ENAE Engineering, Aerospace Fall 2016

ENAE100 The Aerospace Engineering Profession
Credits: 1
Grading Method: Regular, Pass-Fail, Audit
Recommended: ENES100 and MATH140.
Overview of salient aspects of professional practice of Aerospace Engineering. Introduction to the range of technical expertise needed to succeed in the profession and the objectives of the various parts of the Aerospace Engineering program at UMCP in supporting students’ efforts in gaining the required knowledge and skills. Familiarization with departmental faculty and their areas of research, creation of links with other students, professional society student chapters, and available resources. Discussion of ethical issues, business requirements, and their interactions with technical developments.

0101 Norman Wereley Seats (Total: 105, Open: 105, Waitlist: 0)
Tu 12:30pm - 1:45pm EGR 1202

ENAE283 Introduction to Aerospace Systems
Credits: 3
Grading Method: Regular
Prerequisite: PHYS161, MATH141, and ENES102. Corequisite: PHYS261 and PHYS260. Restriction: Must be in Engineering: Aerospace program. Credit only granted for: (ENAE281 and ENAE282) or ENAE283. Formerly: ENAE281 and ENAE282.

0101 Mary Bowden Seats (Total: 90, Open: 90, Waitlist: 0)
TuTh 9:30am - 10:45am CHE 2110

ENAE283H Introduction to Aerospace Systems
Credits: 3
Grading Method: Regular
Prerequisite: PHYS161, MATH141, and ENES102. Corequisite: PHYS261 and PHYS260. Restriction: Must be in Engineering: Aerospace program. Credit only granted for: (ENAE281 and ENAE282) or ENAE283. Formerly: ENAE281 and ENAE282.
ENAE301  Dynamics of Aerospace Systems

Credits: 3  Grading Method: Regular, Pass-Fail, Audit

Prerequisite: PHYS271, MATH461, PHYS270, MATH246, ENAE283, ENAE202, ENES102, and MATH241. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

Kinematics and dynamics of three dimensional motion of point masses and rigid bodies with introduction to more general systems. Primary emphasis on Newtonian methods. Practice in numerical solutions and computer animation of equations of motion using MATLAB.

0101  Derek Paley  Seats (Total: 27, Open: 27, Waitlist: 0)
TuTh 12:30pm - 1:45pm  TuTh 1:00pm - 1:50pm
CHE 2110  EGR 0312  Lab

0102  Derek Paley  Seats (Total: 27, Open: 27, Waitlist: 0)
TuTh 12:30pm - 1:45pm  F 2:00pm - 2:50pm
CHE 2110  EGR 0312  Lab

0103  Derek Paley  Seats (Total: 30, Open: 30, Waitlist: 0)
TuTh 12:30pm - 1:45pm  F 3:00pm - 3:50pm
CHE 2110  KEB 2111  Lab

0104  Derek Paley  Seats (Total: 30, Open: 30, Waitlist: 0)
TuTh 12:30pm - 1:45pm  F 4:00pm - 4:50pm
CHE 2110  KEB 2111  Lab

ENAE311  Aerodynamics I

Credits: 3  Grading Method: Regular

Prerequisite: PHYS271, MATH461, PHYS270, MATH246, ENAE283, ENES220, ENAE202, and MATH241. Corequisite: ENES232. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department. And junior standing or higher.

ENAE311H  Aerodynamics I
(Perm req)

Credits: 3
Grading Method: Regular, Pass-Fail

Prerequisite: PHYS271, MATH461, PHYS270, MATH246, ENAE283, ENES220, ENAE202, and MATH241. Corequisite: ENES232. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department. And junior standing or higher.


ENAE362  Aerospace Instrumentation and Experimentation

Credits: 3
Grading Method: Regular, Pass-Fail, Audit

Prerequisite: MATH246 and ENAE283. Restriction: Must be in Engineering: Aerospace program; and junior standing or higher.

Basic instrumentation electronics including DC electronics, AC electronics, semiconductors, electro-optics and digital electronics. Sensing devices used to carry out experiments in Aerospace Engineering includes metrology, machine tool measurements, bridge circuits, optical devices, and introduction to computer based data acquisition. Topics chosen to support measurements in aerodynamics, flight structures and flight control.
ENAE380  **Flight Software Systems**

Credits: 3  
Grading Method: Regular, Pass-Fail, Audit

Prerequisite: ENAE283 and ENAE202. Restriction: Must be in Engineering: Aerospace program; and junior standing or higher.

Avionics using advanced sensor and computing technologies are at the heart of every modern Aerospace vehicle. Advanced software systems to improve cockpit safety and enable unmanned and deep-space missions. Object-oriented programming and software engineering concepts required to design and build complex flight software systems. Software validation, verification and real-time performance analysis to assess flight software system reliability and robustness. Human-machine interface design for piloted systems. Automatic onboard data acquisition and decision-making for unmanned air and space vehicles.

