits

A survey course designed to provide a basic knowledge of electronics with application to avionics for the non-avionics major.

## AVT 330

### Simulation Maintenance Technician (2,3)

#### 3 Credits

This course is an introduction to simulator types, FAA regulations germane to simulators, and actual operation of different types of simulators. Types of display devices, computer languages, support systems, inspection techniques, and troubleshooting

procedures will be offered in the classroom and laboratory environment. Corequisite: Any AVT or permission of the Department Chair.

## Business Administration

Standing is based on credit hours earned toward the student’s declared degree program.

## BA 101

### Introduction to Business Programs and Careers (3,0)

#### 1 Credit

A course in which students assess and develop the personal and interpersonal dynamics and intellectual and social demands necessary to succeed in college. Time management, study skills, goal clarification, career concerns, and college resources are included in the course. Different aspects of careers and areas of concentration in business will be discussed in depth. This course is graded pass/fail and is available to freshman only.

## BA 105

### American Business Enterprise (3,0)

#### 3 Credits

The role of business in American society. Examines the issues, foundations and environment of the business enterprise system. Business financing, production, marketing and employee relations are stressed. Not available to Aviation Business Administration students.

## BA 120

### Introduction to Computer Based Systems (3,0)

#### 3 Credits

An overview of computing in the business environment, and an introduction to the tools, techniques, and strategies of computer-based information system development. The emphasis is on developing computer literacy through the use of computers in the design and presentation of business communications such as plans, proposals, spreadsheets, graphs, and charts.

# Course Descriptions

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## BA 201

### Principles of Management (3,0)

#### 3 Credits

Provides an overview of relevant management principles and practices as applied in contemporary organizations. Focuses on management theories, philosophies, and functions.

## BA 210

### Financial Accounting (3,0)

#### 3 Credits

An introduction to accounting information systems and financial reports, including accounting concepts, analysis and interpretation of financial reports with an emphasis on the operating activities of aviation related businesses.

## BA 212

### Advanced Financial Accounting (3,0)

#### 3 Credits

An in-depth study of accounting information systems and financial reports used in a management environment, analyzing and interpreting financial reports with an emphasis on the operating, investing and financing activities of all types of organizations, including airline and aviation related companies. Prerequisites: Financial Accounting and sophomore standing.

## BA 221

### Advanced Computer Based Systems (3,0)

#### 3 Credits

This course is a continuation of BA 120. It covers advanced concepts of spreadsheet use, database management systems, and presentation graphics. Students perform macro and command language programming in applications packages. In addition, the course provides experience in locating and retrieving graphical and text-based information from the Internet to support management activities. Prerequisite: Computer Skills.

## BA 308

### Public Administration (3,0)

#### 3 Credits

Characteristics of organization and management in government; impact of political processes and public pressures on administration action; role of regulatory agencies; governmental personnel and budgetary

procedures; unique qualifications of the public administrator. Prerequisites: Management and sophomore standing.

## BA 311

### Marketing (3,0)

#### 3 Credits

Marketing theory; marketing management, sales management; market research. Public and customer relations, advertising, distribution. Prerequisite: sophomore standing.

## BA 312

### Managerial Accounting (3,0)

#### 3 Credits

Emphasizes management's use of cost information in internal decision-making. Decision-making processes include cost analysis, control, allocation, and planning. A variety of accounting techniques applicable to aviation/aerospace companies are presented. Prerequisites: Financial Accounting and junior standing.

## BA 314

### Human Resource Management (3,0)

#### 3 Credits

This course will examine the functions to be accomplished in effectively managing human resources. An in-depth study of the interrelationship of managers, organizational staff and/or specialists, will assist the student in understanding and applying management theories to real world human resource planning. Areas of concentration include human resource planning; recruitment and selection; training and development; compensation and benefits; safety and health; and employee and labor relations. Prerequisites: Management and sophomore standing.

## BA 317

### Organizational Behavior (3,0)

#### 3 Credits

A basic course in the analysis of various behavioral concepts affecting human behavior in business organizations, with emphasis on research, theory and practice. Prerequisites: Management and sophomore standing.

# Course Descriptions

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## BA 320

### Business Information Systems (3,0)

#### 3 Credits

A management approach to understanding business information systems. The general characteristics, potential and limitations of business systems are covered. The major emphasis is on understanding the inputs, processing and outputs of a variety of business systems; the ways in which business systems are interrelated and the inherent management problems involved in the implementation and control of such systems. Prerequisites: Advanced Computer Skills and junior standing.

## BA 321

### Aviation/Aerospace Systems Analysis Methods (3,0)

#### 3 Credits

Overview of the system development life cycle. Emphasis on current system documentation through the use of both classical and structured tools/techniques for describing process flows, data flows, data structures, file designs, input and output designs and program specifications. Prerequisite: Advanced Computer Skills.

## BA 322

### Aviation Insurance (3,0)

#### 3 Credits

An introduction to the basic principles of insurance and risk with its special application to the aviation industry. An in-depth review of the aviation insurance industry in the United States including the market and types of aviation insurers. Prerequisite: sophomore standing.

## BA 323

### Office Automation and Telecommunications with Aviation/Aerospace Applications (3,0)

#### 3 Credits

Office information and decision support systems are examined. Emphasis is given to information processing considerations at the systems level, including analysis and management of support activities such as records management, electronic filing and retrieving systems, word processing, micro and reprographics, and telecommunications. Prerequisites: Computer Skills and junior standing.

## BA 324

### Aviation Labor Relations (3,0)

#### 3 Credits

An investigation of labor-management relations in the aviation industry. Examined are the history of unionism, structure of unions, legal environment and the Railway Labor Act, collective bargaining, public sector relationships, grievance procedures and conflict resolution. Prerequisite: sophomore standing.

## BA 325

### Social Responsibility and Ethics in Management (3,0)

#### 3 Credits

A comprehensive inquiry into the major components of social responsibility including economic, legal, political, ethical and societal issues involving the interaction of business, government and society. Prerequisites: Management and sophomore standing.

## BA 331

### Transportation Principles (3,0)

#### 3 Credits

Basic principles of the several modes of transportation: air, sea, rail, highway, and pipeline-including problems of competition, the importance of each in the economy, and future developmental prospects. Prerequisite: sophomore standing.

## BA 332

### Corporate Finance I (3,0)

#### 3 Credits

The finance function as used by management, including financial analysis and control; financial planning; short, intermediate and long-term financing, using the theory of cost of capital and leverage in planning financial strategies. Aviation-related businesses are emphasized. Prerequisites: Financial Accounting and junior standing.

## BA 333

### Personal Financial Planning (3,0)

#### 3 Credits

A study of the Personal Financial Planning process. Includes taxes, investments, purchase of housing/auto, insurance needs and analysis, use of credit, and retirement and estate planning. Student will develop a personal financial plan and will invest in a \$500,000 portfolio of securities. Prerequisite: junior standing.

# Course Descriptions

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## BA 335

### International Business (3,0)

#### 3 Credits

An analysis of economic development and international trade in modern times, with an examination of current US relations with other nations. Attention will be focused on the impact of foreign trade on the aviation industry and the industry's contribution to economic development. Prerequisite: sophomore standing.

## BA 350

### Analysis Methods for Management (3,0)

#### 3 Credits

The application of mathematical methods to the solution of management problems. Probabilities; decision making using marginal, cost, profit and volume analysis; linear programming; forecasting; introduction to simulation. Prerequisite: College Algebra or Business Statistics.

## BA 390

### Business Law (3,0)

#### 3 Credits

A survey of the legal aspects of business transactions. Areas covered include contracts, agency, bailment, negotiable instruments, partnerships, corporations, consumer credit, and the government's influence on business law. Prerequisite: sophomore standing.

## BA 405

### General Aviation Marketing (3,0)

#### 3 Credits

Marketing and management concepts applicable to FBOs and other general aviation enterprises. Travel analysis is performed to determine the need for a business aircraft. Prerequisite: junior standing.

## BA 406

### Strategic Management of Technical Operations (3,0)

#### 3 Credits

This course presents an advanced study of strategic management theory, technical management and the management of technology within a global aviation industry. Detailed coverage of the aviation technical management field is provided as well as that of the working aviation environment and system integra-

tion where the effective management of research, design, production, technical sales and services functions are employed. Prerequisite: Graduating senior standing.

## BA 408

### Airport Management (3,0)

#### 3 Credits

An examination of management of airports with an emphasis on the facilities that comprise an airport system, including airspace, airfield, terminal and ground access operations. Prerequisites: Management and junior standing.

## BA 410

### Management of Air Cargo (3,0)

#### 3 Credits

Intensive study of the practices and problems of management with respect to air cargo. Importance of air cargo service to the economy, rate and tariff problems, terminal facilities, competition, and future prospects. Prerequisite: junior standing.

## BA 411

### Logistics Management for Aviation/Aerospace (3,0)

#### 3 Credits

This course examines ways to optimize the physical flow of goods and materials within a firm from acquisition through production, and movement through channels of distribution. It focuses on applying logistics theory to aviation management problems in materials handling, managing inventory, planning capacities, and locating distribution centers. It includes case studies with aviation/aerospace applications using computer models. Prerequisite: junior standing.

## BA 412

### Airport Planning and Design Standards (3,0)

#### 3 Credits

The principles of airport master planning and system planning are studied. Fundamental principles of airport layout and design are covered, including geometric design, airport drainage, pavement design, passenger and cargo terminal layout, and capacity and delay effects. Prerequisites: Airport Management and senior standing.

# Course Descriptions

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## BA 415

### Airline Management (3,0)

#### 3 Credits

An introduction to the administrative aspects of airline operation and management. Topics include the annual profit plan, uniform system of accounts and reports, demand analysis, scheduling, the theory of pricing, fleet planning, facilities planning and airline financing. Prerequisites: Management and junior standing.

## BA 418

### Airport Administration and Finance (3,0)

#### 3 Credits

An advanced study of the organizational, political, and financial administration of public and private civil use airports. Areas of emphasis include: public relations management, safety and security issues, employee organizational structures, financial and accounting strategies, revenue and expense sources, economic impacts of airport operations, airport performance measurement standards, and current trends and issues of direct concern to airport administrators. Prerequisites: Airport Management and senior standing.

## BA 419

### Aviation Maintenance Management (3,0)

#### 3 Credits

Comprehensive examination of organizational maintenance policies, programs and procedures. Emphasis on maintenance planning; forecasting and cost control; reliability; safety and flight schedule performance. Prerequisites: Statistics and junior standing.

## BA 420

### Management of Production and Operations (3,0)

#### 3 Credits

An intensive study of management in all organizations-service oriented and product oriented. Scheduling, inventory control procurement, quality control and safety are investigated. Particular attention is given to applications of aviation-oriented activities. Prerequisites: Statistics and senior standing.

## BA 421

### Small Business Management (3,0)

#### 3 Credits

An analysis of the theoretical and practical knowledge necessary to be successful in conceiving, initiating, organizing and operating a small business. Special focus will be placed on small businesses in the aviation field. Prerequisites: Financial Accounting and senior standing.

## BA 422

### Life Cycle Analysis for Systems and Programs in Aviation/Aerospace (3,0)

#### 3 Credits

This course is a study of system theory and its relationship to aviation/aerospace systems management. It covers a brief history of system theory and system life cycle, and presents the major activities in each phase of a system's life cycle. Also covered are specific topics related to system design and support, including reliability, maintainability, availability, testing, quality control, customer support, product improvement program analysis and the role of data collection and analysis in the operational phase. Related topics covered are cost effectiveness analysis and project management. The course examines applications and case studies specific to aviation/aerospace, including military applications and computer simulation models. Prerequisite: senior standing.

## BA 423

### Artificial Intelligence and Expert Systems in Business (3,0)

#### 3 Credits

This course surveys application of artificial intelligence and expert systems in a business environment. Areas include problem solving, knowledge representation, search strategies, natural language processing, perception and learning, and AI computer languages. Reading in cognitive psychology, philosophy and social issues as applied to AI. Building a knowledge system project. Prerequisites: Computer Skills and junior standing.

## BA 424

### Project Management in Aviation Operations (3,0)

#### 3 Credits

This course introduces the student to the concept of project management within aviation operations. It

# Course Descriptions

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addresses the three-dimensional goals of every project—the accomplishment of work in accordance with budget, schedule, and performance requirements. The procedures for planning, managing, and developing projects within an aeronautical environment are covered as well as the aspects of controlling project configuration from inception to completion. Automated tools used to determine cost, schedule, staffing and resource allocation are covered as well as the process of determining the effectiveness and technical validity of aviation related projects. Prerequisites: Computer Skills and senior standing.

## BA 425

### Trends and Current Problems in Air Transportation (3,0)

#### 3 Credits

Analysis of selected contemporary issues, problems and trends facing management in various segments of the aviation industry including general aviation and the airlines. Students apply previously learned concepts to practical problems to develop increased understanding and demonstrate knowledge of the subject. Prerequisites: Management and senior standing.

## BA 426

### International Aviation Management (3,0)

#### 3 Credits

An investigation of international aviation management and its three elements: the nature of international aviation business; working within a foreign environment; and managing within an international environment. Prerequisites: International Business and senior standing.

## BA 427

### Management of the Multi-cultural Workforce (3,0)

#### 3 Credits

An investigation into the management of the multi-cultural workforce. The elements of cultural anthropology and international business, communicating across cultures, contrasting cultural values, and managing and maintaining organizational culture are addressed within the context of international aviation management. Prerequisites: Management and junior standing.

## BA 430

### International Trade and Regulations (3,0)

#### 3 Credits

Economic analysis of international trade, capital flows, and labor migration with particular emphasis on the laws governing these factors. Aviation applications include “code-sharing” and other international airline agreements, the impact of trade subsidies and “open skies” treaties. Prerequisites: Economics, Business Law, and junior standing.

## BA 434

### Corporate Finance II (3,0)

#### 3 Credits

A study of modern portfolio investment theory including traditional financial analysis, technical analysis, efficient and market theory and the capital asset pricing model, theories will be explored in the context of practical application to investment and financial decision-making in aviation industry corporations; analysis of specific companies involved in leasing, mergers, bankruptcies and other reorganizations. Student projects include the selection of an investment portfolio of \$100,000 and analysis of the investment over time. Prerequisites: Corporate Finance and senior standing.

## BA 435

### Taxation (3,0)

#### 3 Credits

An introduction into the areas of Federal Taxation and its relationship with business management decisions. Areas of emphasis will be on identifying tax aspects concerning: selection of business entity; rules of capital gains and losses; acquisition, use and disposition of fixed assets and other topics. Prerequisites: Management and senior standing.

## BA 436

### Strategic Management (3,0)

#### 3 Credits

A business capstone course, strategic management principles involving strategy, formulation, implementation, evaluation, and organization analysis are studied. Case analysis, employing strategic management principles, is used to solve and examine organization problems. Total Quality Management concepts are studied for improvement of organizational effectiveness. Prerequisite: Graduating senior standing.

# Course Descriptions

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## BA 440

### Advanced Professional Logistics

#### 3 Credits

In the advanced professional logistics course, a heavy emphasis is placed on the analysis of previously learned business logistics theories and concepts so as to determine their appropriate application. A secondary emphasis is placed on the horizontal integration of these theories and concepts within a practical framework, which will serve as professional guidance for the business logistics manager. Prerequisites: BA 321, BA 331, BA 410, BA 411, BA 419, BA 420, and BA 422 or the equivalent of each one of these courses.

## BA 445

### Aviation/Aerospace Database Management Systems (3,0)

#### 3 Credits

Introduction to application program development in a database environment with an emphasis on loading, modifying and querying the database using a host language. Discussion and application are centered on data structures indexed and direct file organizations, models of data including hierarchical, network and relational. Discussion of storage devices, data administration and data analysis, design and implementation are also presented. Prerequisites: Computer Skills and senior standing.

## BA 449

### Strategic Marketing Management (3,0)

#### 3 Credits

A capstone marketing course which focuses on strategic analysis and planning by aviation marketing managers. Emphasis will be given to corporate and marketing strategy; market analysis and targeting; strategic marketing programming; and market control. Prerequisites: Marketing and senior standing.

## BA 450

### Airline/Airport Marketing (3,0)

#### 3 Credits

An investigation of the role of marketing within the aviation/airport industries. Topics to be covered include: consumer segmentation, database management, integrated marketing communications, public relations, vendor relations and retailing. Prerequisites: Marketing and senior standing.

## BA 299, 399, 499

### Special Topics in Management

#### 1-4 Credits

Individual independent or directed studies of selected topics in management. Prerequisites: Consent of the instructor and approval of the department chair. May be repeated with change of content.

## Cooperative Education

## CE 396, 397, 398

#### 1-6 Credits

Aerospace Engineering (AE), Aerospace Studies (AR), Aeronautical Science (AS), Aircraft Engineering Technology (ET), Aviation Business Administration (ABA), Management of Technical Operations (MTO), Aviation Management (AM), Avionics (AV), Computer Engineering (CEC), Computer Science (CS), Electrical Engineering (EE), Flight (FL), Maintenance Technology (MT), Science, Technology and Globalization (STG). Practical learning experience in full-time or part-time employment that is related to the student's degree program and career goals. Course title and level are based on the work assignment. Prerequisite: Approval by the department chair and cooperative education administrator.

## CE 496, 497, 498

#### 1-6 Credits

Continuation of CE 396, 397.

## Computer Engineering

## CEC 100

### Introduction to Computer Engineering (2,0)

#### 1 credit

This course introduces first semester freshman students to computer engineering as a profession. The three objectives for this class are: (1) introduction to discipline of computer engineering; (2) introduction to tools and resources supporting the coursework and professional activities (computing facilities and the communication software, laboratories and assorted electronic equipment); (3) development of personal, interpersonal, intellectual and social skills (time management and study skills). Particular atten-

# Course Descriptions

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tion will be given to distance communication in an asynchronous environment. Prerequisites: freshman status, computer engineering major.

## CEC 220

### Digital Circuit Design (3,0)

3 credits

Introduction to logic design and interfacing digital circuits. Boolean algebra, combinatorial logic circuits, digital multiplexers, circuit minimization techniques, flip-flop storage elements, shift registers, counting devices, and sequential logic circuits.

## CEC 222

### Digital Circuit Laboratory (1,2)

1 credit

Laboratory experiments in the measurement and verification of digital circuits. Discrete and integrated logic circuit design analysis and measurements. Corequisite: CEC 220.

## CEC 320

### Microprocessor Systems (3,0)

3 credits

Study of digital computer organizations. Introduction to microcomputer systems using a current microprocessor. Assembly language programming techniques for microcomputers will be used to study digital computer operation. Input and output techniques, memory devices, RS 232 and other interfacing techniques will be studied. Hardware and software relationships will also be discussed. Prerequisites: CEC 220 and experience in programming in a high-level language.

## CEC 322

### Microprocessor Systems Laboratory (1,2)

1 credit

“Hands-on” experience with a microprocessor is provided through weekly experiments involving hardware and software techniques. Corequisite: CEC 320.

## CEC 420

### Computer Systems Design I (2,3)

3 credits

This course introduces students to project discussing issues of project management, planning, task assignment, resource allocation, requirement collection, system specification and design. The team working

in distributed environment will develop a base for implementation of a computer-centered system with elements of both hardware and software. Prerequisites: Computer Engineering major, senior status.

## CEC 421

### Computer Systems Design II (1,6)

3 credits

This course continues with project development focusing on issues of detailed design, modularization, component selection, coding, assembling, testing. The team working in distributed environment will implement and test a computer-centered system with elements of both hardware and software. Prerequisite: CEC 420.

## CEC 460

### Telecommunications Systems (3,0)

3 Credits

Techniques and applications in telecommunications. Types of data communication versus line discipline methodology. Hardware requirements and constraints. Speed versus quality. Security and encoding algorithms. Prerequisite: CEC 320 or permission of instructor.

## CEC 299, 399, 499

### Special Topics in Computer Engineering

1-6 Credits

Directed studies of selected topics in computer engineering. Prerequisite: Consent of instructor and department chair.

## Civil Engineering

## CIV 101

### Topics in Civil Engineering (2,0)

2 credits

Current topics in civil engineering. Professionalism, ethics. The role of civil engineers and their interaction with other engineering disciplines. Study of design and construction of civil engineering projects. Field trips. Case studies.

# Course Descriptions

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## CIV 140

### Engineering Measurements with Laboratory (1,3) 2 credits

Introduction to data collection and analysis. Principles of surveying and mapping, with emphasis on modern methods. Laboratory methods.

## CIV 304

### Structural Analysis (3,0) 3 credits

Analysis of statically determinate and indeterminate structures using statics, kinematics, virtual work, strain energy, force and displacement methods. Structural laboratory testing. Prerequisite: ES 202.

## CIV 307

### Civil Engineering Materials I (3,3) 4 credits

Properties of engineering materials: steel, concrete, soil, asphalt, polymers, composites. Relationship between structure and behavior. Standard methods of testing and inspecting. Laboratory methods.

## CIV 310

### Intermodal Transportation Engineering (3,0) 3 credits

Role of transportation in society and the engineer's role in planning, design and operation of the transportation systems. Nature of civil aviation, structure of the airline industry, navigation and air traffic control and airline operations.

## CIV 311

### Introduction to Transportation Engineering (3,0) 3 credits

Fundamentals of transportation engineering including planning, design, construction, maintenance, operation, economics, and the role of transportation facilities in society. Concepts, underlying theory, and design issues are detailed.

## CIV 316

### Hydraulics (3,0) 3 credits

Open channel and pipe flows. Hydraulic structures. Groundwater hydrology and stormwater management.

## CIV 320

### Soil Mechanics (3,3) 4 credits

Study of the engineering behavior of soil: origin, classification, identification and structure. Permeability, seepage, consolidation, settlement, slope stability, lateral pressures, bearing capacity. Soil sampling and testing. Laboratory methods.

## CIV 330

### Computer Applications in Transportation (1,3) 2 credits

Application of computer software for planning and design of transportation systems. Emphasis is placed on finding solutions to current problems associated with existing airport and intermodal transportation systems. Prerequisite: CIV 311.

## CIV 340

### Construction Engineering (3,0) 3 credits

Delivery of construction projects. Introduction to construction equipment, production rates, construction methods for concrete, asphalt, steel, wood and masonry, planning and scheduling, safety, and construction economics.

## CIV 362

### Engineering and Construction Operations in Space (3,0) 3 credits

U.S. space exploration policies in the 21st century. Construction in zero- or low-weight environments. Development of lunar and planetary resources. Controlled ecological life support systems. Lunar concrete.

## CIV 370

### Computational Methods in Civil Engineering (3,0) 3 credits

Numerical techniques for solving civil engineering problems. Applications of statistical methods. Matrix operations. Spreadsheet development. Prerequisite: CS 223.

# Course Descriptions

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## CIV 380

### Federal Aviation Regulations/Environmental Impact (3,0)

*3 credits*

Survey of state, federal and international regulation of the aviation industry and detailed studies of FARs governing airport system operation, design and fabrication. Basics of environmental impact assessment including air quality, noise pollution, sanitation, ground water, biological and chemical pollution. Field data collection and analysis. Emphasis on official report writing.

## CIV 413

### Geometric Design of Highway Facilities (2,3)

*3 Credits*

Fundamentals of planning, design, and construction of highways and streets, including intersections, interchanges, and traffic operations. Computer laboratory problems expose the student to modern roadway design techniques. Prerequisite: CIV 311.

## CIV 421

### Geotechnical and Foundation Engineering (3,0)

*3 Credits*

Prediction of settlement, analysis of the stability of slopes, prediction of the bearing capacity of shallow and deep foundations, and determination of earth pressures acting on retaining structures. Prerequisite: CIV 320.

