WICHITA STATE UNIVERSITY

AE 711, Intermediate Aerodynamics, Fall, 20xx

Instructor:	Linda Kliment
Department:	Department of Aerospace Engineering
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Preferred Method of Contact:	Email
Office Hours:	TBD
Classroom; Days/Time:	TBD
Prerequisites:	AE 424 or ME 521

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. If changes are made to the information in this document, they will be discussed during class.

Academic Honesty

Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm.
In cases of academic dishonesty, penalties are assessed by the instructor and the department chairman at the time that the cases are discovered.

Course Description

Studies potential flow equations of motion, singularity solutions, principle of superposition, conformal mapping, thin airfoil theory, finite wing theory, effects of fluid inertia, three-dimensional singularities, swept wing theory, delta wing theory, introduction to panel methods, and an introduction to automobile aerodynamics.

Definition of a Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes

This course addresses the following outcomes:

- The student will be required to apply knowledge of mathematics, science, and engineering.
- The student will be required to identify, formulate, and solve engineering problems.
- The student will be required to communicate effectively.

Required Texts/Readings Textbook

Instructor's notes
Available for purchase in the AE office, WH 200

Other Readings (Suggested)

- Katz, Joseph and Plotkin, Allen, *Low-Speed Aerodynamics: from wing theory to panel methods,* McGraw-Hill, 1991
- Anderson, John D., *Fundamentals of Aerodynamics,* Fifth Edition, McGraw Hill, 2011
- Kuethe, Arnold and Chow, Chuen-Yen, *Foundations of Aerodynamics*, Fifth Edition, John Wiley and Sons, 1998
- Moran, Jack, *An Introduction to Theoretical and Computational Aerodynamics,* John Wiley and Sons, 1984
- Karamcheti, Krishnamurthy, *Principles of Ideal-Fluid Aerodynamics,* John Wiley and Sons, 1966

Class Protocol

The students are expected to attend class. If a class must be missed for unavoidable circumstances, the student is expected to know what was covered during the class period by obtaining notes from classmates and/or reading the textbook.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the points earned out of a total 600 points possible. In this class, grades are assigned according to the following chart. (Other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Points	**Letter grade**	**Grade Points**	**Interpretation**
560-600	A	4.00	*The A range denotes excellent performance.*
540-559	A-	3.70	
520-539	B+	3.30	
500-519	B	3.00	*The B range denotes good performance.*
480-499	B-	2.70	
460-479	C+	2.30	
440-459	C	2.00	*The C range denotes satisfactory performance.*
420-439	C-	1.70	
400-419	D+	1.30	
380-399	D	1.00	*The D range denotes unsatisfactory performance.*
360-379	D-	0.70	
0-359	F	0.00	*F denotes failing performance.*

Assignments

There will be homework and exams during the fall 2015 semester. Homework is expected to be individually performed. Exams will take part during the class period and will be closed book, closed notes, with an equation sheet provided by the instructor. Homework will be worth 50 total points. There will be three exams, each worth 130 points, for a total of 390 points. Due dates for the homework and exam days will be announced during class. Study problems will be available to help with homework and exam preparation.

There will be one comprehensive final exam at the end of the semester. The final exam will be closed book, closed notes, with an equation sheet provided by the instructor. The final exam will be worth 160 points. The final exam will be held during the allotted time on the final exam schedule.

Undergraduate vs. Graduate Credit (for 700 level courses)

Undergraduate students enrolled in 700 level courses will receive undergraduate credit (not graduate credit) unless they have a previously approved senior rule application or dual/accelerated enrollment form on file in the Graduate School. Undergraduate credit earned in 700 level courses cannot later be counted toward a graduate degree.

Late Assignments

Homework submitted after the due date will receive no credit without prior arrangement.

Missed Assignments and Exams

A makeup exam or final will be given for documented cases. If possible, the student should notify the instructor prior to the exam. Only those documented incidents that are beyond the control of the student, such as serious accidents and illnesses, will be considered as reasons for a makeup.

Important Academic Dates

The last date to drop a class and receive a W (withdrawn) instead of F (failed) is October 27, 2015.

Disabilities

If you have a physical, psychiatric/emotional, or learning disability that may impact on your ability to carry out assigned course work, I encourage you to contact the Office of Disability Services (DS). The office is located in Grace Wilkie Annex, room 150, (316) 978-3309 (voice/tty) (316-854-3032 videophone). DS will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for you. All information and documentation of your disability is confidential and will not be released by DS without your written permission.

