

**Instructor: Dudley Smith, Ph.D.**

**Office Number: NH, Rm. 249B**

**Office Telephone Number: 817-272-2896**

**Email Address: [dudleys@uta.edu](mailto:dudleys@uta.edu)**

**Office Hours: MW 12-1:00 PM**

**Section Information: MAE 5363-001**

**Time and Place of Class Meetings: Rm. 402 WH, MWF 10-10:50 AM**

**Description of Course Content:**

AE/ME 5363 & MAE 4301 INTRODUCTION to ROTORCRAFT (3-0)

Introduction to rotorcraft analysis and performance, including the aerodynamics and dynamics of rotors, and the assessment of aircraft drag, basic vehicle performance, stability and control characteristics, evaluation of systems and an introduction to initial air vehicle sizing.

**Student Learning Outcomes:**

With the successful completion of this course, the student shall have basic understanding of how to analyze a classic helicopter, establish its basic performance, understand the importance of its different systems (transmission & drive train, etc.) and predict its performance.

**Course Topics:**

- Basic fluid mechanics review and the Standard Atmosphere
- Historical review of different vertical lift concepts
- The Rotor
  - Introduction to Hover Theory
    - Momentum-Energy
    - Blade Element/Momentum models
    - Vortex-lattice/lifting-surface
    - Prescribed/free wake modeling
  - Autorotation
  - Introduction to Forward Flight Theory
  - Rotor Dynamics in Forward Flight
- Ducted fans and alternate propulsion
- Anti-torque Systems
  - Tail rotors
  - Fenestrans
  - Pneumatic systems
- Air Vehicle Drag
- Air Vehicle Propulsion Systems
- Fundamental Forward Flight Performance
  - HOGE, HIGE and VROC
  - Climb and Glide Performance
  - Range, Endurance And Payload-Range
  - Maneuvering and Flight Envelope
- Static Stability and Control

- Every day “Rules of Thumb”

### **Required Textbooks and Other Course Materials:**

#### Textbook:

- Professors notes

#### References:

- “Aerodynamics of the Helicopter” by Gessow & Myer (provided in PDF by the instructor)
- “Rotary Wing Aerodynamics Vol II” NASA CR (provided in PDF by the instructor)

### **Descriptions of major assignments and examinations:**

#### Exams:

- 10 minute quizzes, general weekly, as required when a topical area is completed
- Comprehensive Final Exam

#### Projects:

- Individual projects will be assigned throughout the semester. Due dates and times will be rigorously enforced.

#### Homework:

- Homework will be assigned throughout the semester. Due dates and times will be rigorously enforced.

**Attendance:** At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students’ academic performance, which includes establishing course-specific policies on attendance. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients “begin attendance in a course.” UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

Attendance will follow university rules. Attendance will be taken at the beginning of each class period.

### **Grading:**

- Final Grade Weighting:
 

Projects and Homework:	33%
10 minute quizzes:	34%
Final Examination: (Comprehensive)	33%
- Grade Allocation: Course grades will be assigned

A (90-100), B (80-89), C (70-79), D (60-69), F (less than 60)

In order to receive a passing grade (“C” for Engineering), the weighted average of the 10 minute exams, projects & homework, and the final examination must be 70 or above.

Grades will be posted in Blackboard in a timely manner. Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels.

### **Homework & Project Policy:**

- Assigned homework and projects are due at the beginning of the class meeting of the due date. The assignment will be graded and returned within two class periods of the due date.

- Due dates and times will be rigorously enforced. Offsite personnel will submit their work online via PDF no later than the beginning of class on the date due.
- **Late assignments will not be accepted.**

#### **Exam Policy:**

- A comprehensive final examination will be given at the conclusion of the course.
- 10 minute quizzes will be given throughout the semester as topics are completed. Generally, these will occur weekly.
- Offsite personnel will receive summary exams in lieu of 10 min quizzes. They will be proctored by selected personnel at the facility and assigned online. This is not available to full time students in general attendance at the main campus.
- There will be **NO** make-up quizzes or final exam. Missed quizzes/exam will receive a grade of zero.
- The instructor must be notified, by any student, at the beginning of the semester, **within the first week of class**, of any **'Special Needs'** exam testing requirements for that student. The student must be registered and approved for special testing allowances. If so, the student is responsible for obtaining and presenting the necessary forms to the instructor in that first week. Additionally, **the student is responsible for coordinating all "special needs testing" with the test center two weeks before each exam.** Per the university procedures, the testing center will contact the instructor and arrange the necessary private test schedule after the student has coordinated with the test center. The student is responsible for obtaining and presenting the necessary forms to the instructor at least a week before the final. (Quizzes do not fall under this activity.)  
**Failure to meet these requirements will negate any "special needs testing".**

#### **Expectations for Out-of-Class Study:**

Beyond the time required to attend each class meeting, students enrolled MAE 5363, a 3-credit hour course, should expect to spend at least an additional 9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc. (The general rule of thumb is for every credit hour earned, a student should expect to spend 3-hours per week working outside of class.)