## CIV 422

### Design of Pavement Structures (3,0)

*3 Credits*

Theory and practice in pavement design for highways and airfields, pavement performance, structural design of pavement layers, types of materials used in pavement layers, characterization of pavement layer materials, introduction to pavement management concepts. Prerequisite: CIV 320.

## CIV 423

### Stabilization of Soil Aggregate System (3,0)

*3 credits*

Theory of mechanical and chemical stabilization of soils and soil-aggregate systems. Stabilization using lime, fly-ash, cement, and bituminous materials. Prerequisite: CIV 320.

## CIV 424

### Rehabilitation of Pavement Structures (3,0)

*3 credits*

Pavement distresses and their causes. Pavement evaluation, roughness, friction, drainage survey and evaluation, structural evaluation, material characterization, traffic loading evaluation, design of pavement rehabilitation alternatives, economic analysis and selection of preferred alternatives. Prerequisite: CIV 320.

## CIV 431

### Reinforced Concrete Design (3,0)

*3 credits*

Properties of concrete, its constituents, and reinforcement steels. Design of beams, columns, beam-columns, and slabs. Cracking and deterioration. Torsion and shear reinforcement. Anchorage and bond detailing. Application of the concrete design code. Prerequisite: CIV 304.

## CIV 432

### Structural Steel Design (3,0)

*3 credits*

Steel and its properties. Design of tension members, column members, torsional members, plate girders. Welded and bolted connections. Steel design specifications and building codes. Current philosophies in steel design. Prerequisite: CIV 304.

## CIV 433

### Timber Design (3,0)

*3 credits*

Timber classifications and properties. Effect of grain orientation. Bolted and nailed connections. Environmental effects on timber strength and dimensions. Laminated timber structures. Current design and construction methods. Application of design codes. Prerequisite: CIV 304.

## CIV 435

### Wind Engineering (1,0)

*1 credit*

Investigation into the impacts of wind and wind related phenomena on structural systems. Wind characteristics. Wind event probability distributions. Pressures and resultant forces. Dynamic response of structures to wind loading. Structural design consid-

# Course Descriptions

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erations. Wind tunnel laboratory tests will be conducted. Prerequisite: CIV 304.

## CIV 441

### Civil Engineering Materials II (3,1)

4 credits

Physical and mechanical properties of construction materials, portland cement concrete, proportioning of concrete mixtures including admixtures. Fiber reinforced concrete design and evaluation. Origin, production, specifications and tests of bituminous materials and paving mixtures used in construction and maintenance of roads and pavements, pavement surface properties, pavement distress and correction alternatives. Prerequisite: CIV 307.

## CIV 445

### Airport Pavement Design (3,0)

3 credits

Airport pavement design practices and standards, static and dynamic aircraft loadings, subsurface soil exploration. Pavement durability. Prerequisite: CIV 320.

## CIV 447

### Airport Design I (3,0)

3 credits

Fundamental principles of airport layout and preliminary design. Airport site selection, runway length and orientation, air traffic control, capacity and delay. Prerequisite: CIV 311.

## CIV 457

### Airport Design II (3,0)

3 credits

Airport terminal passenger and vehicle processing systems. Lighting and signing systems, pavement marking, baggage handling, communication systems and security systems. Prerequisite: CIV 447.

## CIV 460

### Senior Design Project (3,0)

3 credits

Detailed and complete design of a civil engineering facility. Progress reports and presentation. Interdisciplinary group cooperation is emphasized. Prerequisite: senior standing.

## CIV 490

### The Civil Engineering Profession (1,0)

1 credit

Current problems in engineering, professional duties and responsibilities, opportunities for professional development, ethics and professionalism. Prerequisite: Graduating senior status.

## CIV 499

### Directed Design Project (Variable)

1-3 credit

Directed design project. Individual investigation of current design problem. Offered by special arrangement only. Prerequisite: Permission of Civil Engineering Program Coordinator.

## CIV 199, 299, 399

### Special Topics in Civil Engineering (Variable)

1-3 credits

Directed studies of special topics in Civil Engineering. Offered by arrangement only. Prerequisite: Consent of instructor and Civil Engineering Program Coordinator.

## Communication

## COM 008

### Academic English for Non-Native Speakers of English (4,0)

4 Credits

A developmental course designed to help intermediate-level non-native speakers of English develop their English language proficiency. The emphasis is on writing and reading in academic settings. Students cannot withdraw from the course. The course must be passed with a grade of C or better. (Credit not applicable to any degree.)

## COM 018

### Advanced Academic English for Non-Native Speakers of English (4,0)

4 Credits

A developmental course designed to help advanced-level non-native speakers of English develop their English language proficiency. The emphasis is on writing and reading in an academic setting and on preparation for degree-credit bearing communication courses. (Credit not applicable to any degree.)

# Course Descriptions

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Students cannot withdraw from the course. The course must be passed with a grade of C or better. Prerequisite: HU 008 or ESL Placement Test.

## COM 020

### Fundamentals of Communication (4,0)

#### 4 Credits

Designed to improve the student's reading and writing abilities through focusing on critical thinking. All three skills are approached as facets of each other and as processes that the student learns to control and take responsibility for. The fundamentals of grammar, punctuation, and sentence structure are strengthened when students write and revise multi-paragraph expository essays. A grade of C is required to pass this course, and it may not be dropped. (Credit is not applicable to any degree.)

## COM 122

### English Composition and Literature (3,0)

#### 3 Credits

This course focuses on principles of writing in response to readings in the humanities, social sciences, and other interdisciplinary fields. Students develop their communicative, evaluative, critical thinking, and research writing abilities through the close examination of key texts across those disciplines. Prerequisite: Satisfactory completion of Basic Skills Requirements.

## COM 219

### Speech (3,0)

#### 3 Credits

A continuation of the study of communication and communication theory with emphasis upon overcoming communication apprehension, developing listening skills, mastering oral performance, and writing about communication. Individual sections may focus upon public speaking, group discussion, oral interpretation, or interpersonal communication. Section emphasis varies by instructor and is listed in the Schedule of Courses. Prerequisite: COM 122.

## COM 221

### Technical Report Writing (3,0)

#### 3 Credits

Preparation of formal and informal technical reports, abstracts, resumes, and business correspondence. Major emphasis placed on the long technical paper and the acquisition of advanced writing skills. Prerequisite: Any course from the HU 140 series.

## COM 222

### Business Communication (3,0)

#### 3 Credits

An introduction to effective business communication. Topics in oral, written, non-verbal, and intercultural communication are covered. Research methods, effective speaking, and the preparation of letters, memoranda, and reports are emphasized. Prerequisite: Any course from the HU 140 series.

## COM 260

### Introduction to Media (3,0)

#### 3 Credits

The structure of, professional opportunities in, and social issues arising from media industries. Required of all Communication students. Must be taken within the first year of entering the program.

## COM 265

### Introduction to News Writing (3,0)

#### 3 Credits

COM 265 offers Communication majors theory and practice in fundamentals of various journalistic genres: news reporting, features, interviews, spot news, page layout, interpretive journalism, and more. This course introduces students to use of AP Stylebook, libel law, and ethical issues in journalism. Prerequisite: COM 122 or permission of instructor.

## COM 351

### Journalism (3,0)

#### 3 Credits

Theory and practice of the techniques of journalism, familiarizing the student with the functions, skills and responsibilities required in writing, editing and producing news, and technical publications. Prerequisite: Any course from the HU 140 series.

## COM 360

### Media Relations I (3,0)

#### 3 Credits

The course focuses upon different theories of persuasive communication and the construction of persuasive messages. Individual instructors may explore persuasive communication in public service and political campaigns, interpersonal communication, social movements, persuasive writing, or advertising. Students are evaluated upon their ability to recognize, apply and evaluate the communication theories used to design persuasive messages. Prerequisite: COM 219.

# Course Descriptions

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## COM 364

### Layout and Design (3,0)

#### 3 Credits

The primary concepts of layout and design for basic publications common to most organizations, including newsletters, magazines, annual reports, and brochures. Students will study the techniques of writing, editing, and designing these basic forms. By acquiring a working knowledge of the fundamentals of layout and design, students will also be able to experiment with more complex formats. An integral part of this course will be the use of page layout software programs with which students will be required to write, edit, and layout sample documents. Required of all students in the Communication program. Prerequisites: COM 221, COM 222, or an equivalent professional writing course; COM 265.

## COM 410

### Advanced Professional Writing (3,0)

#### 3 Credits

A sophisticated process approach to strategies for effective communication in the workplace. Balancing theory and practice in professional communication, students will work singly and in collaborative teams to integrate visuals, layout and design, editing and review systems, online documentation and electronic publishing. All assignments carry written components with equal emphasis placed on oral execution. Prerequisites: COM 219, COM 221, COM 265.

## COM 411

### Publishing on the Internet (3,0)

#### 3 Credits

Basic concepts of aesthetic design, orthographic accuracy, and basic technical aspects of web publishing. Through hands-on experiences in layout and design, students will be able to engage in independently publishing and registering at least one major publication effort. Topics of this effort will be selected collaboratively and in close consultation with the professor.

## COM 412

### Seminar in Writing for Specific Audiences (3,0)

#### 3 Credits

Senior seminar in which students will analyze various audiences and produce documents aimed at specific audiences. Each student may choose to focus upon one of the following areas: Writing Grants and Proposals, Writing Advertising and Public Relations Copy,

Technical Documentation, Writing for Publication, Speech writing. Prerequisites: COM 219, COM 221, COM 265.

## COM 415

### Non-verbal Communication (3,0)

#### 3 Credits

Non-verbal Communication entails the study of communication behaviors and processes, not involving the expression of written or spoken words, which contribute information to a message. Special attention is directed to the study of voice qualities; facial expression and body language; space, personal distance, and touch; the use of time and objects; and personal appearance. Study also involves non-verbal communication in applied settings, as well as research strategies for observing, measuring, and understanding non-verbal phenomena. Prerequisites: COM 219, equivalent Speech Communications course. (Also offered as HU 415. Students receive either communication or humanities credit, but not both.)

## COM 440

### Senior Employment Practicum (1,0)

#### 1 Credit

Open only to Communication majors. Preparation and evaluation of resumes, employment correspondence, portfolios, and mock employment interviews. Must be taken the semester after completing 88 hours. Prerequisite: COM 265.

## COM 460

### Media Relations II (3,0)

#### 3 Credits

Mastery of writing and speaking genres in media relations with an emphasis upon crisis communication. Prerequisites: COM 265, COM 360.

## Computer Science

## CS 100

### Introduction to Computing (2,0)

#### 1 Credit

Provided freshman computer science majors with an overview of the discipline of computing (computer science, software engineering and computer engineering). In addition, the course will include instruction and activities to help students develop the skills necessary to be successful in their college work.

# Course Descriptions

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Prerequisites: To be taken during the first year by students majoring in computer science.

## CS 101

### Introduction to Keyboard Operations (1,0)

#### 1 Credit

Fundamental skills and techniques in the operation of the keyboard and use of computers in word processing. Emphasis is placed on the fundamentals of word processing, and the development of touch typing with speed and accuracy.

## CS 106

### Introduction to Internet (1,0)

#### 1 Credit

This course will provide an overview of the Internet and electronic communications. Students will learn the basic skills needed to utilize the Internet for research. Prerequisite: IT 109 or equivalent knowledge.

## CS 111

### Spreadsheet (1,0)

#### 1 Credit

An understanding of spreadsheet applications and commands designed to develop an intermediate level of spreadsheet competency. An exploration of practical spreadsheet applications such as budgets, income taxes, profit and loss statements, calculating grades, among many others. Specific commands include creating, editing, saving, retrieving, and printing spreadsheets; utilizing statistical data, and financial functions; depicting spreadsheet information graphically in bar graphs, pie charts, and line graphs; linking and integrating spreadsheets, and utilizing spreadsheet macros. Prerequisite: IT 109 or equivalent knowledge.

## CS 114

### Presentation Graphics (1,0)

#### 1 Credit

An overview of business graphics. Emphasis is on the design and creation of professional graphics such as charts and short documents to be used to clarify information in oral and written presentations. Specific topics include planning and organizing charts and presentation documents; creating pie charts, bar charts, line charts and presentation documents, formatting, editing and printing; utilizing text, symbols, and graphics, importing artwork; creating

an automated presentation of charts and documents.

## CS 116

### Recent Trends in Application Software (1,0)

#### 1 Credit

The content of the course is left to the specific needs of the students and new software. Prerequisite: IT 109 or equivalent knowledge.

## CS 117

### Computer Configurations (3,0)

#### 3 Credits

Provide the student an in-depth understanding of the technical aspects of hardware and software and a study of the current trends in computing. The course will include hardware and software installations, troubleshooting, and a survey of resources in the field of personal computing.

## CS 118

### Fundamentals of Computer Programming (3,0)

#### 3 Credits

Introduction to basic concepts of structured programming with applications in a variety of areas: business, technology, and engineering. This course is intended for the student with little or no experience in programming.

## CS 125

### Computer Science I (3,3)

#### 4 Credits

Introduction to problem solving methods, algorithm development and software engineering; software development process, program design, coding, review, testing, and documentation; programming using a modern programming language that supports modular development. The course has a closed laboratory that includes activities dealing with the computing environment, the software development process, and programming exercises. Prerequisite: Experience in programming in a high-level language, proficiency in high school precalculus mathematics.

## CS 207

### Network Based Computing (3,0)

#### 3 Credits

Local area network installation and operations. Topics covered include but not limited to LAN, WAN, terminology, protocols, topologies, mail sys-

# Course Descriptions

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tems, network administration functions, and hardware. Prerequisites: CS 117 and CS 118.

## CS 210

### Scientific Programming (3,0)

#### 3 Credits

Introduction to problem solving methods, algorithm development, program design, coding, debugging, testing, use of subprograms and documentation, and programming in a block-structured high-level language covering control structures and simple data structures such as arrays and files. This course emphasizes scientific/engineering programming techniques and applications. Corequisite: MA 112 or MA 241.

## CS 222

### Introduction to Discrete Structures (3,0)

#### 3 Credits

An introduction to the fundamental algebraic, logical, and combinatorial concepts of mathematics that provides a foundation for the study of computer science. Prerequisites: Experience in programming in a high-level language, pre-calculus mathematics.

## CS 223

### Scientific Programming in C (3,0)

#### 3 Credits

This is a course in C programming for scientists and engineers. Using a problem solving approach for developing algorithms, the algorithms are implemented in C and include the following topics: data types and related operations, input/output, control structures, functions, array, files and strings. Prerequisite: MA 112 or MA 241 or permission of instructor.

## CS 225

### Computer Science II (3,3)

#### 4 Credits

This course emphasizes program design, style, data abstraction, information hiding, and testing; advanced programming features; introduction to object-oriented concepts, basics of algorithm analysis, exception handling, string processing, recursion, pointers, and simple data structures. The course has a closed laboratory that includes activities dealing with the computing environment, the software development process, and programming exercises. Prerequisite: CS 125.

## CS 235

### Assembly Language Programming (3,0)

#### 3 Credits

Introduction to computer architecture; assembler concepts and instruction format; addressing techniques; interrupt processing, especially input/output; segmentation, linkage, and external procedures; programming projects to develop understanding of assembly language concepts. Prerequisites: CS 225, CS 220.

## CS 308

### Practicum (3,0)

#### 3 Credits

Capstone Project Course-Individualized to each student, and utilizing most facets of their prior instruction. Prerequisite: All other courses required in computer applications minor.

## CS 315

### Data Structures and Analysis of Algorithms (3,0)

#### 3 Credits

This course emphasizes the design, implementation, and analysis of algorithms dealing with searching, sorting, graphs, trees, and disk files. Prerequisites: CS 225, CS 222.

## CS 317

### Files and Database Systems (3,0)

#### 3 Credits

Introduction to file and database systems. The course will cover the theory of the database systems, various database models, and the design of a database system. Course homework will reflect real-life problems requiring cooperation, problem formulation, and problem solving skills. A team/group term project may be assigned. Prerequisites: CS 225 and CS 222.

## CS 325

### Programming in ADA (3,0)

#### 3 Credits

Advanced systems concepts using the ADA language to implement software engineering, concurrent programming, and structured design techniques. Prerequisites: CS 210, CS 225 or permission of the instructor.

# Course Descriptions

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## CS 332

### Organization of Programming Languages (3,0)

#### 3 Credits

A comparative study of different programming paradigms. Students program in several languages chosen to illustrate the essential features of the paradigms studied. Formal language concepts are also introduced. Prerequisites: CS 222, CS 225.

## CS 335

### Introduction to Computer Graphics (3,0)

#### 3 Credits

Introduction to computer graphics, algorithms, graphics programming, graphics design, use of graphic packages, and applications of computer graphics to aviation, business and scientific problems. A term project involving a graphics programming application may be assigned. Prerequisites: MA 241 and a proficiency in implementation language.

## CS 344

### C Programming and UNIX (3,0)

#### 3 Credits

This course is an advanced course in the C programming language and the UNIX programming environment and provides basic information about the general principles of operating systems. It begins with an introduction to the UNIX operating system, followed by an in-depth study of the C programming concepts and techniques in the UNIX environment. In addition, topics such as the function and structure of operating systems, process management, memory management, concurrency, UNIX system programming, and UNIX programming tools will be covered. Prerequisite: CS 225 or equivalent experience in programming.

## CS 350

### Computer Modeling and Simulation (3,0)

#### 3 Credits

Introduction to the basic aspects of modeling and simulation. Topics include statistical models, queuing theory, random variate generation, simulation languages, object-oriented programming, graphic output with animation, design and analysis of experiments, verification and validation of simulation models. A term project involving the simulation of an element of the aviation or aerospace may be assigned. Prerequisites: MA 412 or MA 222, a profi-

ciency in computer programming and junior/senior standing.

## CS 420

### Operating Systems (3,0)

#### 3 Credits

Development, structure, and functions of operating systems; demand service models; development of concurrent models. Prerequisite: CS 225 and junior standing.

## CS 441

### Database Management Systems Design (3,0)

#### 3 Credits

Introduction to database concepts, data models, data normalization and data description languages. Relational database design using entity-relationship model or other appropriate tools. Conversion of the design to a particular DBMS. Prerequisite: CS 317.

## CS 445

### Interfacing (3,1)

#### 3 Credits

Introduction to microcomputers and microcontrollers, effect of the microprocessor on the system, memory, and microcomputer input/output methods. The subject of interface components and their characteristics, designing interface components, interfacing to standard buses and peripherals. Interface layout and construction. Interface software design and implementation. Prerequisite: CS 320 or equivalent.

## CS 450

### Real-time Systems (3,0)

#### 3 Credits

The course introduces the concepts of real-time systems from the user and designer viewpoint. The requirements, design, implementation, and basic properties of real-time application software are described with an overview of system software. Related topics such as interrupts, concurrent task synchronization, sharing resources, and software reliability are discussed. A team project on a real-time prototype application may be incorporated in the course. Prerequisites: CS 225, CEC 320. Corequisite: CS 420.

# Course Descriptions

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## CS 455

### Artificial Intelligence (3,0)

#### 3 Credits

This course introduces students to the basic concepts of Artificial Intelligence with emphasis on knowledge engineering. Students gain experience, through individual and group exercises, in the various phases of system development: planning, requirements and specification, design, implementation and testing. Students study and apply commercial tools to the development of knowledge-base systems in the aerospace and aviation domain. Prerequisite: CS 222 or permission of instructor.

## CS 470

### Computer Architecture (3,0)

#### 3 Credits

This course describes in detail the Von Neuman computer architecture which includes processors, memory, input/output, and transfer of information; examples of machine language, assembly language, microprogramming and operating system will be discussed. Additional topics in advanced computer architecture and computer systems will be covered. Prerequisite: CEC 320.

## CS 299, 399, 499

### Special Topics in Computer Science

#### 1-6 Credits

Individual independent or directed studies of selected topics in computer science. Prerequisite: Consent of the instructor and the department chair.

## Drafting Engineering Technology

## DET 101

### College Success (2,0)

#### 1 Credit

A course in which students assess and develop the personal, interpersonal, intellectual and social skills necessary to succeed in college. Time management, study skills, goal clarification, career concerns, and college resources will be included. This course is available to freshmen only.

## DET 111

### Engineering Drawing (1,3)

#### 2 Credits

An introduction to drawing types and interpretation, sketching, orthographic projections, sections, dimensioning, auxiliary views and Computer Aided Drafting (CAD).

## Economics

Standing is based on credit hours earned toward the student's declared degree program.

## EC 200

### An Economic Survey (3,0)

#### 3 Credits

An introduction to macro and microeconomic principles, problems, and policies with a view to current economic problems.

## EC 210

### Microeconomics (3,0)

#### 3 Credits

An introduction to the economic principles of free enterprise supply and demand, private and social implications of profit maximization, market structure, and resource markets. Current microeconomic issues in aviation (such as liability reform, evolution of airline competition, etc.) are discussed.

## EC 211

### Macroeconomics (3,0)

#### 3 Credits

An introductory analysis of employment, inflation, recession, GDP economic growth, and international trade with an emphasis on practical policy alternatives. Macroeconomic aviation applications such as the counter-cyclical growth of start-up airlines and consideration of ATC privatization are incorporated.

## EC 225

### Engineering Economics (3,0)

#### 3 Credits

An introduction to microeconomic principles, problems, and policies as well as basic financial principles such as time value of money, capital budgeting and cost of capital. The course will provide the engineering graduate with the tools needed for success in the workplace.

# Course Descriptions

## EC 310

### Labor Economics (3,0)

#### 3 Credits

A survey of the economics of the labor market to include wage determination and employment theory, labor organization, labor legislation and current developments in labor relations. Prerequisites: Microeconomics and junior standing.

## EC 312

### Money and Banking (3,0)

#### 3 Credits

A preliminary investigation of the financial institutions of the United States and the relationship of monetary policy to income and price stabilization. Some analysis of international capital flows will also be undertaken. Prerequisites: Microeconomics and junior standing.

## EC 315

### Managerial Economics (3,0)

#### 3 Credits

An analytical approach to the manager's role in understanding pricing, costing, production and forecasting. Concentrates on simple quantitative models to explain the firm's position in the market and how the manager can react to and control this information. Aviation topics commonly discussed include airport privatization and employee ownership of airlines. Prerequisites: Microeconomics and junior standing.

## EC 420

### Economics of Air Transportation (3,0)

#### 3 Credits

A study of the economic aspects of airline service with consideration given to the impact of federal aid and regulation, types of aircraft, airport problems, consumer interests and competitive practices. Prerequisites: Microeconomics and junior standing.

## EC 299, 399, 499

### Special Topics in Economics

#### 1-4 Credits

Individual independent or directed studies of combinations of selected topics in economics. Prerequisite: Consent of the instructor and the department chair.

## Electrical Engineering

## EE 120

### Introduction to Engineering Management (3,0)

#### 1 Credit

Study of the tools engineers use to manage projects, programs and research.

## EE 200

### Engineering Software Tools (3,0)

#### 1 Credit

Study of software tools needed to solve engineering problems. Topics include but are not limited to the study of MATLAB®, computer aided design tools, and graphical simulation programs.

## EE 220

### Digital Circuit Design (3,0)

#### 3 Credits

Introduction to logic design and interfacing digital circuits. Boolean algebra, combinatorial logic circuits, digital multiplexers, circuit minimization techniques, flip-flop storage elements, shift registers, counting devices, and sequential logic circuits.

## EE 222

### Digital Circuit Laboratory (1,2)

#### 1 Credit

Laboratory experiments in the measurement and verification of digital circuits. Discrete and integrated logic circuit design analysis and measurements. Corequisite: EE 220.

## EE 223

### Linear Circuits Analysis I (3,0)

#### 3 Credits

Volt-ampere characteristics for passive circuit elements, resistive network circuit theory and simplification. Kirchoff's current and voltage laws. Introduction to linear network theorems and transformations. Transient response of RC, RL and RLC circuits. Steady state and impedance circuit analysis for sinusoidal sources. Prerequisite: PS 250. Corequisite: MA 345.