Counseling & Testing

The WSU Counseling & Testing Center provides professional counseling services to students, faculty and staff; administers tests and offers test preparation workshops; and presents programs on topics promoting personal and professional growth. Services are low cost and confidential. They are located in room 320 of Grace Wilkie Hall, and their phone number is (316) 978-3440. The Counseling & Testing Center is open on all days that the University is officially open. If you have a mental health emergency during the times that the Counseling & Testing Center is not open, please call COMCARE Crisis Services at (316) 660-7500.

Diversity and Inclusive

Wichita State University is committed to being an inclusive campus that reflects the evolving diversity of society. To further this goal, WSU does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, gender identity, gender expression, marital status, political affiliation, status as a veteran, genetic information or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Executive Director, Office of Equal Employment Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0138; telephone (316) 978-3186.

Intellectual Property

Wichita State University students are subject to Board of Regents and University policies (see http://webs.wichita.edu/inaudit/ch9_10.htm) regarding intellectual property rights. Any questions regarding these rights and any disputes that arise under these policies will be resolved by the President of the University, or the President's designee, and such decision will constitute the final decision.

Shocker Alert System

Get the emergency information you need instantly and effortlessly! With the Shocker Alert System, we will contact you by email the moment there is an emergency or weather alert that affects the campus. Sign up at www.wichita.edu/alert.

Student Health Services

WSU's Student Health clinic is located in 209 Ahlberg Hall. Hours are 8:00 am to 7:00 pm Monday through Thursday and 8:00 am to 5:00 pm on Fridays. The clinic may be closed occasionally on Wednesdays from noon to 1:30 pm. The telephone number is (316) 978-3620. In addition to outpatient and preventive care (including immunizations, a prescription service, and testing/counseling for sexually transmitted infections), Student Health can handle minor injuries. All services are confidential. For more information see www.wichita.edu/studenthealth.

The Heskett Center and Campus Recreation

Whether you are wanting to be active on campus, relieve the stress from classes or take care of your body, Wichita State Campus Recreation is the place for you. Campus Recreation, located inside the Heskett Center, contributes to the health, education, and development of Wichita State University students, faculty, staff, alumni, and community members by offering quality programs and services. With many programs and facilities which are free to all students and members, Campus Recreation offers its members limitless opportunities. For more information about our services see www.wichita.edu/heskett.

Video and Audio Recording

Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

Tentative Schedule for 15 week class

Introduction:

- Review of elementary vector operations
- Euler's equations of motion
- Streamlines and stream function
- Vorticity and circulation
- Velocity potential
- Complex velocity potential
- Integration of Euler's equations and Bernoulli's equation

Elementary Solutions:

- Uniform flow
- Sources, sinks, and doublets
- Superposition of uniform and doublet flows
- Flows with circulation
- Flow around a cylinder with circulation
- Distributed singularities
- First order panel methods
- The Kutta condition

Complex Velocity Potential Functions:

- Review of complex variables
- Complex potential and complex velocity
- Complex form of the elementary solutions
- Flow around a cylinder with and without circulation
- Complex power functions
- Flow through an aperture and flow in a rectangular channel
- Method of images

Thin Airfoil Theory:

- Flat plate
- Mapping of flows
- Circular arc airfoil
- General thin airfoil section
- Flapped airfoil
- Cambered airfoil
- Lumped vortex method

Finite Wing Theory:

- Bound vortex system
- The horseshoe vortex
- Fundamental laws of vortex motion
- Helmholtz's theorem
- Biot and Savart law
- Spanwise loading and trailing vorticity
- Downwash and induced drag
- Elliptic load distribution
- General theory of monoplanes
- General solution of the monoplane equations
- Load distribution for minimum induced drag
- Simplified horseshoe vortex
- Aerodynamic interference

Three-Dimensional Irrotational Flow:

- Velocity potential and stream function
- Continuity equation
- Stoke's stream function for axisymmetric flow
- Elementary solutions
- Superposition of the elementary solutions

Swept and Delta Wings:

- Schrenk's approximation
- Swept wings
- Induced velocity of the general horseshoe vortex
- Example vortex lattice method
- Delta wings