Three hours of lecture and two hours of laboratory per week. Prerequisite: ENAE202 and ENAE283. Junior standing. For ENAE majors only.
ENAE398H  
**Honors Research Project**  
(Perm req)  
Credits: 1-3  
Grading Method: Regular  

Planned sequence of steps in aerospace honors research in which student take three (3) consecutive semesters of this course in partial fulfillment of aerospace engineering honors program requirements. The first semester consists of a series of seminars and meetings with faculty mentors on honors research; two semesters consist of undergraduate honors research project and paper conducted under the direction of an aerospace engineering faculty member to be presented at a conference.

**Contact department for information to register for this course.**

ENAE403  
**Aircraft Flight Dynamics**  
Credits: 3  
Grading Method: Regular,  
Pass-Fail, Audit  

Prerequisite: ENAE414 and ENAE432. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

Study of motion of aircraft, equations of motion, aerodynamic force representation, longitudinal and lateral motions, response to controls and to atmospheric disturbances, handling qualities criteria and other figures of merit.

| 0101 | Instructor: TBA | Seats (Total: 70, Open: 70, Waitlist: 0)  
TuTh 3:30pm - 4:45pm | KEB 1110 |

ENAE423  
**Vibration and Aeroelasticity**  
Credits: 3  
Grading Method: Regular,  
Pass-Fail, Audit  

Prerequisite: ENAE324. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

Dynamic response of single and multiple degrees of freedom systems, finite element modeling, wing divergence, aileron reversal, wing and panel flutter.
ENAE423H  Vibration and Aeroelasticity

Credits: 3  Grading Method: Regular, Pass-Fail, Audit

Prerequisite: ENAE324. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

Dynamic response of single and multiple degrees of freedom systems, finite element modeling, wing divergence, aileron reversal, wing and panel flutter.

ENAE441  Space Navigation and Guidance

Credits: 3  Grading Method: Regular, Pass-Fail, Audit

Prerequisite: ENAE404 and ENAE432. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.


ENAE455  Aircraft Propulsion and Power

Credits: 3  Grading Method: Regular, Pass-Fail

Prerequisite: ENES232, ENAE414, and ENAE311. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

Thermodynamic cycle analysis, aerochemistry of fuels and propellants, operating principles of piston, turbojet, fanjet, and other variations of airbreathing aircraft power units.
ENAE457  Space Propulsion and Power

Grading Method: Regular, Pass-Fail

Prerequisite: PHYS271, ENES232, PHYS270, and ENAE311. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department. And senior standing.

Thermodynamic cycle analysis, aerothermochemistry of fuels and propellants, operating principles of rocket, ion, and other exoatmospheric power units.

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<tr>
<th>Section</th>
<th>Instructor</th>
<th>Seats (Total: 49, Open: 49, Waitlist: 0)</th>
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<tbody>
<tr>
<td>0101</td>
<td>Raymond Sedwick</td>
<td>TuTh 2:00pm - 3:15pm PHY 4221</td>
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</tbody>
</table>

ENAE481  Principles of Aircraft Design

Grading Method: Regular, Pass-Fail, Audit

Prerequisite: ENAE324, ENAE362, and ENAE432. Corequisite: ENAE414. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

Aircraft design principles blending both synthesis and analysis. The iterative nature of the design process. Applied aerodynamics. Elements of aircraft performance calculation and optimization. Design of aircraft including payload, crew and avionics provisions, propulsion selection and sizing, aerodynamic configuration optimization, mass properties, stability and control characteristics, and vehicle subsystems. Individual student projects in aircraft design.

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<tr>
<th>Section</th>
<th>Instructor</th>
<th>Seats (Total: 60, Open: 60, Waitlist: 0)</th>
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<tbody>
<tr>
<td>0101</td>
<td>Dominic Palumbo</td>
<td>MWF 2:00pm - 2:50pm EGR 0108</td>
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<tr>
<td>0201</td>
<td>Sung Lee</td>
<td>Seats (Total: 12, Open: 12, Waitlist: 0)</td>
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This course is restricted to students on the Design, Build, Fly team and requires permission from the department to enroll.

ENAE483  Principles of Space Systems Design

Grading Method: Regular, Pass-Fail, Audit

Prerequisite: ENAE404, ENAE324, ENAE362, and ENAE432. Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Principles of space systems analysis and vehicle design. Launch vehicle performance analysis and optimization. Design of vehicle systems including avionics, power, propulsion, life support, human factors, structures, actuator and mechanisms, and thermal control. Design processes and design synthesis. Individual student projects in vehicle design.