# Course Descriptions

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## EE 224

### Electrical Engineering Laboratory I (1,2)

#### 1 Credit

Problem sessions, electrical instrumentation and measurement, verification of theory presented in EE 223, working knowledge of electronic test equipment. Corequisite: EE 223.

## EE 300

### Linear Circuit Analysis II (3,0)

#### 3 Credits

Continuation of EE 223. Study of the Laplace and Fourier transforms, Fourier analysis, complex plane, resonance and coupled circuits, Bode Diagrams, and two-port networks. Prerequisite: EE 223. Corequisite: MA 441 or permission of instructor.

## EE 301

### Electrical Engineering Laboratory II (1,2)

#### 1 Credit

Problem sessions, analysis and simulation of analog and digital circuits using computer aided design and analysis tools. Corequisite: EE 300.

## EE 302

### Electronic Devices and Circuits (3,0)

#### 3 Credits

Introduction to basic semiconductor theory and semiconductor device characteristics. Diode and transistor models used in the analysis and design of electronic circuits. Basic amplifier circuits. Single and multi-stage amplifier analysis, design and frequency response. Integrated circuit implementation of differential stages and operational amplifier circuits. Prerequisite: EE 223 or permission of the instructor. Corequisites: EE 301, EE 304.

## EE 303

### Signals and Filters (3,0)

#### 3 Credits

Mathematics for filtering and spectral analysis of continuous and discrete systems. Solutions to filtering approximations via butterworth, Chebyshev, elliptic and others. Introductions to Z-transforms and digital filter design methods. Prerequisites: EE 300 and MA 441 or permission of instructor.

## EE 304

### Electronic Circuits Laboratory (1,2)

#### 1 Credit

Laboratory experiments in the measurement of electronic device characteristics. Design of biasing networks, small signal amplifiers, and switching circuits. Corequisite: EE 302.

## EE 305

### Electronic Devices and Circuits II (3,0)

#### 3 Credits

Study of the characteristics of operational amplifiers. Design of op amp circuits used in a variety of electronic signal conditioning applications. Analysis and design of popular analog-to-digital and digital-to-analog circuits and their system application and limitations. Further study of basic components found in instrumentation systems such as: sensors, signal conditioning circuitry, power supplies, A/D and D/A circuitry and other special electronic devices. Final design project requires the design of a simple data acquisition system. Prerequisites: EE 300, EE 302.

## EE 306

### Introduction to Electrical Systems (2,0)

#### 2 Credits

Direct Current electricity; circuits, resistance, DC machinery. AC current; transformers, three phase circuits, AC machinery, commercial applications, building codes.

## EE 307

### Avionics I (3,3)

#### 4 Credits

Provides the first part of a comprehensive and rigorous study of avionics systems. A laboratory is provided to give the student the opportunity to gain hands-on experience. The course covers avionics systems from the basic physics of avionics to the latest technology. Prerequisites: EE 223, EE 224, MA345, PS 250, PS 253.

## EE 310

### Avionics II (3,3)

#### 4 Credits

Provides the second part of a comprehensive and rigorous study of avionics systems. This course includes practical laboratory examples. The course

# Course Descriptions

covers avionics systems from the basic physics of avionics to the latest technology. This course is a continuation of EE 307. Prerequisite: EE 307.

## EE 320

### Microprocessor Systems (3,0)

#### 3 Credits

Study of digital computer organizations. Introduction to microcomputer systems using a current microprocessor. Assembly language programming techniques for microcomputers will be used to study digital computer operation. Input and output techniques, memory devices, RS 232 and other interfacing techniques will be studied. Hardware and software relationships will also be discussed. Prerequisites: EE 220 and experience in programming in a high-level language.

## EE 322

### Microprocessor Systems Laboratory (1,2)

#### 1 Credit

“Hands-on” experience with a microcomputer is provided through weekly experiments involving hardware and software techniques. Corequisite: EE 320.

## EE 340

### Electrostatics and Magnetic Fields (3,0)

#### 3 Credits

Electrostatics and magnetostatics. Study of magnetic and dielectric material properties; Maxwell’s equations; energy and radiation of plane waves. Introduction of electromagnetic waves, transmission lines, the Smith chart, and radiation from antennas. Prerequisites: MA 441, PS 160.

## EE 401

### Control Systems Analysis and Design (3,0)

#### 3 Credits

Modeling analysis and design of analog and digital linear control systems using time and frequency domain techniques. Topics include feedback control system characteristics; performance analysis and stability; z-transforms; and controller design. Prerequisites: EE 303, EE 320.

## EE 402

### Control Systems Laboratory (1,2)

#### 1 Credit

Laboratory experiments involving the principles of operation and design of linear control systems. Experiments to support theory introduced in EE 401. Corequisite: EE 401.

## EE 403

### Avionics Communication Systems (3,0)

#### 3 Credits

This course covers the fundamentals of communications systems both digital and analog. This course is in preparation for other communications systems courses. Prerequisites: EE 302, EE 303.

## EE 406

### Digital Signal Processing (3,0)

#### 3 Credits

Discrete-time description of signals and systems. D/A and A/D conversion, sampling, and aliasing. Fourier Transform of discrete signals, the Discrete Fourier Transform, and the z-Transform. Digital filter structures, filter implementation and synthesis techniques. Digitization, quantization, and finite precision effects. Discrete system simulation and DSP applications. Prerequisite: EE 303. Corequisite: EE 407.

## EE 407

### Digital Signal Processing Laboratory (3,0)

#### 1 Credit

Analog and digital filter design using Matlab®. Digital filter implementation with C-programming and assembly code. Input/Output, filtering, and waveform generation with a 32-bit floating-point DSP development system. Corequisite: EE 406.

## EE 408

### Data Communications (3,0)

#### 3 Credits

This course is a continuation of AVE 401 and covers the fundamentals of data communications. Subjects include basic modulation, encoding, error detection and error correction. Prerequisite: EE 403.

# Course Descriptions

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## EE 410

### Communication Systems (3,0)

#### 3 Credits

Theory and application of electronic communications systems; spectral analysis; modulation and demodulation techniques; transmitting and receiving systems. Behavior of receivers and transmitters in the presence of noise. Study of avionic radio systems presently in use such as NAV, COMM, DME, ATCRBS, ILS, and others. Prerequisites: EE 303, EE 340.

## EE 412

### Communication Systems Laboratory (1,2)

#### 1 Credit

Laboratory experiments involving design and analysis of electronic communication circuitry and measuring performance characteristics and limitations of various communication components and systems. Corequisite: EE 410.

## EE 415

### Satellite Systems (3,0)

#### 3 Credits

This course provides the student with the basic understanding of communications satellites. Fundamentals such as orbits, space and launch vehicles, problems associated with maintaining space vehicles, and the design of the communications link are covered. Prerequisite: EE 408.

## EE 420

### Avionics Preliminary Design (3,0)

#### 3 Credits

Study of FAA requirements governing design of airborne electronic equipment. Study of component and subsystem specification and design practices. Application of the above in the preparation of a proposal/design plan for an airborne electrical/electronic subsystem. Integrate the knowledge gained throughout the curriculum with practical aspects of the practice of engineering to enable the student to: 1) comprehend engineering as a pivotal aspect of the business cycle, and 2) to responsibly participate in society by the practice of his/her profession. The course shall introduce the combination of hardware and software requirements and preliminary design, preparation of project and testing plans following established industry standards.

## EE 421

### Senior Capstone Project (3,0)

#### 3 Credits

Continuation of EE 420 or EE 428. Senior-level project. Students will work as members of a team in the execution of winning proposals from EE 420/428. The course shall introduce the combination of hardware and software detailed design, implementation and testing following established industry standards.

## EE 427

### Preliminary Design I (3,0)

#### 1 Credit

Study of organizational structure, quality assurance, reliability, and system standards and specifications. Preparation of senior design specifications.

## EE 428

### Preliminary Design II (3,0)

#### 1 Credit

Study of component and system testing. Preparation of senior design proposal.

## EE 450

### Elements of Power Systems (3,0)

#### 3 Credits

Electrical power conversion and control. Use of electronic devices as switches. Power computations for linear and non-linear circuits, single and three-phase power distribution and transformers. Controlled and uncontrolled rectification. AC voltage controllers, DC-DC converters, DC power supplies, DC-AC inverters, and resonant converters. Prerequisite: senior standing or permission from instructor.

## EE 452

### Power Systems Laboratory (1,2)

#### 1 Credit

Laboratory projects in power conversion and control. Measurement techniques of average and apparent power, power factor, average and RMS voltage and current, and harmonics. PWM control circuits, power electronic circuit design, and thermal management techniques. Corequisite: EE 450.

# Course Descriptions

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## EE 460

**Advanced Controls and System Integration (3,0)**  
*3 Credits*

Continuation of EE 401. Study of modern control methods including state variables, controllability and observability, and modern design techniques. Integration of avionics systems by different avionics bus protocols including ARINC-429, ARINC-629, Mil Std 1553 and RS-232. Study of avionics systems common to modern aircraft. Design project. Prerequisite: EE 401 or equivalent.

## EE 299, EE 399, EE 499

**Special Topics in Electrical Engineering**  
*1-6 Credits*

Directed studies of selected topics in electrical engineering. Prerequisite: consent of instructor and department chair.

## Electronic Engineering Technology

## EET 215

**Electronics Communications Systems (3,0)**  
*3 Credits*

Introduction to communications and circuits, and systems. Subject areas include AM, FM, and SS modulation and receivers, transmission lines, wave propagation, antennas, wave guides, microwave devices, data communications and radar fundamentals. Prerequisites: EET 205, EET 206, EET 210, and EET 211. Corequisite: EET 216, EET 219, EET 220, EET 226, EET 227.

## EET 216

**Electronics Systems Laboratory (0,3)**  
*1 Credit*

One three-hour laboratory session per week with experiments paralleling the material of EET 215. Corequisite: EET 215.

## EET 219

**Pulse Circuits Laboratory (0,3)**  
*1 Credit*

One three-hour laboratory session per week with experiments paralleling the material of EET 220. Corequisite: EET 220.

## EET 220

**Pulse Components and Circuit Applications (2,0)**  
*2 Credits*

An introduction to pulse fundamentals and circuits and their response in high frequency applications. Prerequisite: EET 205.

## EET 225

**Applied Electrical Science with Laboratory (3,3)**  
*4 Credits*

Basic D.C. and A.C. circuit theory with applications to aircraft instrumentation. Familiarity with instrumentation techniques will be gained in the laboratory. Prerequisites: MA 245, PS 250, PS 253.

## Engineering

## EGR 101

**Introduction to Engineering**  
*2 credits*

Introduction to the College of Engineering and the engineering profession. Opportunities to interact with departments. Professionalism, ethics. The role of engineer and various engineering disciplines. Time management, study skills, goal clarification, career concerns, and college resources are included in the course. Develop communication skills and ability to engage in life-long learning. Field trips. Prerequisite: Enrollment in an engineering program.

## EGR 120

**Graphical Communications (1,3)**  
*2 credits*

Free-hand pencil sketching and CAD as tools for graphical communication of engineering designs. Standard forms for design graphics and view layout, orthographic projection, section and auxiliary views, dimensioning, tolerancing, introduction to shop processes. Prerequisite: Enrollment in an engineering program.

# Course Descriptions

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## EGR 215

### CAD Using Solid Modeling (1,3)

#### 2 Credits

Introduction to computer-aided design using solid-modeling techniques. Constructive solid geometry trees. Boolean operations, measurement of geometric properties, animation. Prerequisite: EGR 120.

## Electronics

## EL 107

### Direct and Alternating Current Fundamentals and Circuit Analysis (4,0)

#### 4 Credits

A detailed study of basic D.C. and A.C. theory and circuit concepts. Subject areas include the physical nature of matter, Ohm's Law, D.C. and A.C. components, series and parallel circuits, reactance, resonance, and transformer theory. Prerequisite: MA 111 or MA 145. Corequisites: EL 108, MA 112.

## EL 108

### Direct and Alternating Current Laboratory (0,3)

#### 1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 107. Corequisite: EL 107.

## EL 203

### Microelectronics Fundamentals and Circuit Analysis (4,0)

#### 4 Credits

An introductory course in solid-state fundamentals and circuit analysis. Subject areas include semiconductor construction, biasing, small and large signal amplifier analysis, active devices, operational amplifiers, oscillators, and frequency considerations. Prerequisites: EL 107, EL 108. Corequisite: EL 204.

## EL 204

### Microelectronics Laboratory (0,3)

#### 1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 203. Corequisite: EL 203.

## EL 212

### Digital Circuit and Systems Analysis (4,0)

#### 4 Credits

An introduction to digital fundamentals and their applications to electronic and avionics systems. Prerequisite: EL 107. Corequisite: EL 213.

## EL 213

### Digital Circuit Laboratory (0,3)

#### 1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 212. Corequisite: EL 212.

## EL 301

### Electronic Communication Systems (3,0)

#### 3 Credits

Introduction to communications circuits, and systems. Subject areas include AM, FM and SS modulation and receivers, transmission lines, wave propagation, antennas, wave guides, microwave devices, data, communications and radar fundamentals. Prerequisites: EL 203, EL 204 and MA 112 or MA 241.

## EL 302

### Electronic Communications Laboratory (0,3)

#### 1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 301. Corequisite: EL 301.

## EL 303

### Pulse Components and Circuit Applications (2,0)

#### 2 Credits

An introduction to pulse fundamentals and circuits and their response in high frequency applications. Prerequisites: EL 203, EL 212 and MA 112 or MA 241.

## EL 304

### Pulse Circuits Laboratory (0,3)

#### 1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 303. Corequisite: EL 303.

# Course Descriptions

## EL 307

### Microprocessor Systems (3,0)

#### 3 Credits

An advanced course designed to acquaint the student with microprocessor architecture, software, and hardware. Subject areas include Microprocessor organization, instruction sets, memory mapping software and hardware, microprocessor system design and interfacing to buses, I/O devices, memories, registers, and other digital devices. Prerequisites: EL 212, EL 213 and CS 223 or CS elective.

## EL 308

### Microprocessor Systems Laboratory (3,0)

#### 1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 307. Corequisite: EL 307.

## Engineering Physics

A grade of C or better is required in MA 241, MA 242, PS 140, PS 141, PS 215 and PS 216 for entry into all EP and ES courses.

## EP 320

### Electro-Optical Engineering (3,0)

#### 3 Credits

Geometrical optics of mirrors, thin and thick lenses, prisms and systems. Ray tracing with optical CAD. Fiber optics applications. Physical optics including interference, diffraction and polarization. Phaser methods. Engineering considerations in choice of different types of detectors. Space systems applications. Image Processing. Emphasis on design. Prerequisites: CS 223 and PS 303. Corequisites: MA 345, PS 305.

## EP 391

### Microcomputers and Electronic Instrumentation (2,3)

#### 3 Credits

This course will provide students background in electronics as it applies to the design of circuits of measuring instruments and to interface sensors and computers. The program of study will concentrate on following the form of the electrical signal from light, pressure, temperature and other sensors as it proceeds through signal conditioning circuits and into

the microcomputer for further processing. In the laboratory portion of the course the student will explore the design of pertinent regulated power supplies, amplifiers, logic circuits, filters, stepper motors, servo motors and A to D and D to A converters. This work will serve as the basis for design project assignments to produce one or two working instruments that are interfaced to a microcomputer. Prerequisites: CS 223, PS 219, PS 220, or instructors waiver. Corequisite: MA 345.

## EP 393

### Spaceflight Dynamics (2,0)

#### 2 Credits

Basic topics in analytical dynamics, two body orbits and the initial value problem, the two body orbital boundary value problem, Earth coverage and space mission geometry, non-keplerian effects, orbital maneuvers and rendezvous, and interplanetary transfer. Fundamentals of ascent flight mechanics, launch vehicle selection, fundamentals of entry flight mechanics, and the associated thermal control problem. Prerequisite: ES 204.

## EP 394

### Space Systems Engineering (3,0)

#### 3 Credits

Development of the fundamental principles used in the engineering and design of space systems. Several major subsystems including power, telemetry and command, communications, thermal control and guidance, navigation and control subsystems are covered. Topics on space environmental control and life support systems, space system integration and testing and space system operations are also discussed. Prerequisite: EP 393 or consent of the instructor.

## EP 396

### Introduction to Design I (1,0)

#### 1 Credit

An introduction to Computer-Aided-Design (CAD), the Space mission analysis and design process, mission characterization, evaluation and requirements definition.

## EP 397

### Introduction to Design II (1,0)

#### 1 Credit

Numerical modeling and simulation of engineering

# Course Descriptions

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systems, the finite element method, the finite difference method. Prerequisite: EP 396.

## EP 400

### Thermodynamics and Statistical Mechanics (3,0)

#### 3 Credits

Basic Thermodynamics; Entropy; Kinetic Theory; Distribution of Molecular Velocities; Maxwell-Boltzmann Statistics; Bose-Einstein Statistics; Fermi-Dirac Statistics, Microcanonical Ensemble; Canonical Ensemble. Prerequisites: CS 223, ES 305, MA 345.

## EP 410

### Space Physics (3,0)

#### 3 Credits

Origin, evolution and structure of neutral and ionized terrestrial atmosphere. Effect of sun's electromagnetic radiation on ozone shield. Photoionization and thermal structure of the neutral atmosphere as well as the Ionosphere and Magnetosphere. Solar disturbances and their effects on satellite orbit decay and on long distance communication. Studies of composition, thermodynamics and physical processes of the near-earth space environment. Rocket and satellite monitoring and remote sensing. Numerical and instrument design projects. Prerequisite: EP 320.

## EP 420

### Planetary Science (3,0)

#### 3 Credits

Study of the planetary system: origin, evolution, composition, present configuration, dynamics, interiors, surfaces, atmospheres, and magnetospheres of the planets and where appropriate, similar aspects of the satellites, asteroids, and comets. Interpretations of existing data and definition of future experiments to aid in determination of the origin and evolution of the solar system are stressed. Prerequisite: PS 303.

## EP 440

### Engineering Electricity and Magnetism (3,0)

#### 3 Credits

Solutions of electrostatics problems using Poisson's equation and Laplace's equation, Electrostatic Energy, Electric Current, Magnetic Field, Electromagnetic Induction, Physics of Plasmas, Maxwell's Equations Application of Maxwell's Equations (reflection, refraction, waveguides, antenna radiation). Students will write some simple

computer programs. Prerequisites: CS 223, MA 442, PS 303, PS 305.

## EP 455

### Quantum Physics (3,0)

#### 3 Credits

The Schrodinger equation in 1 and 3 dimensions and its solutions for step potentials, the harmonic oscillator, and the hydrogen atom. Operators and their matrix representations: Dirac bracket formalism, angular momentum and spin, spin-orbit interaction. Identical particles and exchange symmetries. Time independent and time dependent perturbation theory and approximation methods: transition rates; Fermi's Rule, Scattering theory. Classical and quantum statistical distributions. Prerequisites: EP 440, MA 442, PS 303, PS 305, PS 320.

## EP 496

### Space Systems Design I (1,3)

#### 2 Credits

A program of undergraduate research, supervised by physics or engineering faculty, leading to the writing of a technical design report in an area of current interest in engineering physics.

## EP 497

### Space Systems Design II (2,4)

#### 3 Credits

This is a required course in the Engineering Physics program. It is the second of a two-semester sequence and completes senior design project requirements of this program. Its goal is to incorporate several different engineering disciplines and consider them concurrently as a part of the integrated design process and optimization, to synthesize fundamental knowledge gained in the EP program and evaluate overall impact of candidate design concepts on various component subsystems and the integrated system leading to final design selection, and to facilitate communications of the final design through a professional technical report. Continuation and completion of EP 496. Prerequisite: EP 496.

## EP 199, 299, 399, 499

### Special Topics in Engineering Physics

#### 1-4 Credits

Individual independent or directed study of topics within the fields of applied physics, space systems,

# Course Descriptions

and allied engineering disciplines. Prerequisites: Consent of both the instructor and the department chair.

## Engineering Science

A grade of C or better is required in MA 241, MA 242 and either PS 150 or PS 215 and PS 216 for entry into all ES courses. A passing grade in all prerequisite courses or department consent is required for entry into all ES courses.

### ES 100

#### Engineering and Society (3,0)

##### 3 Credits

A survey of the engineering profession and its role in society. Historical technological milestones. The various engineering disciplines and the range of jobs engineers do, especially in aerospace industries and research centers. Engineering ethics and responsibilities. Qualitative consideration of the basic mathematical and physical concepts, terminologies and laws underlying the engineering sciences. Qualitative consideration of the form and function of selected modern systems or devices made possible by engineering. The design process. Future engineering challenges. Prerequisites: None.

### ES 201

#### Statics (3,0)

##### 3 Credits

A vector treatment of the concepts and characteristics of forces and couples. Distributed forces. Center of mass; centroid. Equilibrium of particles and rigid bodies. Trusses and frames. Internal forces. Shear and moment distribution in beams. Area moments of inertia. Prerequisites: PS 150 or PS 215, EGR 120 or consent of the instructor. Corequisite: MA 243.

### ES 202

#### Solid Mechanics (3,0)

##### 3 Credits

The concepts of stress and strain and their tensor properties. Elastic stress-strain relations. Analysis of stress and deformation in members subject to axial, torsional, bending and combined loading. Column stability. Prerequisite: ES 201.

### ES 204

#### Dynamics (3,0)

##### 3 Credits

A vector treatment of the kinematics and kinetics of particles and rigid bodies. Acceleration, work, energy, power, impulse and momentum. Prerequisite: ES 201. Corequisite: MA 345.

### ES 206

#### Fluid Mechanics (3,0)

##### 3 Credits

Physical characteristics of the fluid state. Fluid statics. Kinematics of fluid motion. Flow of an incompressible ideal fluid. The impulse-momentum principles. Similitude and dimensional analysis; fluid measurements. Prerequisite: ES 201.

### ES 207

#### Fundamentals of Mechanics (3,0)

##### 3 Credits

Vector analysis of forces and moments. Equilibrium analysis of static systems. Center of gravity. Kinematics, kinetics, work and energy, impulse and momentum. Prerequisite: PS 150.

### ES 305

#### Thermodynamics (3,0)

##### 3 Credits

A study of the concepts of heat and work and their transformation as governed by the first and second laws of thermodynamics. Properties of pure substances. Ideal gas behavior and relationships. Reversible processes and temperature-entropy diagrams. Conventional power cycles. Properties of ideal gas mixtures. Combustion. Prerequisites: PS 160 or PS 208 and ES 206 or consent of the instructor.

### ES 306

#### Optical Fiber Engineering (2.5, .5)

##### 3 Credits

An introductory course on optical fiber technology and applications. Course covers optical waveguide theory (multi-mode and single-mode), light sources (LED's and Lasers), light detectors and how these components work together to form an electro-optical system. Applications to communications, sensors and aviation are studied. Some laboratory work, computer design and literature research is required to

# Course Descriptions

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broaden student's viewpoint and to achieve 1 credit of engineering design. Prerequisites: MA 441, PS 160.

## ES 307

### Engineering Materials Science with Laboratory (3,1.5)

#### 3 Credits

Materials used in aeronautical engineering applications. Properties of materials and their measurements. Metals and their structures. Characteristics of metallic phases. Equilibrium diagrams. Processing of metals and alloys. Plastics, their structures and characteristics. Ceramics and their characteristics. Composite materials. Corrosion. Prerequisites: COM 221, ES 202, and PS 105 or PS 140 or consent of the instructor.

## ES 312

### Energy Transfer Fundamentals (3,0)

#### 3 Credits

First and Second Laws of Thermodynamics for control masses and control volumes. Fundamentals of heat transfer: conduction, convection, and radiation. Application of energy balances. Prerequisite: PS 160.

