AERO 211-501 - AEROSPACE ENGINEERING MECHANICS  
FALL 2009, 3 CREDITS  
"Scientists discover the world that exists; engineers create the world that never was."  
T. von Kármán

CLASS HOURS:  
TR 02:20PM-03:35PM CE 223, T 09:35AM-10:50AM ZACH 119A
CLASS WEBSITE:  
http://aeweb.tamu.edu/aero211/

INSTRUCTOR:  
Tamás Kalmár-Nagy  
(I am from Hungary. Hence the cute accent and the acute accents.  
Please address me as Dr. Kalmár-Nagy or Prof. Kalmár-Nagy or Dr. T).

CONTACT INFORMATION:  
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kalmarnagy@tamu.edu  
http://aero.tamu.edu/people/kalmarnagy/

TA: Tarek Elgohary, tag2892@aeromail.tamu.edu

OFFICE HOURS:  
(tentative) Tuesdays 3:40-4:40pm (in 743B HRBB). I will try my best to always be available during my office hours. As a faculty member with other teaching, research, proposal-writing and travel commitments, I am juggling many responsibilities and therefore I might not be able to talk with you if you stop by without an appointment. If I miss an office hour due to travel, there will be an extra office hour added later.  
If you can not make it to my office hours, please email me well in advance, and we’ll find time for an appointment. I enjoy teaching and I’d be happy to talk with you about your areas of special interest, help brainstorm topics for your project, etc.

COURSE DESCRIPTION:  
This course is about HOW and WHY bodies move (kinematics and dynamics). We’ll (re)learn the fundamentals of Newtonian mechanics emphasizing the use of vector equations and Free Body Diagrams. This is material that you will use throughout your studies and in your engineering job. I hope you will find this class interesting, exciting, and valuable. Some topics include: Static equilibrium of particles, systems of particles and rigid bodies; Rectilinear and curvilinear motion of particles; Linear and angular momentum; Conservation laws; Plane motion of rigid bodies.

COURSE GOAL:  
To make students proficient in the fundamentals of Newton’s laws and their application to statics and dynamics of particles and rigid bodies, and to prepare them for follow-on courses in Aerospace Engineering. I am committed to make this an engaging and fun class, while maintaining high academic standards. I will do my best to help you succeed in this course, but the ultimate responsibility to LEARN AND PRACTICE the material is on you!

HOW TO SUCCEED IN 211:  
Please do not misunderstand the difficulty of this class. This class is demanding in terms of outside-of-class time. Students are expected to spend as much time as possible to master engineering mechanics by reading, re-reading and understanding relevant book chapters and lecture notes and by completing their assignments. This includes fully understanding “Examples” (you should be able to solve the very same problems the following day or week, without even glancing at the solution!), solving homework assignments in a timely manner (i.e. not right before class). The key to success is to PRACTICE, PRACTICE, PRACTICE!

My personal goal is to see every single student succeed in this class. To accomplish this goal I expect you to work hard on your own, with your classmates and with me.
TEXTBOOKS:
- Statics: Analysis and Design of Systems in Equilibrium
  Sheri D. Sheppard, Benson H. Tongue
- Dynamics: Analysis and Design of Systems in Motion
  Benson H. Tongue, Sheri D. Sheppard

To save money, buy these used. The books will be on reserve in the Evans Library.

COURSE PREREQUISITES: Admission to upper division AERO. Completion of (or concurrent enrollment in) MATH 251 OR 253. Practical knowledge of ETIQUETTE 101.

211 TOPICS (NOT A WEEKLY SCHEDULE!):

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<td>2</td>
<td>Free body diagrams, Newton’s Laws. Forces on rigid bodies. Spring, dashpot.</td>
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<td>4</td>
<td>Equilibrium of rigid bodies (statics). Free body diagrams. Focus on equilibrium in 2-dimensions (one-force, two-force, three-force bodies). Friction.</td>
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<td>7</td>
<td>Point mass kinematics using curvilinear representations. Time derivative of unit vectors. Tangential and normal expression; radial and transverse expressions.</td>
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<td>8</td>
<td>Kinetics of particles undergoing rotational (angular) motion. Angular momentum of a particle.</td>
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QUIZZES:
These will be 15-20 minute closed book exams. In order to be ready for a quiz, you must have read the assigned material, actively participated in class, and have done and understood the homework and the examples in the book.

RE-GRADING POLICY:
You can not contest any grade within the first 24 hours after you received the grade. If, after this waiting period, you still think your homework, quiz, or Exam was unfairly graded, you have 1 week in which to submit your paper to me for re-grading after it has been returned to you. Please include an explanation of what you consider to be relevant information that I should consider. No paper will be re-graded after this ONE-WEEK period.
GRADING POLICY: Standard TAMU grading system.
A>=90%,  80%<=B<90%,  70%<=C<80%,  60%<=D<70%,  F<60%.