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<th>Course</th>
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<tr>
<td>ENAE499</td>
<td>Elective Research</td>
<td>3</td>
<td>Regular</td>
<td>Undergraduate research project and paper conducted under the direction of an aerospace engineering faculty member to be presented at a conference or competition. Contact department for information to register for this course.</td>
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<tr>
<td>ENAE601</td>
<td>Astrodynamics</td>
<td>3</td>
<td>Regular, Audit</td>
<td>Prerequisite: ENAE404 and ENAE441. Mathematics and applications of orbit theory, building upon the foundations developed in ENAE 404 and ENAE 441. Topics include two body orbits, solutions of Kepler's equation, the two-point boundary value problem, rendezvous techniques, and Encke's method.</td>
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<tr>
<td>ENAE631</td>
<td>Helicopter Aerodynamics I</td>
<td>3</td>
<td>Regular, Audit</td>
<td>Prerequisite: ENAE414 and ENAE311. Or permission of ENGR-Aerospace Engineering department; and permission of instructor. A history of rotary-wing aircraft, introduction to hovering theory, hovering and axial flight performance, factors affecting hovering and vertical flight performance, autorotation in vertical descent, concepts of blade motion and control, aerodynamics of forward flight, forward flight performance, operational envelope, and introduction to rotor acoustics. Those sections that begin with a letter are taught via ITV and are not intended for College Park campus students.</td>
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### ENAE641  
**Linear System Dynamics**

**Credits:** 3  
**Grading Method:** Regular, Audit  
**Prerequisite:** ENAE432.

Linear systems; state space, multi-input, multi-output models; eigenstructure; controllability, observability, singular value analysis; multivariable Nyquist condition; observer design; introduction to Kalman filtering. Full state feedback techniques including pole placement and LQR/LQG techniques; introduction to loop shaping and robustness.

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<th>Section</th>
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<tr>
<td>0101</td>
<td>Robert Sanner</td>
<td>TuTh 12:30pm - 1:45pm</td>
<td>CHE 2118</td>
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</tbody>
</table>

### ENAE651  
**Smart Structures**

**Credits:** 3  
**Grading Method:** Regular, Audit  

Topics related to the analysis, design, and implementation of smart structures and systems: modeling of beams and plates with induced strain actuation; shape memory alloys; electro-rheological fluids; magnetostrictor and electrostrictor actuators and fiber optic sensors.

Those sections that begin with a letter are taught via ITV and are not intended for College Park campus students.
### ENAE655  Structural Dynamics

**Credits:** 3  
**Grading Method:** Regular, Audit

*Advanced principles of dynamics necessary for structural analysis; solutions of eigenvalue problems for discrete and continuous elastic systems, solutions to forced response boundary value problems by direct, modal, and transform methods.*

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<tr>
<td>HT01</td>
<td>Roberto Celi</td>
<td>Seats (4, Open: 4, Waitlist: 0)</td>
<td>MW 2:00pm - 3:15pm</td>
<td>TBA</td>
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<td>SG01</td>
<td>Roberto Celi</td>
<td>Seats (4, Open: 4, Waitlist: 0)</td>
<td>MW 2:00pm - 3:15pm</td>
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<tr>
<td>SM01</td>
<td>Roberto Celi</td>
<td>Seats (4, Open: 4, Waitlist: 0)</td>
<td>MW 2:00pm - 3:15pm</td>
<td>TBA</td>
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<tr>
<td>TV01</td>
<td>Roberto Celi</td>
<td>Seats (5, Open: 5, Waitlist: 0)</td>
<td>MW 2:00pm - 3:15pm</td>
<td>TBA</td>
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### ENAE684  Computational Fluid Dynamics I

(Perm req)  
**Credits:** 3  
**Grading Method:** Regular, Audit

*Partial differential equations applied to flow modelling, fundamental numerical techniques for the solution of these equations, elliptic, parabolic, and hyperbolic equations, elements of finite difference solutions, explicit and implicit techniques. Applications to fundamental flow problems.*

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<th>Instructor</th>
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<tr>
<td>0101</td>
<td>James Baeder</td>
<td>Seats (35, Open: 35, Waitlist: 0)</td>
<td>TuTh 11:00am - 12:15pm</td>
<td>ITV 1100</td>
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<tr>
<td>ENAE788A</td>
<td>Selected Topics in Aerospace Engineering; Fundamentals of Explosions: Natural, Accidental,</td>
<td>3</td>
<td>Regular, Audit</td>
<td>0101: Elaine Oran</td>
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<td>Seats (Total: 20, Open: 20, Waitlist: 0)</td>
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<td>MW 2:00pm - 3:15pm</td>
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<tr>
<td>ENAE788D</td>
<td>Selected Topics in Aerospace Engineering; Advanced Space Systems Design</td>
<td>3</td>
<td>Regular, Audit</td>
<td>0101: David Akin</td>
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<td>ENAE799</td>
<td>Master's Thesis Research</td>
<td>1-6</td>
<td>Regular</td>
<td>Contact department for information to register for this course.</td>
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<tr>
<td>ENAE898</td>
<td>Pre-Candidacy Research</td>
<td>1-8</td>
<td>Regular</td>
<td>Contact department for information to register for this course.</td>
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<tr>
<td>ENAE899</td>
<td>Doctoral Dissertation Research</td>
<td>6</td>
<td>Regular</td>
<td>Contact department for information to register for this course.</td>
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