## ES 315

### Space Environment and Effects (3,0)

#### 3 Credits

This course studies the effects of the space environment on spacecraft and spacecraft design. The vacuum, neutral, plasma, radiation, and space debris environments and their effect on space missions are examined. Special emphasis is placed on investigating the effects of radiation on the electrical spacecraft subsystems and the space debris environment. Prerequisites: PS 250, junior standing, or instructor consent.

## ES 402

### Electrical Engineering I with Laboratory (2,3)

#### 3 Credits

Introduction of the fundamentals of electrical engineering. Circuit theory and variables. Voltage-current relationship for passive elements. Circuit analysis and network solutions. Phasors and frequency-domain analysis. Transient analysis of first and second order systems. Equivalent circuits and power. Graded sequence of applicable laboratory

experiments. Prerequisites: COM 221, MA 345, PS 250, PS 253.

## ES 403

### Heat Transfer (3,0)

#### 3 Credits

One- and two-dimensional steady-and unsteady-state conduction heat transfer including an introduction to finite-difference and finite-element methods of analysis. Free and forced convection heat transfer. Radiation heat transfer. Prerequisites: ES 206 or permission of instructor, ES 305, MA 345.

## ES 405

### Electrical Engineering II (3,0)

#### 3 Credits

Diode, transistor and operational amplifier circuit analysis. System block diagrams, feedback and transfer functions. Digital and analog computer principles. Boolean algebra, logic gates and microprocessors. Rotating electrical machines, transformers and other electro-mechanical energy conversion devices. Prerequisite: ES 402.

## ES 410

### Structures and Instrumentation Laboratory (1,3)

#### 2 Credits

Principles of modern laboratory test instrumentation. Basic electrical measurements and devices such as strain gages, piezoelectric sensors and thermocouples. Measurement of fluid pressure and flow; temperature; thermal and transport properties; strain; motion; vibration; force and torque. Experimental static and dynamic analysis of structures. Processing and analyzing experimental data; report writing and data presentation. Prerequisites: AE 404, COM 221, ES 305, ES 402.

## ES 412

### Structural Dynamics (3,0)

#### 3 Credits

Simple harmonic motion. Undamped and damped free vibration; forced vibration. Multiple degrees of freedom. Multi-mass torsional and transverse systems. Equivalent torsional systems. Balancing. Dynamic damping. Computer analysis using finite element modeling. Prerequisites: ES 202, ES 204, MA 345.

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## ES 413

### Engineering Fundamentals Review (1,2)

#### 1 Credit

This course is a review of Fundamental Engineering principles. Problem-solving tutorial sessions help engineering students prepare for the National Fundamental Engineering or Engineering-In-Training Examination. Prerequisite: senior status.

## ES 299, 399, 499

### Special Topics in Engineering Science

#### 1-6 Credits

Individual independent or directed studies of selected topics in engineering science. Prerequisite: Consent of instructor and department chair. May be repeated with change of content.

## Flight - Academic

## FA 109

### Intermediate Flight Transition and Procedural Familiarization

#### 3 Credits

A review of elementary commercial pilot flight operations including basic aircraft control, elementary radio navigation, air traffic control procedure, cross-country operations, and solo flight. Associated ground instruction will include a review of knowledge areas required for Private Pilot certification. This course is specifically designed for students entering Embry-Riddle's Commercial Pilot program with a Private Pilot certificate and desiring advanced standing. Prerequisite: FAA Private Pilot Certificate with Airplane Single-Engine Land Rating.

## FA 110

### Commercial Pilot Flight Operations I

#### 6 Credits

An introduction to commercial pilot flight operations including basic aircraft control, elementary radio navigation, air traffic control procedures, cross-country operations, and solo flight. Associated ground instruction will include completion of the Private Pilot written examination. At the successful completion of this course, the student will have gained the aeronautical knowledge and experience necessary to apply for an FAA Private Pilot Certificate. (FAA Part 141 approved.)

## FA 132

### Commercial Pilot Flight I

#### 1 Credit

During this course the student obtains the foundation for all future aviation training. The student will be introduced to the fundamentals of flight and become proficient in basic maneuvers and operating procedures required for solo flight. Emphasis will be placed on developing a safe and competent student pilot that is adequately prepared for solo, cross-country and night operations. The student will receive training in safety awareness, crew resource management and aeronautical decision-making. Corequisite: AS 132.

## FA 133

### Commercial Pilot Flight II

#### 1 Credit

The student will receive additional training in safety awareness, cross-country and night operations, crew resource management and aeronautical decision making. At the successful completion of this course, the student will have met the requirements of the FAA Private Pilot practical test standards and gained the aeronautical experience necessary to apply for the FAA Private Pilot Certificate, Single and Multi-Engine Land Ratings. Prerequisites: AS 132 and FA 132 or FAA Private Pilot Certificate. Corequisite: AS-133.

## FA 208

### Commercial Pilot Flight Operations II

#### 2 Credits

Flight training in advanced VFR cross-country operations and multi-engine operations and procedures. At the completion of this course, the student will have fulfilled the majority of cross-country requirements for commercial certification. In addition, the student will have gained the aeronautical knowledge, skill and experience to apply for an additional multi-engine class rating to his/her existing FAA Private Pilot Certificate. Prerequisite: FA 109 or FA 110.

## FA 215

### Upset Training

#### 1 Credit

This flight course is designed to give certified pilots experience and knowledge to immediately recognize aircraft upset situations and the skills to safely and precisely recover from such occurrences. This course

# Course Descriptions

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will include flight recoveries from nose dive, nose low and inverted attitudes; spin entries and recoveries; and basic aerobatic maneuvers.

## FA 232

### Commercial Pilot Flight III

#### 1 Credit

The student will receive training in the maneuvers and procedures necessary for him/her to meet the standards contained in the FAA instrument rating practical test standards. Additionally, the student will receive training in cockpit resource management and safe flying practices. At the successful completion of this course the student will have gained the aeronautical experience necessary to apply for the addition of the FAA Instrument Airplane Rating to his/her Private Pilot Certificate. Prerequisites: AS 133 and FA 133 or FAA Private Pilot Certificate Single-Engine/Multi-Engine Land. Corequisite: AS 232.

## FA 251

### Commercial Pilot Flight Operations III

#### 3 Credits

Flight, ground, and simulator training in basic attitude instrument flight procedures and the techniques. The student will be taught to maneuver the airplane in actual or simulated instrument conditions by radio and radar navigation while complying with departure, enroute, and arrival ATC procedures and clearances. Prerequisite: FA 208 (FAA Part 141 approved.)

## FA 272

### Commercial Pilot Flight IV

#### 1 Credit

The student will receive training in the maneuvers and procedures necessary for him/her to meet the standards contained in the commercial pilot practical test standards. Additionally, the student will receive training in cockpit resource management and safe flying practices. At the successful completion of this course the student will have gained the aeronautical experience necessary to apply for the FAA Commercial Pilot Rating, Multi-Engine Land with Instrument Rating. Prerequisites: FA 232 or FAA Private Pilot Single Engine/Multi-Engine Certificate with Instrument Rating and AS 232. Corequisite: AS-272.

## FA 273

### Commercial Single Engine Add-On

#### 1 Credit

The student will receive the flight training required to add a FAA Commercial Pilot Single-Engine rating to his/her FAA Commercial Multi-Engine/Instrument Pilot Certificate. Prerequisite: FA 272 or FAA Commercial Multi-Engine/Instrument Certificate.

## FA 304

### Commercial Pilot Flight Operations IV

#### 2 Credits

Flight and simulator training in instrument approach procedures and associated pilot operations including instrument cross-country operations. At the successful completion of this course the student will have gained the aeronautical knowledge necessary for the addition of an instrument-airplane rating to his/her FAA Private Pilot Certificate. Prerequisite: FA 251 (FAA Part 141 approved.)

## FA 325

### Commercial Pilot Flight Operations V

#### 2 Credits

Flight training in maximum performance and precision commercial flight maneuvers and a review of the pilot operations required of a commercial pilot. At the completion of this course, the student will have gained the aeronautical knowledge, skill and experience necessary to apply for the FAA Commercial Pilot Certificate with Instrument Airplane Single and Multi-Engine Land ratings. Prerequisite: FA 304 (FAA Part 141 approved.)

## FA 340

### Multi-Engine Class Rating

#### 1 Credit

Instruction and flight training to provide the aeronautical skill and knowledge to meet the requirements for the addition of a multi-engine land class rating with instrument privileges to the student's existing FAA Commercial Pilot Certificate. Prerequisite: FAA Commercial Pilot Certificate with an instrument rating (FAA Part 141 approved.)

# Course Descriptions

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## FA 341

### Advanced Commercial and Instrument Flight Operations and Procedural Familiarization

#### 2 Credits

A review of the pilot operations required of a commercial pilot including maximum performance and precision commercial flight maneuvers as required. A review of instrument pilot operations including basic attitude instrument flying, holding, precision and non-precision instrument approaches with emphasis placed on the Pilot-In-Command instrument cross country operations. Associated ground instruction will include a review of knowledge areas required for the Commercial Certificate with an Instrument rating as required. This course is specifically designed for students entering the Aeronautical Science program with a Commercial Certificate with Airplane Single-Engine Land and Instrument Airplane ratings.

## FA 370

### Advanced Multi-Engine Instrument Flight

#### 1 Credit

Introduction to autopilot and flight director operations to further develop instrument piloting skills to the ATP level. In addition, the student is introduced to advanced cross-country operations, with emphasis on precision flying skills and the use of automated flight management systems in an IFR environment. Prerequisites: AS 272 and a Commercial Pilot Certificate with a multi-engine class rating and instrument airplane rating.

## FA 417

### Flight Instructor Rating

#### 3 Credits

The student will receive training in the maneuvers and procedures necessary for him/her to meet the standards contained in the Flight Instructor practical test standards, Single-Engine Land with Instrument Airplane rating. Additionally, the student will receive training in cockpit resource management and safe flying practices. Associated ground instruction will include completion of the Fundamentals of Instruction, the Flight Instructor Airplane and the Flight Instructor Instrument written test. Prerequisite: FAA Commercial Pilot Certificate with Single-Engine and Instrument Rating.

## FA 418

### Airline Transport Pilot Proficiency Development

#### 1 Credit

Certified Commercial and Instrument rated multi-engine pilots are provided extensive detailed instrument-oriented training to airline transport pilot proficiency standards. Emphasis is placed on precision attitude flying techniques including configuration change procedures, attitude and thrust setting determination, and velocity transitions; precise instrument approach and departure procedures; and integration of applicable emergency procedures during all phases of instrument flight. Prerequisites: FAA Commercial Pilot Certificate with Airplane Single- and Multi-Engine Land and Instrument-Airplane ratings.

## FA 420

### Airline Flight Crew Techniques and Procedures

#### 2 Credits

Instruction in airline flight crew operations with emphasis on the transition of the professionally qualified pilot into a highly skilled member of an air carrier flight management team. Prerequisites: Commercial Pilot Certificate with multi-engine/instrument airplane rating, AS 387, AS 420, AS 426.

## FA 460

### Multi-Engine Flight Instructor Rating

#### 2 Credits

The student will receive training in the maneuvers and procedures necessary for him/her to meet the FAA standards required to add the Multi-Engine Flight Instructor rating to his/her CFI/I rating. Additional instruction will be provided in advanced multi-engine flight crew training techniques including cockpit resource management and safe flying practices. Prerequisites: FA 417 or FAA Commercial Pilot Certificate with Airplane Multi-Engine Land and Instrument-Airplane ratings and a FAA Flight Instructor Certificate with an Instrument Airplane rating.

## FA 199, 299, 399, 499

### Special Topics in Flight

#### 0-2 Credits

Flight training in selected areas for the purpose of gaining proficiency in required pilot operations for various certificates and ratings. Prerequisite:

# Course Descriptions

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Approval of chief flight instructor and department chair.

## Human Factors

### HF 300

#### Human Factors I: Principles and Fundamentals (3,0)

##### 3 Credits

This course is intended to provide the student with an understanding of the basic principles of Human Factors Psychology. We will study the research, principles, and methods that are beneficial (and essential) in optimizing the interaction between people and machine elements of a system, while taking the environment into account. Prerequisite: PSY 220.

### HF 302

#### Human Factors II: Analytic Methods and Techniques (3,0)

##### 3 Credits

Covers a variety of engineering and behavioral analytic methods and techniques critical to the study of work performance. Provides required tools needed to accomplish workload analysis as a requisite to a systems design or a redesign of an existing system. Prerequisite: HF 300.

### HF 305

#### Human Factors III: Ergonomics and Bioengineering (3,0)

##### 3 Credits

Advanced applications from a variety of bioengineering subfields are identified and defined with respect to their importance in the practice of human factors engineering. Quantitative methods for the analysis of human movement. Topics include anthropometry, kinematics, kinetics, work and power, muscle mechanics, and electromyography. Introduces students to the application of ergonomic principles to the industrial environment. Includes subject matter on ergonomic planning and implementation, the work environment, NIOSHA work factors, and workstation equipment and design. Prerequisite: HF 300.

### HF 310

#### Human-Computer Interaction (3,0)

##### 3 Credits

The application of cognitive principles, ergonomics, and human factors guidelines and principles to the design and evaluation of human-computer systems. Topics include display technologies, human visual capacities, design of display parameters, and image quality metrics. Prerequisite: HF 302 or permission of the instructor.

### HF 315

#### Automation and Systems Issues in Aviation (3,0)

##### 3 Credits

This course will involve analyzing and discussing the most current issues relevant to the new generation of aviation systems. Assumptions on which current systems are based will be identified and alternatives examined. Prerequisite: HF 300.

### HF 320

#### Processes Underlying Crew Resource Management (3,0)

##### 3 Credits

This course will examine the interpersonal and intrapersonal psychological processes underlying Crew Resource Management (CRM). Emphasis will be on the foundations of group dynamics, social interactions and the theoretical basis of CRM. Topics such as communication styles, supervisory styles, decision making styles, accountability, and role management will be studied. Prerequisite: HF 300.

### HF 325

#### Human Factors and System Safety (3,0)

##### 3 Credits

This course emphasizes the integration of human factors in all phases of a system's life-cycle. Accident prevention, beginning with systems engineering together with sound management, are combined in this course to enable the student to fully comprehend the human's vital roles in preventing accidents. The total program, from basic design concepts through testing, maintenance/systems management, and operational employment, is fully examined and evaluated. Prerequisite: HF 300.

# Course Descriptions

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## HF 330

### Human Factors in Space (3,0)

#### 3 Credits

This course is intended to provide the student with an understanding of the basic principles and knowledge of aerospace human factors. Emphasis will be on the human factors issues with living and working in space. In this course the student will study the research, principles, and methods that are beneficial (and essential) in optimizing the interaction between people and machine elements of aerospace systems. Prerequisite: HF 300.

## HF 335

### Human Factors in Air Traffic Control (3,0)

#### 3 Credits

A comprehensive examination of the application of human factors to air traffic control systems. The course covers the full range of applications of human factors. Prerequisite: HF 300.

## HF 400

### Human Factors IV: System Design (3,0)

#### 3 Credits

Application of human factors concepts to system design. Develops human factors influence on system dynamics, structure, and control as well as impact on reliability and maintainability. Emphasizes the design of control-display integration, cockpit configuration, maintainability, and reliability. Emphasizes the significant human factors contributions to the design of state-of-the-art aerodynamic and space systems. Prerequisites: HF 302 and HF 305.

## HF 405

### System Performance Modeling (3,0)

#### 3 Credits

Studies quantitative means of modeling, analyzing, and predicting the performance of human-machine systems. Topics include queuing models, system simulation, model validation, data collection, quantitative analysis of system performance, system design evaluation, estimation theory, control theory, fuzzy set theory, information theory, and knowledge-based systems. Prerequisites: HF 400, MA 241.

## HF 410

### Human Factors Engineering: Crew Station Design (3,0)

#### 3 Credits

In-depth treatment of human factors principles applicable to design of crew command centers for aerodynamic, aviation/aerospace systems. Prerequisite: HF 300.

## HF 415

### Human Factors in Simulation Systems (3,0)

#### 3 Credits

This course provides a comprehensive examination of the human factors aspects of simulation in modern aviation/aerospace. Topics will include history, state-of-the-art simulation systems, and current research and development. Discussion focuses on the extent and impact of human factors in simulator training. Topics from flight crew training, evaluation, effectiveness, and simulator sickness are examined in detail. Prerequisites: HF 300, PSY 310.

## HF 420

### Advanced Topics in Human-Computer Interaction (3,0)

#### 3 Credits

Seminar exposing students to the theoretical and research issues associated with human-computer interaction (HCI) and cognitive-oriented work from a human factors standpoint. Prerequisites: HF 300, HF 320.

## HF 425

### Human Factors in Computer Systems Design (3,0)

#### 3 Credits

Theoretical paradigms in human-computer interaction and their application to interface design are examined. Emphasis is placed on advanced interface technologies such as multimodal input/output, hypertext, and knowledge based systems. Prerequisites: HF 300, HF 310.

## HF 490

### Practicum in Human Factors Psychology (3,0)

#### 3 Credits

Supervised applied practicum experience. This requirement may be fulfilled in several ways including CO-OP's, internships, or working on an on-campus research team. Practica provide opportunities to gain practical experience in "real world" settings.

# Course Descriptions

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Student completes a specific project under the supervision of an organizational sponsor and/or a faculty member. Prerequisite: Approval of advisor and department chair.

## HF 299, 399, 499

### Special Topics in Human Factors Psychology (3,0) 1 - 6 Credits

An area of study under the direct supervision of a faculty member. The course requirements and area of study are negotiated between the faculty member and the student with the approval of the department chair. Prerequisite: Approval of advisor and department chair.

## Humanities

### HU 130

#### Elementary Spanish I (3,0)

##### 3 Credits

Basic grammar and reading. Introduction to conversation. Not open to students with two or more years of high-school Spanish or the equivalent.

### HU 135

#### Elementary Spanish II (3,0)

##### 3 Credits

A continuation of HU 130.

#### The Humanities 140 Series

The HU 140 series constitutes an integral component of the University's General Education Program. This series offers students a variety of choices, each course fulfilling a lower level requirement in the humanities. The courses in the HU 140 series emphasize writing, reading, and appreciation skills.

Courses within the HU 140 series are designed to expose students to the complexity of human emotions and experiences. Students also explore the framework of historical and cultural contexts within which artistic and creative expressions have arisen.

In selecting a course from the HU 140 Series, students have opportunities to concentrate their studies on one form of cultural expressions, such as music, literature, or the visual arts. Others may opt for a course that provides a chronological examination of a cultural expression or a thematic approach to several disciplines within the humanities.

### HU 140

#### Western Humanities I: Antiquity and the Middle Ages (3,0)

##### 3 Credits

A continuation of COM 122 with an interdisciplinary emphasis. Traces the evolution of the Western humanistic tradition from antiquity to the Middle Ages using examples from art, architecture, music, philosophy, and literature. Emphasizes writing, reading, and appreciation skills. Prerequisite: COM 122.

### HU 141

#### Western Humanities II: Renaissance to Postmodern (3,0)

##### 3 Credits

A continuation of COM 122 with interdisciplinary emphasis. Traces the evolution of the Western humanistic tradition from the Renaissance to the Postmodern using examples from art, architecture, music, philosophy, and literature. Emphasizes writing, reading, and appreciation skills. Prerequisite: COM 122.

### HU 142

#### Studies in Literature (3,0)

##### 3 Credits

A continuation of COM 122 with emphasis on a survey of literature. Reading materials include selected novels, poems, and plays. Emphasizes writing, reading, and appreciation skills. Prerequisite: COM 122.

### HU 143

#### Studies in Rhetorical Theory (3,0)

##### 3 Credits

A continuation of COM 122 in the form of a broad survey of speculation concerning the nature and techniques of persuasion. This writing-intensive course will focus on enduring issues in the study of rhetoric: its value, the nature of audiences, the most effective techniques-and how those issues were continually reframed to meet changing circumstances. Prerequisite: COM 122.

### HU 144

#### Studies in Art (3,0)

##### 3 Credits

A continuation of COM 122 with an emphasis on art. Provides a foundation in the basic vocabulary, concept, processes, and history of art. Works of art, sculpture, architecture, and film from various cultures are analyzed. Emphasizes writing, reading, and appreciation skills. Prerequisite: COM 122.

# Course Descriptions

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## HU 145

### Themes in the Humanities (3,0)

#### 3 Credits

A continuation of COM 122 with interdisciplinary emphasis. Through close reading of primary texts and analysis of visual and performing arts, Themes in the Humanities explores ideas central to the evolution of culture. The course is not restricted by period and is open to the full range of humanistic studies. Themes vary by instructor and are listed in the Schedule of Courses. Emphasizes writing, reading, and appreciation skills. Prerequisite: COM 122.

## HU 146

### Music Appreciation and Criticism (3,0)

#### 3 Credits

A continuation of COM 122 with an emphasis on listening to and writing about music. Elements of music (rhythm, meter, tempo, pitch and pitch relationships), instruments of music, musical forms. The course emphasizes western classical music. Prerequisite: COM 122.

## HU 150

### Elementary Arabic I (3,0)

#### 3 Credits

Elementary oral-aural introduction to Arabic, including such topics as courtesy phrases, basic vocabulary, and patterns for questions and answers. Not open to students with two or more years of high-school instruction or the equivalent, or native speakers of the language.

## HU 151

### Elementary Arabic II (3,0)

#### 3 Credits

A continuation of HU 150. Prerequisite: HU 150 or permission of the instructor.

## HU 152

### French I (3,0)

#### 3 Credits

Elementary oral-aural introduction to French including such topics as courtesy phrases, basic vocabulary, and patterns for questions and answers. Not open to students with two or more years of high-school instruction or the equivalent, or native speakers of the language.

## HU 153

### French II (3,0)

#### 3 Credits

A continuation of HU 152. Prerequisite: HU 152 or permission of the instructor.

## HU 154

### German I (3,0)

#### 3 Credits

Elementary oral-aural introduction to German including such topics as courtesy phrases, basic vocabulary, and patterns for questions and answers. Not open to students with two or more years of high-school instruction or the equivalent, or native speakers of the language.

## HU 155

### German II (3,0)

#### 3 Credits

A continuation of HU 154. Prerequisite: HU 154 or permission of the instructor.

## HU 156

### Japanese I (3,0)

#### 3 Credits

Elementary oral-aural introduction to Japanese including such topics as courtesy phrases, basic vocabulary, and patterns for questions and answers. Not open to students with two or more years of high-school instruction or the equivalent, or native speakers of the language.

## HU 157

### Japanese II (3,0)

#### 3 Credits

A continuation of HU 156. Prerequisite: HU 156 or permission of the instructor.

## HU 158

### Russian I (3,0)

#### 3 Credits

Elementary oral-aural introduction to Russian including such topics as courtesy phrases, basic vocabulary, and patterns for questions and answers. Not open to students with two or more years of high-school instruction or the equivalent, or native speakers of the language.

# Course Descriptions

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## HU 159

### Russian II (3,0)

#### 3 Credits

A continuation of HU 158. Prerequisite: HU 158 or permission of the instructor.

## HU 160

### Mandarin Chinese I (3,0)

#### 3 Credits

Introduction to Mandarin Chinese language, including the pronunciation system (pin yin), basic grammar, traditional character writing and reading, speaking simple sentences, as well as cultural contexts inseparable from the language. Open only to those without prior knowledge of Mandarin Chinese or with consent of instructor.

## HU 161

### Mandarin Chinese II (3,0)

#### 3 Credits

A continuation of Mandarin Chinese I. Prerequisite: Satisfactory completion of Mandarin Chinese I or consent of instructor.

## HU 250

### Introduction to Logic (3,0)

#### 3 Credits

Principles of valid thinking; the nature of inductive and deductive inferences and their applications. Prerequisite: Any course from the HU 140 series.