**Grade Grievances:** Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog. For undergraduate courses, see <http://catalog.uta.edu/academicregulations/grades/#undergraduatetext>; for graduate courses, see <http://catalog.uta.edu/academicregulations/grades/#graduatetext>. For student complaints, see <http://www.uta.edu/deanofstudents/student-complaints/index.php>.

**Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

**Disability Accommodations:** UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA)*, *The Americans with Disabilities Amendments Act (ADAAA)*, and *Section 504 of the Rehabilitation Act*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a **letter certified** by the Office for Students with

Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

**The Office for Students with Disabilities, (OSD)** [www.uta.edu/disability](http://www.uta.edu/disability) or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability).

**Counseling and Psychological Services, (CAPS)** [www.uta.edu/caps/](http://www.uta.edu/caps/) or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

**Non-Discrimination Policy:** *The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit [uta.edu/eos](http://uta.edu/eos).*

**Title IX Policy:** The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit [www.uta.edu/titleIX](http://www.uta.edu/titleIX) or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or [jmhood@uta.edu](mailto:jmhood@uta.edu).*

**Academic Integrity:** Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

*I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

*I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University. Additional information is available at <https://www.uta.edu/conduct/>.

### **Lab Safety Training:**

No lab training is required for this course.

**Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

**Campus Carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

**Student Feedback Survey:** At the end of each term, students enrolled in face-to-face and online classes categorized as “lecture,” “seminar,” or “laboratory” are directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student’s feedback via the SFS database is aggregated with that of other students enrolled in the course. Students’ anonymity will be protected to the extent that the law allows. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit <http://www.uta.edu/sfs>.

**Final Review Week:** for semester-long courses, a period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

**Student Support Services:** [Required for all [undergraduate courses](#)] UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring](#), [major-based learning centers](#), developmental education, [advising and mentoring](#), personal counseling, and [federally funded programs](#). For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to [resources@uta.edu](mailto:resources@uta.edu), or view the information at <http://www.uta.edu/universitycollege/resources/index.php>.

**The IDEAS Center** (2<sup>nd</sup> Floor of Central Library) offers **free** tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. To schedule an appointment with a peer tutor or mentor email [IDEAS@uta.edu](mailto:IDEAS@uta.edu) or call (817) 272-6593.

**Library Home Page** [library.uta.edu](http://library.uta.edu)

## **Resources Students**

### **Academic Help**

Academic Plaza Consultation Services [library.uta.edu/academic-plaza](http://library.uta.edu/academic-plaza)

Ask Us [ask.uta.edu/](http://ask.uta.edu/)

Library Tutorials [library.uta.edu/how-to](http://library.uta.edu/how-to)

Subject and Course Research Guides [libguides.uta.edu](http://libguides.uta.edu)

Subject Librarians [library.uta.edu/subject-librarians](http://library.uta.edu/subject-librarians)

## Resources

A to Z List of Library Databases [libguides.uta.edu/az.php](http://libguides.uta.edu/az.php)

Course Reserves [pulse.uta.edu/vwebv/enterCourseReserve.do](http://pulse.uta.edu/vwebv/enterCourseReserve.do)

FabLab [fablab.uta.edu/](http://fablab.uta.edu/)

Special Collections [library.uta.edu/special-collections](http://library.uta.edu/special-collections)

Study Room Reservations [openroom.uta.edu/](http://openroom.uta.edu/)

## Teaching & Learning Services for Faculty

Copyright Consultation [library-sc@listserv.uta.edu](mailto:library-sc@listserv.uta.edu)

Course Research Guide Development, Andy Herzog [amherzog@uta.edu](mailto:amherzog@uta.edu) or your subject librarian

Data Visualization Instruction, Peace Ossom-Williamson [peace@uta.edu](mailto:peace@uta.edu)

Digital Humanities Instruction, Rafia Mirza [rafia@uta.edu](mailto:rafia@uta.edu)

Graduate Student Research Skills Instruction, Andy Herzog [amherzog@uta.edu](mailto:amherzog@uta.edu) or your subject librarian

Project or Problem-Based Instruction, Gretchen Trkay [gtrkay@uta.edu](mailto:gtrkay@uta.edu)

Undergraduate Research Skills Instruction, Gretchen Trkay [gtrkay@uta.edu](mailto:gtrkay@uta.edu) or your subject librarian.

**The instructors reserve the right to make changes to the course syllabus as necessary. It is the student's responsibility to keep up with changes to the syllabus as posted on the class website.**

**COPYRIGHT**

Copyright 2018 UTA COE as to this syllabus, all lectures, and all materials. Students are prohibited from selling notes taken during this course (or being paid for taking by) any person or commercial firm without the express written permission of the professor teaching this course.

*AE/ME 5363 & MAE 4301 – Introduction to Vertical Lift/Rotorcraft*

Fall Semester 2018

Dudley E. Smith • Room 249B NH • Tel: 817-272-0125 • E-Mail: [dudleys@uta.edu](mailto:dudleys@uta.edu)

---

**Introduction to Vertical Lift/Rotorcraft**

**AE/ME 5363 & MAE 4301**

**3 HOURS CREDIT**

**SPRING 2018**

*SYLLABUS*

By signing this syllabus, the student acknowledges that he/she has read and understood this document.

Print Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Prepared by: Dudley E. Smith

Date: 20 January 2018