Course grade will be based on your assignments, 5 quizzes, a midterm, a final comprehensive exam, and Project score.

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<td>10 HW at 5 pts each*</td>
<td>50 pts</td>
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<tr>
<td>5 Quizzes</td>
<td>5*20 pts</td>
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<tr>
<td>Midterm</td>
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<td>Final examination**</td>
<td>100 pts</td>
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<td>Project (optional)</td>
<td>(25) pts</td>
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<td>Total points</td>
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*After the 15th of September, unstapled HW and HW without the Honor Pledge (see below) will not be graded.
Homework is collected at the beginning of class on the due date.
**A score of 50% or higher is necessary (but not sufficient) to pass the course.

QUIZZES, MIDTERMS AND FINAL EXAM:
The exams will be closed book. There are no scheduled make-up dates for quizzes, exams, and HW (the low score dropping mechanism ensures that your grade is not influenced if you happen to miss a quiz or your pet turtle feasts on your assignment). Quizzes will be given at the beginning of class.

Quiz 1: September 17, Thursday
Quiz 2: October 6, Tuesday
Quiz 3: October 20 Tuesday
Midterm: October 26, Monday 7-9pm (Tentative)
Quiz 4: November 12, Thursday.
Quiz 5: December 1, Tuesday
Final Exam: December 16, Place TBA.

EXTRA CREDIT: Many times throughout the course, I will mention bonus problems in class. The deadline to turn these in is one week after the lecture they were announced. You can also earn extra credit by solving extra homework problems and turning these in with your regular homework. Mark these pages as “Bonus Problem(s)” The pedagogical purpose of giving few extra points is to encourage you to practice 211 material.

GRADING PHILOSOPHY:
The problems in this class and the textbook usually have a unique answer (this is usually not so for open-ended design problems). My grading philosophy is:

1) An engineer obtains a solution to a problem based on physical understanding of the problem and the solution is supported through careful engineering analysis (including clearly stating assumptions),
2) An engineer should always try to have a “gut-feeling” for the solution, i.e., he/she should know when the solution is obviously (or probably) wrong (because of math or other errors),
3) In engineering problems we deal with dimensional quantities (forces, mass, temperature, area, etc.). Thus, a solution is not 3.26 but 3.26 something (something = N, kg, m/s^2, etc.).
   Clear diagrams and units are essential!! No engineering work is correct without proper use (i.e. carrying) of units. Always specify the coordinate systems used.
4) Incorrect solutions may ONLY receive partial credit if it is clear to me that your solution procedure is correct and you have satisfied 1-3 above.
PROJECTS:
The project should be on something that you are interested in and can be related to the course material. **A short (half-page) project title and description is due on September 24th in class.** Team projects are allowed. I will be glad to provide feedback on project proposals through email or in office hours. No project proposal will be accepted after the 24th of September. Project reports and presentations are due on the 8th of December. Project presentations to the class will be on the 5th of December.

ATTENDANCE:
I strongly recommend you to attend all classes and BE ON TIME (being consistently late is a sign of disrespect). If you need to miss a class, I would appreciate if you sent me an email well in advance.

BEHAVIOR IN CLASS:
No laptops, cellphones, texting, iPod-ing. SU-DON’T-KU! Crosswords puzzle me. Please do not sleep in class. If you are so tired that you can’t keep your eyes open, please stay home and rest (propping eyes open with toothpicks has proven to be unhealthy). Your sleeping is disrespectful to the class. Please help to keep our classrooms clean, even if you did not create the mess.

READING ASSIGNMENTS:
You are responsible for reading and studying the text material that has been assigned for a particular lecture. This is your responsibility whether I remind you or not.

TEAMING:
Working on homework together is fine. However, you can NOT just copy assignments from each other. You have to INDEPENDENTLY write up the solution and you MUST unambiguously show the name(s) of the other person(s) you worked with. I may, at my discretion, choose to quiz any class member on current or past assignments. If it becomes obvious that the person being quizzed does not adequately understand what they have affixed their signature to, the grade for that item will automatically be recorded as a zero and you will probably earn an F in the course. (See also Academic Integrity).

HOMEWORK:
There will be roughly one homework assignment per week.
1) Homework is to be turned in at the beginning of the class on the due date. Only one late homework will be accepted.
2) Homework must be complete with all steps shown. You may use computer software (Matlab et al.) but you must describe what you did and show computer output if computer software was utilized.
3) Make sure your work is neat (it reflects on you) and staple the pages together.
4) Your final answer must be easily identifiable (either boxed, highlighted, underlined, separate from other work, etc.) and must appear with appropriate units.
5) **IMPORTANT:** Your name must appear on the top right corner of the first page, together with the following signed Honor Pledge (whichever is appropriate)
   “On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work.”/“On my honor, as an Aggie, I have given or received aid on this academic work from the following people: NAMES. I attest that I wrote up this assignment independently”
6) Not giving credit is considered scholastic dishonesty, and will be grounds for removal from the class. PLEASE TAKE THIS SERIOUSLY, I DO.
ACADEMIC INTEGRITY: “An Aggie does not lie, cheat or steal, or tolerate those who do.” Students should strive to uphold the Honor Code (http://www.tamu.edu/aggiehonor), to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. There is no tolerance for cheating in any form. Remember, if you cheat the system, you cheat yourself, as well.