## HU 270

### Mandarin Chinese III (3,0)

#### 3 Credits

A continuation of Mandarin Chinese II with emphasis on communicative abilities in listening, speaking, reading and writing. Prerequisite: Satisfactory completion of Mandarin Chinese II or consent of instructor.

## HU 271

### Mandarin Chinese IV (3,0)

#### 3 Credits

A continuation of Mandarin Chinese III. Prerequisite: Satisfactory completion of Mandarin Chinese III or consent of instructor.

## HU 300

### World Literature (3,0)

#### 3 Credits

Major works and literary trends in world literature. Course content varies by instructor and is listed in the Schedule of Courses. Prerequisite: Any course from the HU 140 series.

## HU 305

### Modern Literature (3,0)

#### 3 Credits

The mainstreams of literature of this century. Course content varies by instructor and is listed in the Schedule of Courses. Prerequisite: Any course from the HU 140 series.

## HU 310

### American Literature (3,0)

#### 3 Credits

A survey of intellectual backgrounds, major works, and literary trends in American literature. Course content varies by instructor and is listed in the Schedule of Courses. Prerequisite: Any course from the HU 140 series.

## HU 315

### Drama Seminar (3,0)

#### 3 Credits

Students are exposed to the theater arts and especially to performance. They acquire acting skill through class exercises and performance assignments. Dramatic literature is studied with special attention given to its stage applications. Students may participate either as actors or technicians in the theatrical production, which entails out of class rehearsal. Prerequisite: COM 219.

## HU 319

### Advanced Speech (3,0)

#### 3 Credits

This course continues the study of oral communication with emphasis on effective public speaking. It includes the analysis and practice of modern and traditional methods of persuasion within and beyond the classroom. Prerequisite: COM 219.

# Course Descriptions

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## HU 320

### Aesthetics of Visual and Musical Arts (3,0)

#### 3 Credits

Provides a survey of the major artistic monuments of Western culture and discusses the methods by which artistic productions are analyzed. Prerequisite: Any course from the HU 140 series.

## HU 325

### Exploring Film (3,0)

#### 3 Credits

A survey of the art of the film. History of the cinema. Basic elements, photography, continuity and rhythm, movement, imaging, music and sound, script writing, directing, editing, acting, great film artists/directors, cinematographers, actors, etc. Prerequisite: Any course from the HU 140 series.

## HU 330

### Values and Ethics (3,0)

#### 3 Credits

This course focuses on the process of practical ethics as a way of resolving moral conflict and of understanding professional responsibility in a multi-culturally diverse society without devaluing specific viewpoints of ethical or metaphysical theory, ideology, or religion. Students will use proposals, value judgments, observation statements, assumptions, and alternate-world assumptions in arguing contemporary issues of moral importance. With this basic moral logic, students will resolve issues in terms of rights, responsibilities, and the community of rational beings; in terms of consequences and contingencies; and in terms of habituated virtues and character. Free and unrestricted discourse will be encouraged so as to let students find common ground in diversity. Prerequisite: Any course from the HU 140 series.

## HU 335

### Technology and Modern Civilization (3,0)

#### 3 Credits

A humanistic analysis of technology, with special attention to its influence upon modern American culture in a global context. Topics include the history and development of technology, the influence of technology upon certain philosophies such as determinism and utilitarianism, the influence of technology on the ecosphere, and the depiction of technology in imaginative literature. Prerequisite: Any course from the HU 140 series.

## HU 341

### World Philosophy (3,0)

#### 3 Credits

An in-depth study of prominent philosophers and major philosophical movements in America, Europe, and Asia, showing their interrelatedness, emphasizing their contributions to the world of thought, and demonstrating the importance of reason in the contemporary world. Prerequisite: Any course from the HU 140 series.

## HU 345

### Comparative Religions (3,0)

#### 3 Credits

A survey of the major religions of the world, including Judaism, Christianity, Islam, Hinduism, Buddhism, and Confucianism, as well as a brief examination of the development of religion as a vital aspect of humanity's experience in history. Prerequisite: Any course from the HU 140 series.

## HU 355

### Creative Writing (3,0)

#### 3 Credits

The course culminates the interpretive and expressive elements of communications classes. The study, practice, and utilization of a personal style of creative composition; examples of contemporary literature and submittal of publications are included in this course. Prerequisite: Any course from the HU 140 series.

## HU 361

### Interpersonal Communication in the Work Group (3,0)

#### 3 Credits

Examination of interpersonal and small-group communication topics in order to focus upon maximizing decision making in work groups. Students are assigned to simulated consensus-driven groups. Evaluation is based upon the quality of the groups' decision making, exams, class participation, and presentation of the groups' findings in a public setting. Prerequisite: COM 219.

## HU 362

### Communication & Organizational Culture (3,0)

#### 3 Credits

Theory, survey, and application of research methods for the analysis of communication. Instructors may

# Course Descriptions

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choose to apply methods in a variety of contexts, such as in house publications, internal communication, speeches, and interview communication. Prerequisites: COM 219 and COM 221.

## HU 363

### Communication and Society (3,0)

#### 3 Credits

An examination of human communication in a variety of cultural settings. Topics vary from semester to semester. Communication behavior is viewed expansively to include verbal discourse, symbolic imagery, non-verbal communication, literature, music, and other art forms. Focus is on understanding communication behavior as symbolic action, as constructive of social reality, and as a means for entry into cultural and subcultural group experience. Prerequisite: junior standing or permission of professor.

## HU 370

### Advanced English Grammar (3,0)

#### 3 Credits

Advanced English Grammar introduces students to concepts of grammatical theory mainly at the level of syntax. Avoiding the niceties of linguistic distinctions, the course will introduce the student to useable concepts and terms that are also echoed in contemporary style checkers. Prerequisite: junior standing.

## HU 375

### The Nature of Language (3,0)

#### 3 Credits

This course provides a practical investigation into how people use language functions as a system of meaning. The diversity, complexity, and intrinsic fascination of this most human of behaviors is studied largely with reference to the English language. Topics include popular ideas about language, language and identity, language structure and system, language media, language acquisition and learning, language and the brain, and world languages. Prerequisite: COM 221 or COM 222.

## HU 415

### Non-verbal Communication (3,0)

#### 3 Credits

Non-verbal Communication entails the study of communication behaviors and processes, not involving the expression of written or spoken words, which contribute information to a message. Special attention is directed to the study of voice qualities; facial

expression and body language; space, personal distance, and touch; the use of time and objects; and personal appearance. Study also involves non-verbal communication in applied settings, as well as research strategies for observing, measuring, and understanding non-verbal phenomena. Prerequisites: COM 219, equivalent Speech Communications course. (Also offered as COM 415. Students receive either communication or humanities credit, but not both.)

## HU 420

### Applied Cross Cultural Communication (3,0)

#### 3 Credits

An examination of the challenges to communicating across the variety of subcultures present in work environments. Ethnicity, nationality, gender, physical impairment, and sexuality are among the areas of difference often present in business and professional environments that may influence the establishment of cooperative working relationships. Means for analyzing and developing strategies to transcend and make positive use of sub-cultural differences will be considered. Prerequisites: COM 219, COM 221.

## HU 475

### Senior Thesis

#### 3 Credits

As the culmination of the student's experience in the interdisciplinary Aerospace Studies program, Senior Thesis requires the student to complete documented research under the guidance of a faculty advisor, involving subject matter that is demonstrably tied to at least two of the student's three chosen minor fields of study. A series of seminar discussions or extended individual consultations with the faculty advisor may accompany the guided writing of the thesis.

## HU 299, 399, 499

### Special Topics in Humanities

#### 1-6 Credits

Individual independent or directed studies of selected topics in the humanities. Prerequisites: consent of instructor and approval of the department chair.

# Course Descriptions

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## Information Technology

### IT 109

#### Introduction to Computers and Applications (3,0)

##### 3 Credits

Introduction to computers and an overview of PC applications. Computer literacy is presented through lectures on the computer process, the impact of computers on society, emerging technologies, and how to make hardware and software purchasing decisions. A hands-on overview of the most popular computer applications such as word processing, spreadsheet, database, electronic mail, and Internet is provided. Prerequisite: Proficiency in college preparatory mathematics.

### IT 210

#### Web Page Authoring and Design (3,0)

##### 3 Credits

This course will address the organization of the Internet, addressing, routing, DNS, and use of Internet applications. It will review such applications as FTP, telnet, and advanced web searching methodology. This course covers Web page authoring and design techniques using both HTML and WYSIWYG authoring software. Students will study, create, and refine web pages online as well as create web graphics. Lastly, legal and ethical issues related to the Internet and emerging technologies are discussed. Prerequisite: CS 109 or BA 120, or BA 221 or CS 223, or approval.

### IT 220

#### Introduction to Networking (3,0)

##### 3 Credits

Introduction to networking covers each of the seven layers of the OSI reference model, MAC and IP addressing, identification of IP class addressing schemes including subnet masks, network wiring standards, and TCP/IP network layer protocols. Prerequisite: CS 109 or BA 120 or BA 221 or approval.

### IT 310

#### Web Site Management (3,0)

##### 3 Credits

The course addresses effective web site design including page layout, user interface design, graphic

design, content flow, and site structure. Additionally students will learn the optimal use of keywords and search engine positioning to maximize page exposure. Web site management including security and Intranet management will be discussed. The use of design standards and templates will teach students to emphasize site consistency. Students will design and create a major Web site with multiple pages and cross-linked structure. Prerequisite: IT 210.

### IT 320

#### Network Configurations (3,0)

##### 3 Credits

Introduces the four router elements, configuration vehicles, user and privileged mode commands, configuring IP addresses, and monitoring/troubleshooting of router functions. More advanced topics include LAN switching theory, VLANs, LAN switched design, Novell IPX, and threaded case studies. Prerequisite: IT 220.

### IT 330

#### Programming for the Web (3,0)

##### 3 Credits

This course introduces programming the Common Gateway Interface for Web pages using scripting languages. The emphasis is on fundamentals of programming and creating of interfaces to handle HTML form data. Students will create basic scripting programs with Web Interfaces, learn to adapt existing code and process data flows from online form with basic database structures. Prerequisite: CS 118 or CS 223 or programming experience in a high-level language.

### IT 340

#### WAN Theory and Design (3,0)

##### 3 Credits

WAN theory and design covers WAN technology, PPP, Frame Relay, ISDN. It further discusses network troubleshooting, national SCANS skills and threaded case studies. Prerequisite: IT 320.

# Course Descriptions

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## Logistical Engineering Technology

### LET 304

#### Applied Reliability and Maintainability Engineering (3,0)

##### 3 Credits

This is an introductory course in the application of probability theory and statistics to aircraft systems. Emphasis is placed on reliability and maintainability engineering. Prerequisite: MA 242.

### LET 413

#### Integrated Aviation Logistics Support (3,0)

##### 3 Credits

An intensive study of logistics engineering in aviation support systems. Subjects include: Field service, customer service, publications, product support, training, packaging, computer resources, reliability and maintainability engineering. Prerequisite: LET 304.

## Mathematics

### MA 005

#### Quantitative Skills (3,0)

##### 3 Credits

Fundamentals and theory of algebra including exponents, radicals, factoring, linear equations, rational expressions, quadratic equations, polynomial arithmetic, and solutions to applied problems. (Credit not applicable to any degree.) Required of all students who are placed in this course.

### MA 006

#### Intermediate Algebra (3,0)

##### 3 Credits

An intermediate level algebra course. Topics include fundamental concepts of algebra; linear equations and inequalities; polynomials; rational expressions; exponents and radicals; quadratic equations; functions and graphing; systems of linear equations and inequalities. Prerequisite: MA 005 or placement. (Credit not applicable to any degree.)

### MA 106

#### Basic Algebra and Trigonometry (3,0)

##### 3 Credits

A study of the basic laws of fractions, exponents, radicals, inequalities, quadratic equations, complex numbers and the elements of trigonometry.

### MA 111

#### College Mathematics for Aviation I (3,0)

##### 3 Credits

A pre-calculus course designed for the student of aviation. Review of the fundamentals of algebra; linear equations and inequalities; quadratic equations; variation; polynomial, rational, exponential, logarithmic and trigonometric functions; radian measure; right triangle solutions, vectors, and the laws of sines and cosines. Prerequisite: MA 006, MA 106 or placement.

### MA 112

#### College Mathematics for Aviation II (3,0)

##### 3 Credits

Basic calculus designed for the student of aviation. Differentiation and integration of algebraic functions; applications to velocity, acceleration, area, curve sketching and computation of extreme values. Prerequisite: MA 111.

### MA 120

#### Quantitative Methods I (3,0)

##### 3 Credits

An algebra methods course with applications to business and economics. Operations, relations, functions, modeling, and problem solving; systems of linear equations and inequalities. Prerequisite: MA 006 or placement.

### MA 125

#### Space Mathematics (3,0)

##### 3 Credits

Units of measure used in Space Technology, launch and re-entry velocities and accelerations, force and acceleration of gravity on the moon and on an asteroid, "g forces" on an astronaut, analysis of the behavior of sounding rockets both when launched and when returned to earth, the reliability of spacecraft systems, multi-stage rocket design, tracking of model rockets, investigation of the movement of celestial bodies on the celestial highways. Prerequisite: MA 111.

# Course Descriptions

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## MA 140

### College Algebra (3,0)

#### 3 Credits

Fundamentals of exponents, radicals, linear, quadratic and absolute value equations, inequalities and complex numbers. Introduction to functions, curve sketching, elementary theory of equations, sequences and series, matrix algebra and systems of equations. Prerequisite: MA 006, MA 106, or placement.

## MA 142

### Trigonometry (3,0)

#### 3 Credits

Trigonometric functions and their graphs; identities; radian measure with applications; compound, half and double angle identities; solving elementary trigonometric equations, right and oblique triangles; law of sines and cosines; exponential, logarithmic and inverse trigonometric functions; vectors and trigonometric form of a complex number. Prerequisite: MA 006, MA 106, or placement. Corequisite: MA 140.

## MA 145

### College Algebra and Trigonometry (5,0)

#### 5 Credits

Fundamentals of exponents, radicals, linear and quadratic equations, inequalities, elementary theory of equations, sequences and series, functions, exponential, logarithmic and trigonometric functions, radian measure, trigonometric identities and equations, vectors, laws of sines, cosines, solutions of right triangles, and complex numbers. Prerequisite: MA 006, MA 106 or placement.

## MA 211

### Statistics with Aviation Applications (3,0)

#### 3 Credits

Descriptive statistics; populations and samples; measures of central tendency and dispersion; elementary probability; binomial and normal distributions and their interrelationship; random variables; one and two sample hypothesis testing involving proportions and means for large and small samples; estimation and confidence intervals; Chi-square distribution; correlation coefficient; least squares line. Prerequisite: MA 111.

## MA 220

### Quantitative Methods II (3,0)

#### 3 Credits

An introduction to the methods and concepts of calculus with applications to business and economics; marginal functions, graphing, extreme values, and area problems. A brief introduction to descriptive statistics. Prerequisite: MA 120 or MA 111.

## MA 222

### Business Statistics (3,0)

#### 3 Credits

Measures of central tendency and dispersion; histograms; algebra of probability; sample spaces; dependent events; Bayes' Theorem with applications; binomial, Poisson, normal distributions and their interrelationships; sampling distributions; hypothesis testing; confidence intervals. Prerequisite: MA 111 or MA 140.

## MA 241

### Calculus and Analytic Geometry I (4,0)

#### 4 Credits

Graphs and functions; limits and continuity; differentiation and integration of algebraic and elementary trigonometric functions; applications of first and second derivatives. Prerequisite: MA 140 or MA 145 or equivalent. Corequisite: MA 142.

## MA 242

### Calculus and Analytic Geometry II (4,0)

#### 4 Credits

Differentiation and integration of transcendental functions; special integration techniques; polar coordinates; applications of the definite integral; numerical methods. Prerequisite: MA 241.

## MA 243

### Calculus and Analytic Geometry III (4,0)

#### 4 Credits

Solid analytic geometry; vector functions in three dimensions; elements of infinite series; partial differentiation; directional derivative and gradient; multiple integrals. Prerequisite: MA 242.

## MA 244

### Combined Calculus (5,0)

#### 5 Credits

Covers all of the topics currently in MA 241 and MA 242. Prerequisite: One year of calculus.

# Course Descriptions

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## MA 245

### Applied Differential Equations (3,0)

#### 3 Credits

Applied treatment of ordinary differential equations; Laplace transforms; matrix algebra and applications; computer techniques; numerical methods; least squares fit; normal distribution and applications. Prerequisites: CS 210, MA 242. (Not for Bachelor of Science degree in Aerospace Engineering credit.)

## MA 320

### Decision Mathematics (3,0)

#### 3 Credits

The mathematical concepts and applications in mathematical model building and problem solving. Included are mathematical areas which are basic to decision theory. Prerequisite: MA 211 or MA 222. (Not open to engineering students.)

## MA 345

### Differential Equations and Matrix Methods (4.0)

#### 4 Credits

Treatment of ordinary differential equations to include principal types of first and second order equations; methods of substitution on simple higher order equations; linear equations and systems of linear equations with constant coefficients; methods of undetermined coefficients and variation of parameters; Laplace transforms; series solutions; linear algebra and matrix methods of solutions; applications to physics and engineering. Prerequisite: MA 243.

## MA 412

### Probability and Statistics (3,0)

#### 3 Credits

Finite sample spaces; conditional probability and Bayes' Theorem, discrete and continuous random variables and their functions; expected value, variance and standard deviation; systematic study of the major discrete and continuous distributions; moment generating functions; hypothesis testing and estimation. Prerequisite: MA 242.

## MA 432

### Linear Algebra (3,0)

#### 3 Credits

Review of vector and matrix operations including matrix inverses, eigenvectors and eigenvalues. Equations of lines and planes, vector spaces including basis and dimensions, linear transformations, change of basis, diagonalization of matrices, inner products

and orthonormal bases, applications. Prerequisite: MA 245 or MA 345.

## MA 438

### Numerical Analysis I (3,0)

#### 3 Credits

Floating point arithmetic, error analysis, algorithms in interpolation, integration, differentiation, matrix algebra, approximation and solution of equations, use of numerical software packages. Prerequisites: CS 210 or CS 215, MA 245 or MA 345.

## MA 441

### Advanced Engineering Mathematics I (3,0)

#### 3 Credits

Line and surface integrals; vector fields with the study of Green, Gauss and Stokes Theorems; applications of vector field theory; Fourier series. Prerequisite: MA 345.

## MA 442

### Advanced Engineering Mathematics II (3,0)

#### 3 Credits

The solution of linear differential equations with variable coefficients; study of the derivation, characteristics and solutions of partial differential equations; Fourier series, Fourier transform, Laplace transform and Green's function; applications in science and engineering. Prerequisite: MA 441.

## MA 443

### Complex Variables (3,0)

#### 3 Credits

Algebra of complex numbers; complex functions, analytic functions; mapping by elementary functions; conformal mappings and their applications; additional topics may include complex integration, power series expansion. Prerequisite: MA 441.

## MA 299, 399, 499

### Special Topics in Mathematics

#### 1-6 Credits

Individual independent or directed studies of selected topics in mathematics. Prerequisites: Consent of instructor and approval of the department chair.

# Course Descriptions

## Mechanical Engineering Technology

### MET 200

Machine Shop Laboratory (0,3)

1 Credit

Introduction to machine techniques.

### MET 201

Applied Statics and Dynamics (4,0)

4 Credits

Free body diagrams and equilibrium of beams, frames, and truss structures. Centroids, and moments of inertia. Kinematics and kinetics of rigid bodies. Prerequisite: MA 242, PS 150.

### MET 210

Applied Thermodynamics (3,0)

3 Credits

Definitions of heat and work, first and second laws of thermodynamics, gas mixtures, and chemical reactions. Prerequisite: PS 101.

### MET 211

Applied Strength of Materials with Laboratory (3,3)

4 Credits

Concepts of stress and strain. Stress and deflections of members subject to axial, torsional and bending loads. Prerequisite: MET 201.

### MET 212

Applied Hydraulics (2,0)

2 Credits

An introduction to fluid mechanics with applications to aircraft hydraulic systems. Prerequisite: MET 201.

### MET 303

Mechanical Design (3,0)

3 Credits

Study of machine motion, velocity, acceleration and cycling. Sizing of machine elements under operational conditions. Application and design of mechanical linkages, springs, clutches, brakes, cams, sprockets, gears and gear trains, bearings and lubrication with aircraft component applications. Other selected topics. Prerequisite: MET 211.

### MET 405

Non-Destructive Testing and Quality Assurance with Laboratory (2,3)

3 Credits

Inspection procedures, proof of design requirements per FAR Part 23, material inspection techniques (magnetic particle, X-ray, visual), dimensional checking and use of inspection instruments. Statistical analysis of test data. Prerequisite: ACET 301.

## Manufacturing Engineering

### MFE 330

Introduction to CAD/CAM (1,4)

3 Credits

Introduction to computer-aided engineering and computer-aided manufacturing concepts. Engineering modeling and analysis methodology using finite elements and finite differences. Engineering design optimization. Use of graphics software for 2D and 3D modeling. Use of finite element analysis and design optimization software; Introduction to CAM software. Introduction to concurrent engineering principles. Prerequisite: senior status in EP, AE, ACET, ACS, CE or permission of the instructor.

### MFE 492

Robotics and Computer-Aided Manufacturing (1,4)

3 Credits

Advanced concepts in computer-aided manufacturing; production/industrial engineering fundamentals; production management principles; project planning; scheduling and control; materials processing and selection; numerical control of machines (NC and CNC.) Concepts of robotics in CAM; Concepts of concurrent engineering in manufacturing; Extensive use of design through manufacturing software in the individual "real world" design project with a local industry in CAD/CAM. "Hands-on" robot programming using training robots and CNC milling machine. Prerequisite: senior status in EP, AE, ACET, ACS and CE.

### MFE 493

Concurrent Engineering (1,4)

3 Credits

Introduction to concurrent engineering concepts; advanced concepts in CAD/CAM with in depth

# Course Descriptions

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applications to aerospace, automotive and marine engineering. Engineering economics and costing techniques; risk and reliability analysis; value engineering concepts. Introducing the concepts of *What if?* analysis and incorporating design changes. Extensive use of CAD/CAM software to concurrent engineering principles. Provide an environment to practice concurrent engineering principles via an individual project for graduate students and a group project for undergraduate students. Prerequisites: MFE 330 and MFE 492.

## *Military Science Army ROTC*

### MY 103

#### Basic Military Science (1,0)

##### 1 Credit

A study of the defense establishment and the organization and development of the United States Army. A study of the roles the active Army Forces, the Army Reserve Forces and the Army National Guard play in our nation's defense. A study of the military courtesy, customs and traditions of the service. A historical perspective of the role of the different branches of the United States Army and the role they have played in the freedom of our nation. An introduction to physical readiness training. Course includes lectures and laboratory. Field Training Exercises normally include M16-A1 rifle firing, rappelling training, and airmobile helicopter operations. Corequisite: MY 103 Laboratory.

### MY 103L

#### Basic Military Science Laboratory (0,1.5)

##### 0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training is introductory in scope and includes operations and tactics and land navigation subjects. Practical training exercises familiarize students with the field environment and field survival skills. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

### MY 104

#### Basic Military Science (1,0)

##### 1 Credit

Continued emphasis on physical readiness training. Course includes lecture and laboratory. Field Training exercises normally include M16-A1 rifle firing, rappelling training, and airmobile helicopter operations. Corequisite: MY 104 Laboratory.

### MY 104L

#### Basic Military Science Laboratory (0,1.5)

##### 0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training continues the leader development process while remaining introductory in scope and develops basic operations and tactics and land navigation skills acquired in MY 103 Laboratory. Practical training exercises continue cadet field orientation with the focus being on individual training. Special topics including stream crossing techniques, field survival skills, and bivouac techniques are covered. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

### MY 203

#### Basic Military Leadership I (1,0)

##### 1 Credit

A review of the customs and traditions of the Service. The fundamentals of leadership development and the importance of understanding the principles that are important to effective leadership. This includes focus on goal setting, communication, problem solving, decision making and group process. The course requires mandatory physical training and includes lecture and laboratory. Corequisite: MY 203 Laboratory.

### MY 203L

#### Basic Military Leadership I Laboratory (0,1.5)

##### 0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training continues the development of cadet leadership and critical skills while remaining basic in scope and includes operations and tactics, land navigation, first aid, and general military subjects.

# Course Descriptions

Practical training exercises stress development of basic skills with the focus on soldier-team development at the squad/team level. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

## MY 204

### Basic Military Leadership II (1,0)

#### 1 Credit

The fundamentals of Military Geography and their application in the use of navigational aids for the military forces. A study of preventative medicine countermeasures and first aid techniques that every leader must know. The course requires mandatory physical training and includes both lecture and leadership laboratory. Two weekend training exercises normally include M16-A1 rifle firing, rappelling training, and airmobile helicopter operations. Corequisite: MY 204 Laboratory.

## MY 204L

### Basic Military Leadership II Laboratory (0.1.5)

#### 0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences, strong focus on ethics, communication skills, time management and leadership values. Training continues basic skills acquired in MY 203 Laboratory and includes operations and tactics and land navigation. Practical training exercises continue development of basic skills with the focus on soldier-team development at the squad/team level. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

## MY 303

### Officership I (3,0)

#### 3 Credits

This course examines the foundations of officership, the character, responsibilities, and status of being a commissioned officer. It is dynamic, challenging, and stressful for it is the course that emphasizes the warrior ethic. The course covers a wide spectrum of subjects, from training in common military skills to fostering a value system that emphasizes service to the nation, readiness to persevere in the face of obstacles, and willingness to make personal sacrifices in pursuit of the greater good. This course includes lecture, advanced leadership laboratory, physical training, and practical field training exer-

cises. Prerequisites: Completed basic military science (or given constructive credit) and be a contracted Army ROTC cadet. Corequisite: MY 303 Laboratory.

## MY 303L

### Officership I Laboratory (0,2.5)

#### 0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training continues development of cadet competencies and confidence through intermediate leadership and technical/tactical instruction. Practical training exercises are supplementary in scope and include operations and tactics, land navigation, and weapons training. Special topics including tactical bivouac techniques, individual tactical techniques, tactical foot march techniques, squad tactics, and small unit patrolling are covered. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

## MY 304

### Officership II (3,0)

#### 3 Credits

A continuing development of the processes that distinguish commissioned military service from other professional endeavors. The main emphasis of this class will be the preparation of cadets for the six-week advanced camp they normally attend at the end of the junior year. Here their capability to conceptualize, innovate, synthesize information, and make sound decisions while under stress will be evaluated. This course includes lecture, advanced leadership laboratory, enhanced physical training and practical field training exercises. Prerequisite: MY 303. Corequisite: MY 304 Laboratory.

## MY 304L

### Leadership II Laboratory (0,2.5)

#### 0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training continues development of intermediate leader and critical skills in preparation for Advanced Camp. Practical training exercises focus on soldier-team development at squad/patrol level. Training is supplementary and includes tactics, land navigation, and weapons subjects. Special topics include tactical bivouac techniques, small unit patrolling, a mini-STRAC exercise, and drownproof-

# Course Descriptions

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ing. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

## MY 403

### Advanced Military Leadership I (3,0)

#### 3 Credits

A study of military professionalism with emphasis on command and staff relationships, organizational functions and duties of various staff officers that assist in the leadership of the organization. A study of personnel and logistical systems and the role they play in helping the organization optimize operations and improve life in the Army community. Training in staff briefings will be used as an introduction to military procedures. This course includes lecture, laboratory, and physical readiness training. Corequisite: MY 403 Laboratory.

## MY 403L

### Advanced Military Leadership I Laboratory (0,2.5)

#### 0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training culminates the leader development process at the pre-commissioning level. Training is supplementary and includes operations and tactics, land navigation, and radio wire communication subjects. Students perform as subject matter experts and are responsible for conducting and evaluating training. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

## MY 404

### Advanced Military Leadership II (3,0)

#### 3 Credits

A study of ethics and professionalism in the military and the role they play in carrying out the defense policy of the United States. The fundamentals of Military Law, its impact on the American military society and its place in the jurisdictional system. A history of the military courts martial as it relates to the jurisdictional process of American society. A study of the Law of Land Warfare and its relationship to the conduct of soldiers in combat. This course includes lecture, laboratory, and physical readiness training. Corequisite: MY 404 Laboratory.

## MY 404L

### Advanced Military Leadership II

#### Laboratory (0, 2.5)

#### 0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training culminates development of leader skills emphasizing the transition from cadet to second lieutenant. Expands the frame of reference and gradually shifts it to orient on future assignments as an officer. Training is supplementary and includes operations and tactics, land navigation, and radio wire communication subjects. Students perform as subject matter experts and are responsible for conducting and evaluating training. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

## MY 399, 499

### Special Topics in Military Science (3,0)

#### 1-3 Credits

Individual, independent or directed studies of selected topics in general military science. Prerequisites: Consent of instructor and approval of professor of military science.

## Naval Science

## NSC 1101

### Naval Science Lab

#### 1 Credit

Military drill, cruise preparation, customs, traditions and special areas of knowledge required of commissioned officers in the Navy and Marine Corps. Required for all midshipmen.

## NSC 1110

### Introduction to Naval Science (3,0)

#### 3 Credits

Introduction to the Naval Service with emphasis on the mission, organization, regulations and components of the Navy and Marine Corps. Must be completed during the freshman year. Required for all midshipmen.

# Course Descriptions

## NSC 1140

### Seapower and Maritime Affairs (3,0)

#### 3 Credits

Importance of seapower in historical events, including emphasis on worldwide political-military confrontations following the Cold War. Must be completed in the freshman year. Required for all midshipmen. Nurse Corps option midshipmen only may take course during sophomore year.

## NSC 2121

### Naval Ships System I (Engineering) (3,0)

#### 3 Credits

Types, structures, and purpose of naval ships. Hydrodynamic forces, stability, compartmentalization, electrical, and auxiliary systems. Theory of design and operation of steam, gas turbine, and nuclear propulsion. Shipboard safety and firefighting. Required for Navy option midshipmen; not required for Nurse Corps and Marine option midshipmen.

## NSC 3122

### Naval Ships Systems II (3,0)

#### 3 Credits

Fire control systems, weapons types, capabilities, and limitations. Physical aspects of radar and underwater sound for target acquisition, threat analysis, tracking, weapons selection, delivery, and guidance. Explosives, fusing, and Naval ordnance. Required for all Navy option midshipmen. Not required for Nurse Corps or Marine option midshipmen.

## NSC 3213

### Navigation/Naval Operations I (3,0)

#### 3 Credits

Piloting and celestial navigation theory, principles, and procedures. Tides, current, weather, use of navigation instruments and equipment, and practicum. Laboratory required. Required for all Navy option midshipmen. Not required for Nurse Corps and Marine option midshipmen.

## NSC 3213 L

### Navigation/Naval Operations I Laboratory

#### 1 Credit

Laboratory work in piloting and celestial navigation to complement Naval Science 2213. One hour per week. Required for all Navy option midshipmen. Not required for Nurse Corps and Marine option midshipmen.

## NSC 3214

### Navigation/Naval Operations II (3,0)

#### 3 Credits

International and Inland rules of the road; relative motion-vector analysis; ship handling, employment, and tactics, afloat communications; and operations analysis. Laboratory required. Required for all Navy option midshipmen. Not required for Nurse Corps and Marine option midshipmen.

## NSC 3214 L

### Navigation/Naval Operations II Laboratory

#### 1 Credit

Laboratory work in maneuvering board (vector analysis) and Rules of the Road to complement NSC 3214. One hour per week. Required for all Navy option midshipmen. Not required for Nurse Corps and Marine option midshipmen.

## NSC 3221

### Evolution of Warfare (3,0)

#### 3 Credits

Survey of military history emphasizing principles of warfare, strategy and tactics, and significant military leaders and organizations. May be taken in the sophomore or junior year. Required for all Marine Corp option midshipmen. Not required for Navy option or Nurse Corps midshipmen.

## NSC 3222L

### Marine Corps Professional Laboratory

#### 1 Credit

Laboratory for Marine Corps commission candidates in the fourth year of NROTC. Meets once per week for one hour. Required for all Marine Corps midshipmen.

## NSC 4224

### Amphibious Warfare (3,0)

#### 3 Credits

The history of amphibious warfare emphasizing doctrine and techniques. May be taken in the junior or senior year. Required for all Marine Corps midshipmen. Not required for Navy option or Nurse Corps midshipmen.

## NSC 4231

### Principles of Naval Leadership & Management (3,0)

#### 3 Credits

Theory and principles of management, focusing on

# Course Descriptions

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the officer-manager as an organizational decision maker. Includes interpersonal skills; behavior factors; group dynamics. Required for all midshipmen during the sophomore year. Nurse Corps midshipmen only may take during the junior year.

## NSC 4232

### Principles of Naval Management II/ Leadership and Ethics (3,0)

#### 3 Credits

Integration of professional competencies and qualities of effective leadership with emphasis on moral and ethical responsibilities, accountability, communications and military law for the junior officer. Required for all midshipmen.

## NSC 4233L

### Marine Corps Professional Laboratory

#### 1 Credit

Laboratory for Marine Corps commission candidates in the fourth year of NROTC. Meets once per week for one hour. Required for all Marine Corps midshipmen.

## Physical Science

## PS 101

### Basic Chemistry (3,1.5)

#### 3 Credits

Elementary chemical theory. Covers basic atomic theory, elements, compounds, and mixtures, calculation of weight and weight volume relationships, basic descriptive chemistry. One 1.5-hour laboratory session per week. (Cannot be used for credit in chemistry toward a degree in Aerospace Engineering.) Students who take PS 108 may not also take PS 101. Prerequisite: MA 111 or corequisite: MA 140.

## PS 102

### Explorations in Physics (3,0)

#### 3 Credits

Survey course in elementary physics. Stress will be placed on basic concepts, principles and history of the development of physics. Presentations will include selected topics in mechanics, heat, light, sound, electricity and magnetism, and modern physics. (Cannot be used for credit in physics toward degrees in Computer Science, Engineering Physics, Civil, Aerospace or Electrical Engineering, Aircraft Engineering Technology, Aeronautical Science, or Avionics Technology.) Prerequisite: MA 111.

## PS 103

### Technical Physics I (3,0)

#### 3 Credits

A course in elementary physics. Stress will be placed on basic physics principles. Problem solving and problem solving logic will be an important, integral part of this course. Topics will include Newton's Laws, projectile motion, circular motion, work, energy, conservation laws, momentum. (Cannot be used for credit in physics toward degrees in Computer Science, Engineering Physics, Civil, Aerospace or Electrical Engineering, or Aircraft Engineering Technology.) Prerequisite: MA 111 or MA 140. Corequisite: MA 112 or MA 241. Corequisite: PS 103L.

## PS 103L

### Technical Physics I Laboratory (0,1)

#### 0 Credit

Techniques for data analysis and laboratory methods in the context of experiments dealing with Newton's laws, energy, and rotational motion. This laboratory is designed to complement PS 103. Corequisite: PS 103.

## PS 104

### Technical Physics II (3,0)

#### 3 Credits

Application of basic physics principles discussed in PS 103. Other areas will include fluids, properties of matter, thermodynamics, wave motion, sound, simple harmonic motion, kinetic theory, basic electromagnetic theory and elementary circuits. (Cannot be used for credit in physics toward degrees in Computer Science, Engineering Physics, Civil, Aerospace, or Electrical Engineering, or Aircraft Engineering Technology.) Prerequisites: PS 103, MA 112 or MA 241. Corequisite: PS 104L.

## PS 104L

### Technical Physics II Laboratory (0,1)

#### 0 Credit

Techniques for data analysis and laboratory methods in the context of experiments dealing with oscillatory motion, sound, heat, fluids, and electricity. This laboratory is designed to complement PS 104. Corequisite: PS 104.

## PS 105

### General Chemistry I (3,3)

#### 4 Credits

Fundamental principles of chemistry that include:

# Course Descriptions

nomenclature, stoichiometry, atomic structure, periodic relationships, chemical bonding, geometry of molecules, properties of gases, solutions, and an introduction to organic chemistry. Laboratory working includes both descriptive and quantitative work. Prerequisites: One year of high school chemistry or PS 101, and MA 140 or its equivalent.

## PS 106

### General Chemistry II (3,3)

#### 4 Credits

Chemical principles that include thermodynamics, acids and bases, rates of reaction, electrochemistry, organic chemistry, synthetic materials. Prerequisite: PS 105.

## PS 107

### Elements of Biological Science (3,0)

#### 3 Credits

A physical science course with emphasis on anatomy and physiology of man including chemical and cellular basis of life, biology of organisms, and ecology.

## PS 108

### Contemporary Chemistry (3,1)

#### 3 Credits

Elementary chemical theory. The origins and development of chemistry with an overview of the present applications of chemistry and its future potential in human affairs. Applications to scientific decision-making in the business and industrial environment. One one-hour laboratory session per week. Students who take PS 108 may not also take PS 101.

## PS 109

### Current Topics in Space Sciences (1,0)

#### 1 Credit

A survey seminar intended to explore contemporary topics encountered in the exploration of the upper atmosphere and near space environment.

## PS 111

### Plant Biology (3,3)

#### 4 Credits

This course will study principles and processes associated with the biology of plants, including survey of fungi, green protista, and plants. Major emphasis on vascular plants, evolutionary origins, and ecological adaptations. One three-hour laboratory session per week.

## PS 112

### Animal Biology (3,3)

#### 4 Credits

This course will study principles and processes found in the animal kingdom, including survey of the major animal groups. Major emphasis on structure, diversity, phylogeny and ecological adaptations. One three-hour laboratory session per week.

## PS 140

### Chemistry for Engineers (4,0)

#### 4 Credits

Chemical stoichiometry; states of matter; solutions; thermodynamics; rate of reaction; equilibrium; oxidation-reduction; corrosion; organic compounds; and polymers. Prerequisites: High school chemistry and placement or PS 101. Corequisite: PS 141.

## PS 141

### Chemistry for Engineers Laboratory (0,3)

#### 1 Credit

One three-hour laboratory session per week, with experiments paralleling the material of PS 140. Corequisite: PS 140.

## PS 142

### Introduction to Environmental Science (3,0)

#### 3 Credits

An introductory course which stresses the interrelations of all aspects of the living and the non-living world. Introduces the student to key concepts and principles that govern how nature works and the application of these concepts and principles to possible solutions to environmental and resource problems.

## PS 150

### Physics I for Engineers (3,0)

#### 3 Credits

Vectors and scalar quantities, geometrical optics, kinematics, Newton's Laws of Motion, work, work-energy, conservation of energy, conservation of momentum, center of mass and its motion. Corequisite: MA 241.

## PS 160

### Physics II for Engineers (3,0)

#### 3 Credits

Special theory of relativity, rotational motion, simple harmonic motion, waves, fluids, heat, kinetic theory, thermodynamics. Prerequisite: PS 150. Corequisite: MA 242.

# Course Descriptions

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## PS 208

### Physics II (3,0)

#### 3 Credits

Fluids; Temperature; Heat; First and Second Laws of Thermodynamics; Wave Motion; Acoustics.

Prerequisites: PS 215, PS 216, MA 242. Corequisite: MA 243.

## PS 210

### Physics II Laboratory (0,3)

#### 1 Credit

One three hour laboratory session per week with experiments chosen primarily from wave motion, transverse and longitudinal waves, superposition of waves, traveling waves and standing waves.

## PS 215

### Physics I (3,0)

#### 3 Credits

Estimations, order of magnitude analysis, Newton's Law, gravitation, kinematics, work and energy, momentum, rotation, harmonic motion. Prerequisite: MA 241. Corequisites: MA 242, PS 216.

## PS 216

### Physics I Laboratory (0,3)

#### 1 Credit

One three-hour laboratory session per week, with experiments chosen primarily from mechanics. Corequisite: PS 215.

## PS 219

### Physics III (3,0)

#### 3 Credits

Static electricity, Gauss's Law, potential, Ohm's Law, direct current circuits, magnetic fields, induced electromotive force, inductance, EM waves, the nature of light, images formed by mirrors and lenses and optical instruments. Prerequisites: PS 208, MA 243. Corequisite: PS 220.

## PS 220

### Physics III Laboratory (0,3)

#### 1 Credit

One three-hour laboratory session per week with experiments chosen primarily from thermodynamics, electricity and magnetism, and geometric optics. Prerequisites: PS 208 and MA 243. Corequisite: PS 219.

## PS 240

### Natural History of the Region (3,3)

#### 4 Credits

This course focuses on the geology, paleohistory, flora, fauna, and ecosystems of the region. The course covers such topics as the relationship between slope, elevation, and topography and plant communities.

## PS 250

### Physics III for Engineers (3,0)

#### 3 Credits

Gravitational fields, electric fields and magnetic fields, Gauss's law, electric potential, linear accelerators, cyclotrons, capacitors, Ohm's law, Kirchoff's laws, Ampere's law, Faraday's law, Lenz's law, Maxwell equations, selected topics from modern physics. Prerequisite: PS 160, MA 242.

## PS 253

### Physics Laboratory for Engineers (0,3)

#### 1 Credit

One three hour session per week. Experiments will vary from semester to semester, but will be chosen from: Laboratory report writing workshop, error analysis, damped harmonic oscillations, spectrometers, optics, fiber optics, atomic physics, thermodynamics, R-C circuit theory. Corequisite: PS 250.

## PS 290

### Physics Laboratory Practicum (0,1)

#### 0 Credit

Required, non-credit course. Requires the student to direct the operation of a basic laboratory for one semester. Includes laboratory preparation, laboratory discussion, and grading of laboratory reports. Prerequisite: COM 219.

## PS 301

### Astronomy (3,0)

#### 3 Credits

A descriptive course dealing with the structure and evolution of the physical universe. Topics include the solar system (Earth, Moon, Sun, and planets), stars, black holes, galaxies, quasars, cosmology and exobiology. Planetarium trips and night observing sessions optional. Prerequisite: PS 102 or PS 103 or PS 150 or PS 215.

# Course Descriptions

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## PS 302

### Evolution of Scientific Thought (3,0)

#### 3 Credits

Traces the development of science from the earliest times through the modern period, with particular emphasis given to our changing concepts of nature and of science itself. (Also offered as SS 302. Students receive either social science elective credit or physical science elective credit, but not both.) Prerequisites: Either HU 140 or HU 141 or HU 142 and either PS 101 or PS 102 or PS 103 or PS 150 or PS 215.

## PS 303

### Modern Physics (3,0)

#### 3 Credits

Modern concepts in physics including optics. Topics include refraction, diffraction, and scattering of electromagnetic radiation, special relativity, wave-particle duality, the uncertainty principle, quantum theory of atomic structure, X-rays, lasers and nuclear reactions. Prerequisites: PS 219 and PS 220.

## PS 304

### Environmental Science (3,0)

#### 3 Credits

A survey course in the environmental problems arising from man's use and abuse of his environment. Ecological, economic, sociologic and technologic principles will be applied to the management control of pollution of the atmosphere and water sources of the earth. Prerequisites: PS 101 or PS 140 and PS 141.

## PS 305

### Modern Physics Laboratory (0,3)

#### 1 Credit

Experiments in atomic and nuclear physics, including spectroscopy, nuclear particle analysis, X-Ray analysis, and laser applications. Corequisite: PS 303.

## PS 306

### Consumer and Hazardous Waste (3,0)

#### 3 Credits

Introduction to sources, characteristics, and concerns of hazardous materials in environmental systems. Examination of general approaches toward site assessment, risk analysis, site remediation, and other issues pertinent to hazardous waste management. Development of environmental literacy is emphasized. Prerequisite: One year of high school chemistry or concurrent enrollment in PS 105 or PS 106.

## PS 308

### Atmospheric Environmental Studies (3,0)

#### 3 Credits

Overview of atmospheric environmental topics on local and regional issues as well as global change issues. Introduction to the chemistry of atmospheric pollution. Examination of sources of air pollution especially from the aerospace industries. Includes discussion of monitoring, regulation, and control of air pollution. Prerequisites: PS 108 or equivalent, PS 142, or permission of instructor.

## PS 309

### Principles of Ecology (2,3)

#### 3 Credits

This course is designed to provide practical experience in the scientific measurement of environmental parameters. Experience in collecting and identifying plants and animals in the different ecosystems will be developed by field and laboratory work. Prerequisites: PS 107, PS 108 or equivalent (PS 101 or PS 140), and PS 142, or permission of instructor.

## PS 310

### Air Quality and Sound Pollution (3,0)

#### 3 Credits

The examination of the fundamental principles that govern air quality, its pollution, and its management. Also the fundamental principles associated with sound pollution and its management. Prerequisites: PS 105, PS 106, PS 142, and WX 201.

## PS 311

### Water Quality (3,0)

#### 3 Credits

The hydrologic cycle, with emphasis on atmospheric, land surface, shallow subsurface, and groundwater processes. Examination of physical, chemical, and biological properties of these aquatic systems and the effects of common pollutants. Development of environmental literacy is emphasized. Prerequisites: PS 105, PS 106, and PS 142.

## PS 312

### Plant Identification (2,3)

#### 3 Credits

This course is designed to provide practical experience in identification of local flowering plants through the use of regional floras and recognition of

# Course Descriptions

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common plant families. Elements of plant collection, identification, and herbarium techniques will be taught through classroom lectures, field and lab work. Students will be required to prepare their own plant collection. Prerequisite: PS 111.

## PS 313

### Riparian Ecology (2,3)

3 Credits

The analysis of the structure, function, and classification of riparian habitats with special emphases on southwestern waterways. Evaluation of limnological, floral, and geomorphic resources that create specific riparian habitats will be covered.

## PS 320

### Classical Mechanics (3,0)

3 Credits

Fundamentals of mechanics; oscillatory motion; systems of particles; varying mass; motion under central forces; motion in three dimensions; gyroscopic motion; generalized coordinates; normal coordinates; Lagrangian and Hamiltonian formulations. Students will write some simple computer programs. Prerequisites: MA 345, ES 204, PS 219. Corequisite: PS 303.

## PS 400

### Senior Physics Laboratory I (2,3)

3 Credits

Study of geometrical and physical optics including plane waves, mirrors, lenses, emission and absorption line spectroscopy, diffraction gratings, lasers and interferometers. Prerequisite: PS 305.

## PS 401

### Astrophysics (3,0)

3 Credits

Study of the basic physical processes operating in the astronomical environment; stellar structure and evolution, the interstellar medium, galaxies, cosmology. Astrophysical concepts are emphasized, thus underlining the common features operating within many astronomical systems. Prerequisites: MA 345 and three semesters of physics.

## PS 402

### Environmental Quality Laboratory (0,3)

1 Credit

A laboratory course using field techniques and equipment commonly found in environmental work place. Projects and demonstrations will use local flight line, airport municipalities as examples. Prerequisites: PS 306 and PS 310.

## PS 403

### Wildlife and Airports (3,0)

3 Credits

An examination of the problems and solutions associated with wildlife and their impact on airport safety. Special emphasis on problems correlated with birds. Prerequisite: PS 309.

## PS 405

### Atomic/Nuclear Physics (3,0)

3 Credits

Multi-electron atoms, X-rays and gamma rays, radiative transitions in the atom and the nucleus. Basic properties of nuclei, systematics of nuclear stability, dynamics of nuclear reactions, nuclear models and nuclear forces. Introduction particle physics and its applications to cosmic rays, stellar energy, and the formation of the elements. Prerequisite: EP 455.