ACCOMMODATION FOR STUDENTS WITH DISABILITIES:
The Americans with Disabilities Act is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe that you have a disability requiring accommodation, please contact the Department of Student Life, Services for Students with Disabilities, Cain Hall (979-845-1637, http://studentlife.tamu.edu/ssd). Any student needing accommodation due to disability, either in the classroom or during exams should let me know privately during the first week of the semester.

ACCOMMODATION FOR RELIGIOUS OBSERVANCE:
Texas HB256 (9/1/03): “An institution of higher education shall excuse a student from attending classes or other required activities, including examinations, for the observance of a religious holy day, including travel for that purpose. A student whose absence is excused under this subsection may not be penalized for that absence and shall be allowed to take an examination or complete an assignment from which the student is excused.” An effort will be made to accommodate students’ needs for religious observance. Students should contact me during the first week of class in order to make arrangements. Please do not switch between religions during the term.

FEEDBACK:
At any time during the term I will appreciate your constructive feedback to improve the classes (personally or in email). Almost every other week I will give you the opportunity to provide anonymous feedback after quizzes.

QUESTIONS IN CLASS:
I strongly encourage you to ask questions in class to clarify a concept. Framing questions is part of the learning process. If answering would take too much time, I will indicate so, but I will be happy to answer the question after class.

RECOMMENDATION LETTERS:
Please only request a letter after the term. I need at least several months to form an opinion about your intellectual ability and work ethic. The letter will state your class ranking, strengths and weaknesses.
HOW TO SUCCEED IN YOUR ENGINEERING STUDIES

I. USE OF VECTORS: You must be able to do vector algebra and calculus to work mechanics problems. Vectors must be denoted clearly with an underbar (you can also use overbar, though this can be confused with average). Vector equations written using scalar notation are WRONG (e.g. equations which equate vectors to scalars, use scalars where vectors are required, contain division by vectors, indicate vector multiplication without a dot/cross product).

II. CONSISTENCY: Only practice will help you develop good engineering habits. E.g. many people who don't use units and/or correct vector notation on homework say they will do it right on the exam. Right… If you practice it wrong, that is how you will do it on the exam; under pressure you will revert to the habits you have practiced, be they good or bad. The best way is to do it right all of the time.

III. UNITS: In this class, SI units will be emphasized. Always carry units in evaluating an equation. If the units don't match up in various terms of a long equation; this is telling you something: the equation is wrong; you have mixed units that need conversion, or something else.

IV. SLOPPY MATHEMATICS: The mathematics used for mechanics is very well defined. You cannot ignore signs, equations, etc., because they don't agree with what you expect. For example, if you have two scalar equations involving only one unknown you cannot arbitrarily solve on one equation for the unknown and ignore the other equation. If you get inconsistent equations, signs, etc; go back and find the error (assumptions, equations, arithmetic, etc.).

STRATEGIES FOR TAKING AN EXAM

I. Study early and get plenty of sleep the night before the exam: Cramming does NOT work for engineering courses. In these courses, you have to understand and be able to apply basic principles to unknown problems to do well on an exam. You will perform significantly better if you learn the principles early and get a good night's sleep the night before the exam. It is definitely NOT a good idea to try and digest a lot of information in the 3-4 hours just prior to an exam. This often results in your spending time trying to recall what it was that you saw when you see a similar figure accompanying an exam problem. You will be much better off focusing on the problem you have actually been asked to do.

II. Quickly read ALL of the problems and note their point value before you start working on any problem: Answer the problems you judge to be easiest first and the hardest problems last. Do not spend more time on a problem than its point value justifies (unless you have already attempted all of the other problems). If you can do the easier problems quickly you may have extra time for the harder problems. Do not assume that the order in which the problems are presented is also the order of increasing difficulty.

III. Make sure you pace yourself as you work through an exam: The time that you can spend on a particular page of the exam is about the same (in minutes) as the point value of that page. Do not get stuck on one page - move on! You can always come back later if you have time left.

IV. Interpret and check your answers. When you finish any engineering problem you should check your answers to see if they make sense and are dimensionally correct. If you come up with an answer that you know is wrong but you do not have time to find your error, write the grader a short explanation why you think the answer is wrong. For example, if you calculate that the tension in a cable is negative, then something is obviously wrong since you cannot push on a rope. Write "Negative tension impossible. Out of time." on your paper so that the grader at least knows that you realized your answer was physically impossible.

Based on Prof. Haisler’s wisdom distilled from his syllabi for different courses.