## PS 408

### Astrophysics II (3,0)

3 Credits

Radiative transfer in astrophysical environments; stellar atmospheres, stellar interiors, and gaseous nebulae. Emission and absorption processes. Interaction of radiation with matter. Prerequisites: MA 345, PS 401.

## PS 410

### Senior Physics Laboratory IIa (2,3)

3 Credits

Binary stars, spectroscopic binaries, proper motion, galaxy rotation curves, image processing. Prerequisites: PS 400, PS 401.

## PS 412

### Particle Physics and Cosmology (3,0)

3 Credits

Study of the evolution of the universe including large-scale structure, Big-Bang cosmology, general rel-

# Course Descriptions

ativity and the search for dark matter. Prerequisites: MA 441, PS 405.

## PS 414

### Senior Physics Laboratory IIb (2,3)

#### 3 Credits

Measurements of nuclear and particle systems using high-precision detectors and high-speed data acquisition. Prerequisites: PS 303, PS 305, PS 400.

## PS 199, 299, 399, 499

### Special Topics in Physical Science

#### 1-4 Credits

Individual independent or directed study of topics within the fields of the physical sciences impinging on aerospace development or practices and which are of current or anticipated interest. Prerequisites: Consent of instructor and approval of the department chair.

## Psychology

## PSY 220

### Introduction to Psychology (3,0)

#### 3 Credits

A survey of the biopsychosocial continuum and the intrapsychic, interpersonal, and organizational factors affecting human behavior. A primary feature of the course is its focus on the scientific method as the route to psychological knowledge. Students study the rationalist, empiricist and experimental foundations of the scientific method and how these foundations can be critiqued. Topics include sensation, perception, learning, memory, personality, psychopathology, physiological psychology and social processes. Emphasis is placed on the application of the basic principles of psychology to engineering, aviation, public policy and business.

## PSY 225

### Research Analysis in Psychology (3,2)

#### 4 Credits

This course is an elementary program in data analysis and statistics. The focus is on basic statistical concepts for the social sciences. Although computer data analysis is a component of the course, it is secondary to statistical theory and computational procedures. The body of the course covers parametric procedures including t-tests, analysis of variance, correlational techniques, descriptive statistics, and frequency distri-

butions. Some attention is devoted to non-parametric analysis. The emphasis is on decisions to choose the appropriate statistical technique and computational work. Statistical computations using computer software will be covered. Data setup and analysis, as well as graph generation and statistical output interpretation will be focused on. Prerequisites: MA 111 or MA 140, PSY 220.

## PSY 300

### Research Design in Psychology (3,0)

#### 3 Credits

This course is an elementary program in research design. The course focuses on the development of research designs, surveys, scaling techniques, field studies, case study data designs, and techniques commonly used in the social sciences and human factors. Considerable attention is devoted to designing experiments. Concepts in controlling, manipulating and measuring dependent and independent variables, sampling techniques, generalization, construct and content validity, reliability, issues in confounding and counterbalancing measures, restriction in range problems, practice effects, order effects, inter-rater and intra-rater reliability, error variance, sampling error, pre-test/post-test designs, and ethical concerns form the basis of the course. Corequisite: PSY 225.

## PSY 305

### Experimental Psychology (2,1)

#### 3 Credits

An advanced research design course focusing on the experimental and quantitative methods used by psychologists to acquire knowledge, and to determine the reliability and validity of research data. The course incorporates direct experience in the laboratory with the methods of data collection and analysis, and the description of research findings. Prerequisite: PSY 300.

## PSY 310

### Sensation and Perception (2,1)

#### 3 Credits

How organisms sense and perceive the environment. Topics discussed include: types of stimuli affecting the sensory receptors, the anatomy and physiology of the sensory systems responding to those stimuli, and current knowledge and theories about perceptual abilities. Laboratory/research experience is included. The laboratory will include experimental investigations and demonstrations of sensory and perceptual phenomena. Vision, audition, taste, smell, the skin senses and balance will be included. Prerequisite: PSY 220.

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## PSY 315

### Cognitive Psychology (3,0)

#### 3 Credits

Contemporary theories of human information processing. Major topics include attention, mental representations, categorization, short-term and long-term memory, psycholinguistics, reasoning, problem-solving, judgment and decision making. Prerequisite: PSY 220.

## PSY 320

### Aviation Psychology (3,0)

#### 3 Credits

A study of the complexities of human factors research in aviation. Drawing extensively on such diverse areas as human physiology, basic learning theory, aviation safety, and pilot training. The course surveys the study of human behavior as it relates to the aviator's adaptation to the flight environment. Prerequisite: PSY 220.

## PSY 325

### Group Structure and Process (3,0)

#### 3 Credits

An examination, at an advanced level, of situational and individual determinants of social structure and interaction in face-to-face groups. Various theories of exchange, equity, power, and leadership are considered. Prerequisite: PSY 220.

## PSY 330

### Learning and Motivation (3,0)

#### 3 Credits

This course explores elementary learning processes and how they combine with complex cognitive, motivational, and social factors to influence what organisms do. Prerequisite: PSY 220.

## PSY 335

### Physiological Psychology (2,1)

#### 3 Credits

A study of the neural and biochemical bases of behavior with special emphasis on sensory processing, motivation, emotion, learning, and memory. Both experimental analysis and clinical implications are considered. Activities are conducted on the anatomy and physiology of the nervous system, and on the development, evolution and function of behavior. Prerequisite: PSY 220.

## PSY 340

### Industrial-Organizational Psychology (3,0)

#### 3 Credits

A survey of major topics in industrial-organizational psychology, with emphasis on organizational and personnel psychology applied to business, industry, and government. An examination and critical review of theories and research in selected areas of organizational behavior. Emphasis is on intrapersonal behavior, such as, motivation, job stress, and job satisfaction. Prerequisite: PSY 220.

## PSY 345

### Training and Development (3,0)

#### 3 Credits

A review of the principles and techniques applicable to training and training development. Prerequisite: PSY 220.

## PSY 350

### Social Psychology (3,0)

#### 3 Credits

This course examines the interactional forces between groups and the individual in society. Since the major focus of the course is on social interactions, such diverse topics as group dynamics, interpersonal relationships, prejudice, discrimination, and antisocial behavior will be considered. Special attention is given to the topic of stress in the aviation environment. Prerequisite: PSY 220.

## PSY 365

### Abnormal Psychology (3,0)

#### 3 Credits

This course is intended to familiarize students with the theory and research on the biological, cognitive-behavioral, and social-family perspectives and interventions of psychological disorders as problems that affect nearly everyone. Its emphasis on the research process, family issues, and the line between normal and abnormal behavior is intended to encourage students to think critically about social and personal issues, and to understand the strategies, methodologies, and the applicability of research in abnormal psychology. Prerequisite: PSY 350.

## PSY 400

### Introduction to Cognitive Science (3,0)

#### 3 Credits

An introduction to the science of the mind from the perspective of cognitive psychology, linguistics, neu-

# Course Descriptions

rosience, philosophy, and artificial intelligence. The focus is on the similarities and differences in the approach taken by researchers in these different fields in their study of cognitive mechanisms. Issues to be addressed: What does it mean to be able to think? What kind of computational architecture(s) is most appropriate to describe cognitive mechanisms? Is the mind an emergent property of the brain? What kind of hardware is required for thinking to occur? Can a computer have a mind? Prerequisite: PSY 315.

## PSY 405

### History and Systems of Psychology (3,0)

#### 3 Credits

Review contributions of the early Greek philosophers and the influence of the early church on the concepts of thoughts about human psychology. The emergence of psychological concepts in the Renaissance and in the early scientific developments are noted. The dimensions of contemporary psychology are explored. Prerequisites: PSY 220 and junior/senior standing.

## Regional Studies

## RS 200

### Modern Asia (3,0)

#### 3 Credits

A survey course of the major political, economic, cultural and historical changes in Asia since the nineteenth century. A regional and/or thematic focus may be created depending on the instructor's expertise. For example, an instructor may focus on East rather than South Asia, on history rather than economy. Prerequisites: HU 14x and sophomore standing or consent of instructor.

## RS 300

### Observing Asian Cultures (3,0)

#### 3 Credits

An interdisciplinary course that takes an anthropological, philosophical, geographical approach to traveling Asia. Topics include geographical changes of Asia, philosophical issues of travel, theory and methodology of studying other cultures and societies. The course cumulates in an optional yet strongly recommended field trip to an Asian country. Prerequisite: sophomore standing or consent of the instructor.

## RS 305

### Asian Literature (3,0)

#### 3 Credits

Asian literature in translation. Representative readings are chosen from ancient times to the present, from poetry to prose, from female writers to male writers, from South to East Asia. Synthesis of major literary themes and development, as well as the cultural contexts for literature, is an important part of the course. The course uses both books and films as study material. A regional and or thematic focus may be created depending on the instructor's expertise. For example, an instructor may focus on East rather than South Asia, on prose rather than drama. Prerequisite: sophomore standing or consent of the instructor.

## Software Engineering

## SE 300

### Software Engineering (3,3)

#### 4 Credits

This course introduces students to the fundamental principles and methodologies of large-scale software development. Students learn about the theory and practice of software engineering and work as part of a team on a full life-cycle software project that includes planning, software specification, software design, coding, inspections, and testing. The course has a closed laboratory that includes activities that guide project teams through a software development process and support team project activities such as team building, planning, requirements analysis and specification, design, testing, and the use of tools. Prerequisite: CS 225.

## SE 310

### Analysis and Design of Software Systems (3,0)

#### 3 Credits

This course focuses on the fundamental methods employed in the analysis and design of software systems. Analysis is the process of determining a complete and consistent set of system requirements. Design is the process of producing a system architecture, both logical and physical, and determining an appropriate way to construct the software. The result of these processes is a documented model of the desired system. The student will learn and practice methods appropriate for both object-oriented and

# Course Descriptions

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procedural systems. Prerequisites: CS 315, SE 300.

## SE 320

### Advanced Programming Practices (3,0)

#### 3 Credits

This course provides the student with advanced instruction in programming with an object oriented programming language. The course objective is proficiency in use of a language widely used for general purpose software development. In addition, the student will be introduced to tools and processes appropriate for employing this language in a significant software development environment. Students attending this course must already be proficient in the use of one major programming language and have knowledge of basic software engineering practices. Prerequisites: CS 315, SE 300.

## SE 450

### Software Team Project (1,6)

#### 3 Credits

This course is focused on the development of a functioning software product for a real client. Also, material on business practices, professional practices and ethics is included. Students, working in teams, are involved in management and planning, analysis and specification, design, implementation, and testing of a software system. Project work is assessed using modern industrial software standards and review techniques. Laboratory work includes team building, project reports, walk-throughs and inspections, design activities, process analysis, and acceptance tests. Prerequisites: CS 450, SE 310, senior standing.

## Safety Science

## SF 201

### Introduction to Health, Occupational and Transportation Safety

#### 3 Credits

This course introduces the student to the basic health and safety concepts associated with industry and transportation. Included are a comprehensive health and safety overview, a historical study of the legislative development and enactment of appropriate statutes, regulations and law, the definition of safety terms, and a discussion of the ethics and professionalism required by the health and safety profession. This course also provides an introduction to hazard

recognition and reporting, evaluation, and control concepts used in risk management, accident investigation, ergonomics, and accident prevention management.

## SF 210

### Introduction to Aerospace Safety (3,0)

#### 3 Credits

An introduction and overview of the theories, concepts, applications, and practices of the field of aerospace safety. The course is designed for the beginning safety student and is a prerequisite for most of the higher-level safety courses. Material presented covers the major specialty areas such as Human Factors, Mechanical Factors, Accident Investigation, Safety Programs, Safety Statistics, etc.

## SF 315

### Environmental Compliance and Safety

#### 3 Credits

This course examines matters associated with health and safety relating to the environment including air, water quality and sanitation. The course concentrates on hazardous materials, their storage, handling, and transportation by air, rail, marine, and highway. Additional study includes waste management and cleanup as well as a detailed study of environmental laws, regulations, and protection of workers involved in activities associated with hazardous material activities.

## SF 320

### Human Factors in Aviation Safety (3,0)

#### 3 Credits

An examination of the major causative agent in aircraft accidents; the human being. Emphasis is placed on psychologic and physiologic factors which enhance the accident probability. Included is a detailed analysis of Ergonomics (human engineering) and its influence.

## SF 330

### Aircraft Accident Investigation (3,0)

#### 3 Credits

A detailed evaluation of methods and procedures involved in aircraft accident investigation. The organization, duties and procedures of the Aircraft Accident Board are analyzed. The student explores procedures for determining accident causes through analysis of such elements as the function and tech-

# Course Descriptions

niques employed by the trained accident investigator and the role of the specialized laboratory. Analysis is also made of reporting procedures and the all-important follow-up work designed to avoid like or related aircraft accidents. Prerequisite: SF 201 or SF 210. Recommended: AS 120 or AS 131 or knowledge at the private pilot level.

## SF 335

### Mechanical and Structural Factors in Aviation Safety (3.0)

#### 3 Credits

Examination of design, manufacturing, metallurgy and maintenance as to the influence each has on aircraft accidents. A detailed analysis of the "Failure Process" will be conducted. Additional topics include: stress and design loading, fatigue, corrosion, and the envelope of operation. Prerequisite: SF 330. Recommended: AS 309.

## SF 345

### Safety Program Management (3,0)

#### 3 Credits

A study of the principles of the development and management of an effective safety program. The philosophy and historical development of major concepts are examined with particular emphasis on areas of special concern in organizational accident prevention. Students analyze the influence of morale, education and training, the role of the supervisor, and other substantial program elements of value to the safety manager. Prerequisite: SF 201 or SF 210.

## SF 350

### Aircraft Crash and Emergency Management (3,0)

#### 3 Credits

Theory, practices, and techniques utilized in the response phase of aircraft crashes and emergencies. Designed as a "real world" introduction to the field of emergency response at the CFR agency level, the airport response and administration levels, and the related and associated entities involved in aircraft mishaps. Prerequisite: SF 201 or SF 210.

## SF 355

### Industrial Hygiene and Toxicology

#### 3 Credits

This course examines principles associated with industrial hygiene. Topics include recognition, evaluation and control of hazards related to noise, vibra-

tion, ionizing and non-ionizing radiation, thermal conditions, pressure, chemicals, airborne contaminants, and biological substances. These subjects will be discussed in relation to all regulatory requirements using both engineering and non-engineering controls. Prerequisite: SF 201.

## SF 365

### Fire Protection

#### 3 Credits

This course introduces the basics of fire and fire protection. Students will study the physics, chemistry, characteristics and behavior of fire, fire hazards of material, fire suppression systems, extinguishing agents, and detection and alarm systems. Primary emphasis will be on transportation-related fire hazards and the regulatory requirements associated with air, rail, marine, and highway modes of transportation.

## SF 375

### Propulsion Plant Investigation

#### 3 Credits

A technical course in aircraft reciprocating and turbine engine fundamentals and relevant accident investigative procedures. Areas of study include basic construction and design with emphasis on major sections, components, and their mechanical relationships. Power plant systems and system mishap investigation is also covered and includes fuel, lubrication, ignition, and start systems. A study of propeller basics and investigative techniques is also included. On site field investigation as well as engine teardown/disassembly procedures are presented. Prerequisite: SF 330.

## SF 410

### Design of Engineering Hazard Controls

#### 3 Credits

This course addresses the application of scientific and engineering principles and methods to achieve optimum safety and health through the analysis and design of processes, equipment, products, facilities, operations, and environments. Subjects will include product design, plant layout, construction maintenance, pressure vessels, and transportation vehicles and systems. These subjects will be discussed in relation to all regulatory requirements. Prerequisites: PS 101, PS 103, and SF 201.

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## SF 435

### Aircraft Crash Survival Analysis and Design (3,0) 3 Credits

An in-depth analysis of the accident environment with particular emphasis on the protection of the occupants. The injury mechanisms and causes will be analyzed as will the physics and kinematics of the impact sequence. The intent of the course is to familiarize the student with what can be done to minimize the effects of an accident. Prerequisite: SF 335.

## SF 445

### System Safety in Aviation (3,0) 3 Credits

“System Safety” entails specialized integration of skills and resources in all phases of the life cycle of a given system in furtherance of accident prevention. Its heritage is systems engineering and management theory but amplified to include modern safety practices derived from numerous disciplines. Accordingly, this course reviews the development and implementation of system safety technology in aviation, both civil and military. Students will acquire an understanding of how accident prevention is designed into an aircraft under development, evaluated and enhanced during flight test, and assured or otherwise controlled during operational use; this in juxtaposition with other elements of the total aviation system.

## SF 462

### Health, Safety and Aviation Law 3 Credits

This course introduces the student to the legal issues and concerns confronting the health and safety industry. Included is an overview of the historical legal precedence established for the aviation industry as well as a comprehensive examination of the laws, regulations, and legislation which governs the actions and authority of the health and safety professional. This course also provides an introduction to the governing bodies and associations which are tasked with setting the legal standards by which the industry must operate, including the scope and level of their authority.

## SF 299, 399, 499

### Special Topics in Aviation Safety (3,0) 1-3 Credits

Individual independent or directed studies of selected topics in aviation safety. Prerequisites: Consent of

Instructor, approval of department and program chairs and 12 hours of SF courses.

## Space Studies

## SP 110

### Introduction to Space Flight (3,0) 3 Credits

A survey of the major aspects of space flight. Topics covered include the history of space flight, Space Shuttle operations, and present and future commercial, industrial, and military applications in space.

## SP 200

### Planetary and Space Exploration (3,0) 3 Credits

This is a survey course of U.S. and international space programs. The student will be introduced to the Earth and its space environment, to methods of scientific exploration and to spacecraft and payload criteria at the introductory physics level.

## SP 210

### Space Transportation System (3,0) 3 Credits

A survey course of the Space Transportation System (STS) at the introductory physics level. Included are manned space flight operations, supporting systems and the Space Shuttle mission, both present and future. A review of Space Shuttle flight profiles, guidance and navigation control, proximity operations and rendezvous and a brief review of hypersonic orbiter aerodynamics are included. Also covered are future STS applications to space station logistical operations, commercial applications and Department of Defense operations.

## SP 215

### Space Stations Systems and Operations (3,0) 3 Credits

This course is designed to provide a brief study of the Space Station flight operations, its supporting elements and planned systems. The survey study will include commercial applications, logistical support, maintenance and servicing design concepts at the introductory level.

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## SP 220

### Life Support Systems (3,0)

#### 3 Credits

This course is a survey, at the elementary physics level, of the requirements and design considerations for life support systems in space and on other planets. Included are an introduction to basic human physiology, a description of the space environment and a survey of historical life support systems, and a presentation of spacecraft limitations and requirements. Prerequisite: PS 102 or PS 103.

## SP 300

### Satellite and Spacecraft Systems (3,0)

#### 3 Credits

Orbital satellites and spacecraft are discussed according to their application, design and environment. The power system, shielding and communication systems are reviewed along with their missions, space environment and limitations. The course will be taught at the introductory physics (PS 104) level. Prerequisite: MA 112.

## SP 400

### Introduction to Space Navigation (3,0)

#### 3 Credits

This course will introduce the student to basic elements of space navigation at the introductory physics level. The consequences of Newton's law of gravitation and central force motion, including Kepler's three laws of planetary motion are explained. The physical characteristics of the solar system and the Earth/Moon system are reviewed. The basic methods and techniques of navigating in near-earth orbit and the moon and planets are described. Prerequisites: MA 112 and PS 103.

## SP 425

### Selected Topics in Space and Aerospace (3,0)

#### 3 Credits

This course introduces students to problems in space operations, space flight or other space-related topics which can be critically addressed from a knowledge base of elementary calculus, elementary physics and the subject matter of any two Space Studies courses. The specific topics will be selected by the course monitor and instructor and published in the Schedule of Courses in the preceding semester. This is a required course for the Space Studies minor. Prerequisites: PS 104 and any two SP courses.

## SP 299, 399, 499

### Special Topics in Space Studies

#### 1-3 Credits

Individual independent or directed studies of selected topics in space studies related topics. Prerequisites: Consent of instructor and approval of department or program chairman. May be repeated with a change of subject.

## Social Sciences

## SS 110

### World History (3,0)

#### 3 Credits

Designed primarily as a survey of the development and evolution of Western Civilization from 1500 to the present. Emphasis is placed on the effect of Western influence on the world.

## SS 120

### American History (3,0)

#### 3 Credits

From 1865 to the present. Reconstruction, the age of big business, the United States as a world power. World War I, World War II, the Great Depression and its aftermath.

## SS 130

### History of Aviation in America (3,0)

#### 3 Credits

A survey of the history of America in the Twentieth Century, emphasizing the explosive growth of aviation as a major influence upon the economic, military and societal development of the United States.

## SS 204

### Introduction to Geography (3,0)

#### 3 Credits

A survey course designed to acquaint the student with types of maps, map reading and utilization, as well as to show relationships between geography and economics, culture and geopolitics. Man and his use of his environment are stressed, along with the usual emphasis on places, names and locations. Ancillary topics will include climate, demography and transportation.

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## SS 210

### Introduction to Sociology (3,0)

#### 3 Credits

Integrated survey of the fundamental concepts of culture, forms of collective behavior, community and social organization, social interaction and social change. The social effects of aviation and the impact of science on the social order living in an air-age will also be investigated.

## SS 302

### Evolution of Scientific Thought (3,0)

#### 3 Credits

Traces the development of science from the earliest times through the modern period, with particular emphasis given to our changing concepts of nature and of science itself. (Also offered as PS 302. Students receive either social science elective credit or physical science elective credit, but not both.) Prerequisites: Any course from the HU 140 series and either PS 101 or PS 102 or PS 103 or PS 150 and PS 215.

## SS 305

### American Military History (3,0)

#### 3 Credits

Military history with emphasis on military policy, organization and technology as they relate to political, economic, and social developments from 1775 to the present. Prerequisite: SS 110 or SS 120 or SS 130.

## SS 310

### Personality Development (3,0)

#### 3 Credits

A course to acquaint the individual with the intrapersonal and environmental factors that affect personality development, emotional stability, and interpersonal relationships in our society. Through an understanding of these factors, the individual will have discovered new modes of adjustment, both in his own life and in his family and occupational setting. Prerequisite: PSY 220.

## SS 320

### American National Government (3,0)

#### 3 Credits

Basic issues of American democracy, constitutional principles and the executive, legislative and judicial branches of government. Prerequisite: College level history or permission from the instructor.

## SS 325

### International Studies (3,0)

#### 3 Credits

An overview of the land, the people, the culture and the history of one region of the world, with emphasis on current events and policies on the world scene. Specific content varies from year to year. Prerequisite: College level history or permission from the instructor.

## SS 326

### Russian-American Relations (3,0)

#### 3 Credits

This course explores the development of Russian-American economic and political relations, emphasizing the era of the twentieth century. Prerequisite: College level history or permission from the instructor.

## SS 331

### Current Issues in America (3,0)

#### 3 Credits

A course in selected political-economic issues of national and international importance. Extensive use of journals, magazines and newspapers to supplement lectures and discussions. Prerequisite: College level history or permission from the instructor.

## SS 332

### Gender, Ethnicity, and Class in 19th and 20th Century Global History (3,0)

#### 3 Credits

The social and cultural conceptualization of gender, ethnicity, and class; and their significance and role in global history during the 19th and 20th centuries.

## SS 333

### US-Asian Relations (3,0)

#### 3 Credits

This course explores the development of US-Asian political, cultural and economic relations, from their beginnings in the nineteenth century to the present. The course will examine America's domestic motivations for expanding into the Pacific, the various impacts that the United States had on Asian nations, and Asia's collaboration with and resistance to the American presence. Prerequisite: Lower developmental history course or junior standing.

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## SS 340

### American Foreign Policy (3,0)

#### 3 Credits

A survey of the evolution of present American foreign policy, stressing the factors which affect and shape this policy. Attention is given to present governmental offices, agencies and departments and the role each plays in policy formulation. Emphasis is on the period since World War II. Prerequisite: College level history or permission from the instructor

## SS 350

### Psychology of Relationships (3,0)

#### 3 Credits

The course provides theoretical and practical knowledge of the intrapersonal and interpersonal components of successful relationships. Lectures and discussions will focus on research, theory and applications of Social, Behavioral, Psychoanalytic, Family and Humanistic Psychology to interpersonal, romantic, marital and family relations in contemporary society. Class will also focus on self-knowledge and skills conducive to successful relationships. Prerequisite: PSY 220.

## SS 351

### Relationship Skills Laboratory (0, 3)

#### 1 Credit

This laboratory provides small group practice of principles taught in SS 350, Psychology of Relationships. Methods of practice include individual mental, emotional, and imaginal awareness techniques, pair interactional exercises interspersed with individual writing and reflection, role playing, and group discussion. Co/prerequisite: Open to students who are taking or have completed SS 350.

## SS 360

### Environmental Law (3,0)

#### 3 Credits

Provides a general introduction to the field of planning, examines the procedural approaches shared by practitioners working in all areas of contemporary planning. Introduces legal concepts and doctrines relevant to pollution control, assessment of environmental impacts, and land use. Prerequisite: PS 142 or permission of instructor.

## SS 361

### Labor and Technology (3,0)

#### 3 Credits

This course examines the relationship between labor and technology from historical and cultural perspectives. This examination ranges from the industrial revolutions of the 18th and 19th centuries to the present with extrapolations into the future of industry, labor and society. Particular emphasis will be placed in analyzing the change from mass production (fordism) to flexible production (post-fordism), and the relationship between the mobility of labor and capital with the globalization of technology. This course will look at case studies from aviation/aerospace telecommunication, and automobile industries in the U. S. Pacific Rim, European Community, and Latin America. Prerequisite: College level history or permission from the instructor.

## SS 363

### Inter-American Relations (3,0)

#### 3 Credits

This course explores the development of US political and economic relations with Latin America from their beginnings in the nineteenth century to the present. Prerequisite: SS 110 or SS 120 or SS 130 or junior standing.

## SS 299, 399, 499

### Special Topics in the Social Sciences

#### 1-6 Credits

Individual independent or directed study of selected topics in the areas of history, sociology, psychology, and human culture in general. Prerequisites: Consent of instructor and approval of the department chair.

## Science, Technology and Globalization

## STG 100

### Introduction to STG (3,0)

#### 3 Credits

The course will examine the way in which science and technology are culturally configured. The course will have three main elements that give it shape: (1) an examination of methods for "reading" or analyzing culture; (2) a familiarization with terms and concepts

# Course Descriptions

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in the field; (3) an overview of the main themes in STG studies as well as several in-depth examples.

## STG 205

### Global Economics (3,0)

#### 3 Credits

The purpose of this introductory course is to present the theory of comparative advantage and understand protectionism, distinctions in developed compared to developing countries as well as trade policy. Regional and global trade agreements as well as multinational enterprises will be studied.

## STG 210

### Global Problem Solving (3,0)

#### 3 Credits

A practical introduction to problem solving by learning to assess, develop, and contribute one's expertise to the solution of problems that organizations face in a global environment. Emphasis is given to problem recognition, definition, and solution. Various types of non-mathematical problem solving strategies are explored such as consulting, strategic planning and management, organizational change, conflict resolution, and facilitation. Concepts presented are applicable to all fields, such as aviation, engineering, computer science, environmental studies, security, and technology policy and management.

Prerequisite: PSY 220 or SS 120 or permission from instructor.

## STG 305

### Global Policy Studies (3,0)

#### 3 Credits

A cross-national survey and analysis of the processes of policy making for science and technology, environment, and security. Emphasis on how local, national, international and global policy making are related in these three areas of global change. Prerequisites: two social science courses and one history course or permission of instructor.

## STG 310

### Evolution, Revolution and Change (3,0)

#### 3 Credits

This course provides an historical and global survey of psychological, political, social, cultural, scientific and technological change. Prerequisites: two physical science courses and two social science courses and one history course or permission of instructor.

## STG 312

### Global Crime and Criminal Justice Systems (3,0)

#### 3 Credits

This course presents the current status and future trends in global crime and criminal justice systemic approaches to combating global crime. First, the course describes the rise of novel criminal activities in the context of globalization as well as the influence of globalization on pre-existing criminal activities. Second, the course describes globalization's effects on the structure, function, and process of criminal justice systems. Third, the course explores the reciprocal interactive and contextual relationships between global crime and criminal justice systems. The course emphasizes global, multi-cultural, and world historical perspectives of crime to professionally and personally prepare students for the challenge of 21st century life. Prerequisites: SS 210 or PSY 220; SS 110 or SS 120; SS 340; at least 2 STG core courses, including STG 305; or permission from the instructor.

## STG 315

### Studies in Global Intelligence I (3,0)

#### 3 Credits

This course will examine the uses of strategic intelligence by world leaders in shaping policy and the effects of strategic intelligence on world events. Issues to be covered include theoretical models of strategic intelligence; intelligence collection, evaluation, analysis, production, and dissemination; intelligence oversight; covert and clandestine operations; intelligence bureaucracies; ethical and moral issues in intelligence; counterintelligence. The course emphasizes strategic intelligence in the business, political, military, scientific, and technological domains. Prerequisites: one psychology course and one government or history course and completion of all general education math and physical/life science requirements and four STG core courses; or permission of the instructor.

## STG 318

### Science and Religion (3,0)

#### 3 Credits

This course explores the relationship between science and religion through an examination of essays and segments of texts in the areas of modern science and modern theology with an eye toward understanding the basic assumptions, the new theories and models, and the language of both. Such understanding will then allow for an informed debate as to whether these two fields must stand in inevitable conflict or

# Course Descriptions

whether they can move in the direction of co-existence, dialogue, or even integration. Prerequisite: junior standing.

## STG 320

### Topics in Global History (3,0)

#### 3 Credits

This course provides students with the chance to focus on selected areas in world history. The area under discussion in a particular semester will vary according to student and program needs. The basic areas covered on an as-needed basis will include Europe, Latin America, the Middle East, Africa, and Asia. Students may repeat the course in order to study another topic area. Prerequisites: COM 122 and SS 110 or SS 120.

## STG 325

### Engineering Cultures (3,0)

#### 3 Credits

This course seeks to improve students' abilities to understand and assess engineering practices and knowledge from humanistic and global perspectives. This course encourages students to step back, critically assess, and intervene in technological problems that they encounter (and will encounter) as future engineers or colleagues of engineers. The course both compares the cultures of engineering at different times and places and explore how forms of engineering have contributed to everyday cultural life. Prerequisite: SS 210 or SS 220 or permission from instructor.

## STG 330

### Environmental Consulting (3,0)

#### 3 Credits

Today's industries including the aviation industry are under the umbrella of federal and state regulations dealing with a variety of environmental issues. One aspect of these regulations is an EA (Environmental Assessment), which is part of the NEPA (National Environmental Protection Act) regulations. This process will be examined and used to analyze local and regional projects.

## STG 400

### Security and Globalization (3,0)

#### 3 Credits

An analysis of 21st-century international security issues related to scientific and technological change. Topics include the nature of security--economic, sociocultural, and military; political leadership/followership, decision making, and conflict resolution;

political violence--especially terrorism and ethnic conflict; intelligence and counterintelligence analysis and operations; weapons proliferation; information warfare; the politics of international organized crime; bureaucratic evil; internal dislocation and immigration; and the politics of public health. A special focus throughout the course will be on the aviation and aerospace industries--policies and operations, safety, and security. This course will emphasize science, technology, and globalization--as the environment in which concepts of international security evolve and as impacted by international security phenomena. Prerequisites: college-level psychology and college-level history or permission of instructor.

## STG 401

### Environment and Culture (3,0)

#### 3 Credits

This course provides an overview of the various ways nature has been used in historical and cultural contexts. It will examine Christian, Native American, Scandinavian and Eastern imagery of the earth as well as scientific writings on nature. In addition, the course will examine the relationship between what is considered natural and social policy. The course will also examine the politics of environmental and economic policies. At least one significant piece of nature writing (fiction or nonfiction) will be included each time the course is offered. Prerequisites: HU 143 and PS 142 or permission of instructor.

## STG 402

### Global Technosciences (3,0)

#### 3 Credits

This course provides an in-depth analysis of globalization of production, dissemination, transfer, and practice of science and technology. Social and cultural theories of globalization will be applied to emerging transnational infrastructures (e.g., Internet, NASA hypersonic flight project, International Space Station, Human Genome Project) and to transnational scientists and engineers (e.g., European Ingenieur, corporate research scientists and engineers). Prerequisite: college-level sociology or college-level international studies or permission of instructor.

## STG 405

### Consulting Field Casework (3,0)

#### 3 Credits

Teams of students--generally in advanced stages of their program of study--are assigned to work with selected business organizations. The team's purpose is to provide the client organization with consulting

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advice in the areas of strategic management, organizational design, human resource utilization, and operations productivity. Work takes place both in the classroom and at the client's work location. This course will equip students to contribute their education and expertise in situations where they must rely on influence, rather than managerial control, to impact an organization. Their ability to recognize and define problems and present workable solutions as members of interdisciplinary teams will be developed as they respond to various case situations. Their written/oral presentations and teamwork skills will be raised to professional standards. This course takes students beyond textbooks and case studies in the real world. Students will be challenged to define and help solve complex problems in a changing environment. They will work with clients who are *real* people with a personal investment in the project and a "show me" attitude. Success is measured by the students' ability to find workable solutions to the client's real or perceived problems, and get them implemented. Unlike a co-op, students do not take direction from nor have a direct reporting relationship with the client company. Their "direct report" is the instructor of the class, who acts as overall project manager. The student teams' relationship with the company or organization is consultant-client. Prerequisites: STG 210, BA 201, BA 311, BA 332, and BA 436 or permission from instructor.

## STG 406

### Environmental Management (3,0)

#### 3 Credits

This course focuses on the development of an environmental management plan. Today much of the environmental work in corporations including aviation industry is carried out in projects. The management of these projects starts with the development of proposals, funding sources, tasks, and timeline. Employees at a variety of levels are required to help manage projects, so terms and organizational contents will be covered.

## STG 415

### Studies in Global Intelligence II (3,0)

#### 3 Credits

This course provides an intensive, semester-long simulation for teams of students assuming the roles of political, military, economic, or scientific and technological intelligence case officers. Through the semester-long immersion with an intelligence tasking, students will be expected to demonstrate sophistication with case officer-agent relationships; staffing and

coordination involving the various combinations within one's intelligence station, among stations, and between one's station and regional and central headquarters; intelligence briefings, executive summaries, and estimates; credibility and risk analysis –both of sources and of recommendations concerning specific covert action, espionage, and counterintelligence operations; operations/physical/communications/personnel securities; the intelligence opportunities, limitations, and threats presented by today's era of globalization. Prerequisite: STG 315 or permission of the instructor.

## STG 475

### Senior Thesis (3,0)

#### 3 Credits

As the culmination of the student's rigorous intellectual experience in the interdisciplinary Science, Technology, and Globalization program, this course requires students to complete an original product of scholarship that is an original contribution to knowledge and a practical resolution of a global problem. Students must demonstrate their mastery of literature review, methodology, data analysis, data interpretation, and policy analysis. A weekly meeting and extended individual consultations with the faculty advisor will accompany the guided writing of the thesis. This course is required for all students in the STG program.

## College Success

## UNIV 101

### College Success (2,0)

#### 1 Credit

A course in which students assess and develop the personal, interpersonal, intellectual, and social skills necessary to succeed in college. Time management, study skills, goal clarification, career concerns, and college resources will be included. This course is available to freshmen only.

## UNIV 102

### Self-Assessment and Portfolio Preparation (2,0)

#### 1 Credit

This course is required of all adult undergraduate students seeking an assessment of their prior experiential learning by portfolio. Students will assess their prior learning experiences in light of career and educational goals. The distance learning course is designed to assist students in life and career plan-

# Course Descriptions

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ning, goal clarification, career concerns, portfolio preparation, and the development of college success skills. Focus is on methods of self-assessment of prior learning work/education/training experiences and procedures for assembling a portfolio to document learning experiences. This course is graded Satisfactory/Unsatisfactory and is required for students who seek prior learning portfolio evaluation. Students must register for UNIV 102 within six months of course registration.

## UNIV 400

### Career Development (1,0)

#### 1 Credit

Introduces students to various elements involved in obtaining a position in their chosen fields. Topics included are: self assessment, research and selection of a career path, sources of jobs, job search techniques, resumes and letters of application, references, interviewing skills, business etiquette, and professional image. Each student will develop a career portfolio including personal and professional information related to career goals.

## Applied Meteorology

## WX 201

### Meteorology I (3,0)

#### 3 Credits

A survey course in atmospheric science that includes applications to flight. Included is a systematic development of the following: thermal patterns, atmospheric moisture, horizontal and vertical pressure patterns, clouds, atmospheric circulation, local winds, stability, air masses, fronts, fog, icing, thunderstorms, jet streams and turbulence. Students will study and make use of surface weather observations, surface maps, and constant pressure maps.

## WX 202

### Current Weather Discussion (1,0)

#### 1 Credit

This course takes advantage of real time weather data to introduce, review, and apply various topics that are developed in other courses within our program. Two, three, and four dimensional analysis techniques are used to examine the evolution of previous, current, and forecast weather conditions. Subject matter will vary from semester to semester. Course is repeatable for a total of three credits.

## WX 205

### Reading the Clouds (1,0)

#### 1 Credit

This course focuses on visually identifying clouds and cloud formations to interpret their underlying meteorological meaning. Formations associated with wind shear, turbulence, stable and unstable atmospheres and severe weather will be discussed. Prerequisite: WX 201.

## WX 210

### Introduction to Geographic Information Systems (3,0)

#### 3 Credits

Geographic Information Systems (GIS) encompass all aspects of spatial data analysis from data acquisition and manipulation through problem solving to the graphic presentation of results. This course surveys GIS theory and applications as students learn to store, retrieve, manipulate, analyze, and display spatial data according to a variety of user-defined specifications. Lectures will emphasize fundamental principles of GIS while computer-based exercises will emphasize training.

## WX 211

### Introduction to Weather Observations (1,0)

#### 1 Credit

This course provides an in-depth examination of the currently used aviation routine weather report (METAR). Various methodologies of modern measurement techniques, including the use of remote sensing, are examined in detail. The impacts of converting from a human-based observation system to an automated, machine-based system are presented and discussed. In-situ measurements will be taken and field measurement sites that provide observational support to the aviation/aerospace industry will be visited. Prerequisite: WX 201.

## WX 261

### Applied Climatology (3,0)

#### 3 Credits

WX 261 is an in-depth survey of the varied climates of the world, the weather systems that contribute in the aggregate to those climates, and their cumulative influence on aircraft system performance and the National Air Space over very small to global space and time scales. Included are presentations from an

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historical perspective over geological time frames on the development of past climactic regimes, and their transition to the present era climate as well as the atmospheric dynamics involved in the global change process. Aviation-related practices, procedures, and operations dictated by various climactic regimes are discussed. Prerequisite: WX 201.

## WX 270

### Weather Information Systems (3,0)

#### 3 Credits

An introduction to the various states of weather sensing equipment modernization and the systems that deliver weather information to various users. The development of various sensing devices are explored and the current technology explained. Prerequisite: WX 201.

## WX 320

### Atmospheric Thermodynamics (3,0)

#### 3 Credits

This course provides an application of physics and calculus to the study of atmospheric thermodynamics. The course covers such topics as hydrostatics, conservation of energy, the Ideal Gas Law, temperature relationship to kinetic energy, specific heats, Enthalpy, and Entropy. Additionally, water and its transformations, the thermodynamics of dry, moist, and saturated air, and thermodynamic diagrams are covered. Prerequisites: PS 208, WX 353. Corequisite MA 245.

## WX 352

### Meteorology II (3,0)

#### 3 Credits

An expansion of Meteorology I, including the following theoretical concepts: hydrostatic instability, baroclinic instability, thermal wind, and kinematic fields. These will be integrated into real-time weather analysis of synoptic patterns involving mid-latitude cyclones, advection, frontal systems, and jet streams. Practical application will be achieved through presentation of current and historical weather data emphasizing common hazards to aviation such as thunderstorms, strong winds, fog, icing, and turbulence. An introduction to weather forecasting concepts will be presented. Prerequisites: MA 112, PS 103, WX 201.

## WX 353

### Advanced Meteorology I (3,0)

#### 3 Credits

A course for those requiring an in-depth understanding of the physical processes governing the atmosphere. Includes discussion and quantitative treatment of meteorological conventions, atmospheric state and structure, radiation, heat/energy transfer, boundary layer structure and fluxes, moisture, stability, cloud formation, and precipitation. Prerequisites: PS 104 (or PS 208), WX 352.

## WX 354

### Advanced Meteorology II (3,0)

#### 3 Credits

A course for those requiring an in-depth understanding of the dynamic processes governing the atmosphere. Includes discussion and quantitative treatment of atmospheric forces, the equations of motion, local and global winds, air masses and fronts, middle latitude cyclones, quasi-geostrophic theory, thunderstorms, and hurricanes. Prerequisites: PS 104 (or PS 208), WX 353.

## WX 355

### Weather Analysis (5,0)

#### 5 Credits

This course presents conceptual models of synoptic weather features and applies them to analysis of meteorological data fields. Meteorological codes for surface and upper air data are surveyed and the basic conventions of surface and upper air charts are introduced. Labs cover the standard tools of weather analysis, and give students practice constructing and using isopleths of pressure, temperature, dew point, and geopotential height. The horizontal and vertical structure of fronts is examined through pattern recognition of standard meteorological variables, atmospheric "thickness," and cross-section analyses. Methods for analyzing wind fields such as streamlines, air parcel trajectories, and jet stream identification are presented. Students practice conceptually integrating satellite and radar data to verify and refine their analyses in accordance with dynamical principles. This course covers both manual (hand-drawn) weather map techniques and computer meteorological analysis software packages. Prerequisite: WX 353. Corequisite: WX 354.

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## WX 363

### Thunderstorms (3,0)

#### 3 Credits

This course provides tools for analyzing and forecasting thunderstorms and their associated hazards. Key characteristics of the thunderstorm and its environment are explored using both case studies and real-time weather data. Students examine atmospheric soundings to determine the likelihood of storm development and the amount of energy available for thunderstorms. Vertical wind shear is analyzed for clues about storm organization and severity. Other information such as weather charts, computer models, satellite imagery, and Doppler radar imagery is used to observe the characteristics of thunderstorms and the weather patterns that favor them. Students gain a basic scientific understanding of thunderstorm behavior as well as practical experience observing and predicting them. Prerequisite: WX 352.

## WX 364

### Weather for Aircrews (3,0)

#### 3 Credits

Making use of The Weather Center and the Internet, students collect and study weather data from around the world. Emphasis is placed on decoding information contained in the "remarks" section of weather observations and on the differences between North American weather charts and those produced in other parts of the world. Students investigate the flying conditions and aviation environment over the seven continents. The proper operation of airborne weather radar is studied. Students identify weather hazards by using ground-based weather radar and satellite imagery. At the Daytona Beach campus, this is the capstone course for the Aviation Weather Minor. Prerequisite: WX 352.

## WX 365

### Satellite and Radar Weather Interpretation (3,0)

#### 3 Credits

A practical introduction to meteorological interpretation of satellite and weather radar imagery. This course surveys the basic physics of electromagnetic (EM) radiation and shows how characteristics of the EM spectrum are exploited in passive (satellite) and active (radar) remote sensing to create digital images of geophysical information. The theory of radar signal propagation and precipitation estimation is applied to the meteorological interpretation of radar

imagery and supplemented with practical analysis of various radar product types. Weather satellite image types including visible, conventional infrared, and water vapor channels and their meteorological applications are examined. Real-time satellite identification of meteorological phenomena will be emphasized, including mountain waves, midlatitude cyclones, fronts, jet streams, troughs, ridges, vorticity, cloud types, fog, precipitation, ordinary and severe thunderstorms, tropical waves and hurricanes. Surface and upper air weather maps will be used to enhance the students' understanding of satellite image signatures. Prerequisites: WX 202 and WX 352.

## WX 370

### Planetary Atmospheres (3,0)

#### 3 Credits

The knowledge of mechanisms and forces that cause the earth's atmosphere to move will be applied to the other planets. Solar effects on space travel will be studied. Emphasis will be placed on the weather of planets which will most likely be visited in the early 21st century. Students will present a project that examines the solar and atmospheric effects of travel to their favorite planet. This course can be used to satisfy a requirement within the Minor in Space Studies. Prerequisite: WX 352.

## WX 390

### Atmospheric Physics (3,0)

#### 3 Credits

Topics covered include elements of earth-sun geometry, radiative transfer, photochemistry, and remote sensing of the atmosphere. Additionally, properties of aerosols and clouds, cloud nucleation, precipitation processes, and atmospheric electricity will be discussed. Prerequisites MA 245, WX 353.

## WX 401

### Meteorology of Aircraft Mishaps (3,0)

#### 3 Credits

WX 401 investigates the role weather plays in the chain of causality of an aircraft mishap, paying special attention to the acquisition and application of atmospheric "witness-data" obtained from conventional and/or remote-sensor sources. The limitations and accuracy envelope of both human observers and automated meteorological systems (AWOS/ASOS) are explored and developed. The weather types that are a part of the accident chain of causality are examined in detail relative to specific case histories as

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recorded in selected National Transportation Safety Board (NTSB) reports. Prerequisite: WX 352.

## WX 427

### Forecasting Techniques (3,0)

#### 3 Credits

This course provides an introduction to the world of weather prognostication. Topics include the traditional forecast methods based on weather analysis techniques, up through the latest computer generated weather prediction models. The student is exposed to techniques for forecasting tomorrow's weather as well as seasonal weather trends. Prerequisite: WX 355. Corequisite WX 202.

## WX 429

### Severe Weather Seminar (2,0)

#### 2 Credits

Investigations into recent severe weather outbreaks. Students will collect and analyze data using the latest techniques to document and explain large-scale convective systems. Radar and satellite data are assessed and case studies are published. Prerequisite: WX 363.

## WX 457

### Weather Operations Seminar (3,0)

#### 3 Credits

This course simulates a number of industry/agency operational weather environments. The student will acquire and evaluate the significance weather impact variables have on all phases of the operational environment. Real-time as well as pre-programmed scenarios are used to provide the student the opportunity to become knowledgeable in the methodologies employed by decision-makers in flight and marine planning/operations, multi-media productions, and agribusiness operations. Prerequisite: WX 355.

## WX 490

### Dynamic Meteorology I (3,0)

#### 3 Credits

This first course in atmospheric dynamics utilizes physics and calculus. The instruction includes such topics as equation of motion on a rotating Earth, balanced flow, kinematics, circulation theorem, conservation of absolute angular momentum, mass continuity, vorticity equation, and wind-pressure imbalance. Prerequisites: MA 245 and WX 320.

## WX 491

### Dynamic Meteorology II (3,0)

#### 3 Credits

This is the second course in atmospheric dynamics, which uses vectors. It includes such topics as Rossby waves, quasi-geostrophic theory, and synoptic-scale instability theory. Prerequisite: WX 490.

## WX 299, 399, 499

### Special Topics in Meteorology

#### 1-6 Credits

Individual independent or directed studies of selected topics in applied meteorology. Prerequisites: Consent of instructor and approval of the program coordinator.