

University of Alberta, Faculty of Science  
Department of Physics  
Fall 2016

## EN PH 131: Mechanics

4.3 / 3.0 Credits

Lectures: Tuesdays/Thursdays 11:00 – 12:20 V-Wing 103  
Seminars: Tuesdays 17:00 – 17:50 MEC E4-001/003

**Instructor:** Gregory R. Sivakoff

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(level 2, near western elevators)

**Office Hours:** Wednesdays 10:30 – 11:30

Fridays 9:30 – 10:30

or by appointment

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**Office:** MEC 4-9A

**Office Hours:** Fridays 15:00 – 16:00

or by appointment

*Occasional cancellations of office hours, if any, will be announced on eClass*

**Website:** <https://eclass.srv.ualberta.ca/my/>

Look for “EN PH 131 Fall 2016 - Mechanics” under “My Courses.” The site will contain course announcements, deadlines, class lectures (after the lecture has been given), links to “Mastering Engineering” for assignments, discussion forums, representative evaluative material for exams, etc.

### Calendar Course Description:

★4.3 (*fi* 6) (either term, 3-1s-3/2). Kinematics and dynamics of particles; gravitation; work and energy; linear momentum; angular momentum; systems of particles; introduction to dynamics of rigid bodies. Prerequisites: MATH 100 or 117, and ENGG 130. Corequisite: MATH 101 or 118. Restricted to Engineering students. Other students who take this course will receive ★3.0.

### Real Course Description:

This course covers a range of Engineering Mechanics principles that deal with the accelerated motion of a particle, system of particles, or a rigid body. Attention will be paid to both the geometric aspects of these bodies in motion and the forces that cause this motion. Specific objectives include:

- Understand forces, acceleration, work, energy, impulse, linear momentum, torque, angular momentum, and motion, as well as the interplay between these concepts.
- Evaluate the motion of a particle, system of particles, or a rigid body under a range of physical forces in one, two, or three dimensions.
- Develop and apply a toolbox for solving problems in Engineering Mechanics.

### Course Prerequisites:

Math 100 or Math 117, and ENGG 130. Corequisite: MATH 101 or 118. Students who do not have the required prerequisites at the time of taking this course should not expect supplementary professorial tutoring from the instructor. Prerequisites may be waived with instructor approval: to do so, please obtain a “Waiver of Prerequisite” form and ask the instructor to sign it. Students must have either all prerequisites or a signed waiver to get credit for the course.

### Required Course Textbooks and Equipment:

- “Engineering Mechanics: Dynamics, Fourteenth Edition”, by Hibbeler.
- Lab Manual for PHYS 130 / EN PH 131 by Isaac and Rudzinski.

### Optional Textbooks and Equipment:

- “Mastering Engineering Student Access Kit”.  
The “Mastering Engineering Student Access Kit” was a no-cost addition to the “Engineering Mechanics: Dynamics, Fourteenth Edition” by Hibbeler package in the University Bookstore. If your textbook did not come with a “Mastering Engineering Student Access Kit,” consider purchasing a kit (available at either [www.masteringengineering.com](http://www.masteringengineering.com) or the University Bookstore). Students have the option to access the assignments on the “Mastering Engineering” system for no charge on computers housed in the Cameron library. Students who took EN PH 131 last year and purchased “Engineering Mechanics: Dynamics, Fourteenth Edition” by Hibbeler should e-mail the instructor.
- “Top Hat Lecture” Subscription.  
Interactive lecture questions and student responses will be organized through the “Top Hat” teaching platform. A subscription can be purchased at either the University Bookstore or <https://tophat.com>. Students who wish to participate with a no-cost option should e-mail the instructor.
- “Engineering Mechanics: Statics, Fourteenth Edition” by Hibbeler and Yap.  
Most students should already own an edition of this book from ENGG 130.
- “Fundamentals of Physics, Tenth Edition” by Halliday, Resnick, and Walker.  
Most students should already own this book from PHYS 130.
- “Engineering Mechanics: Dynamics Study Pack, Fourteenth Edition” by Schiavone.  
The “Study Pack” was a no-cost addition to the “Engineering Mechanics: Statics & Dynamics, Fourteenth Edition” package in the University Bookstore.
- Calculator with Faculty of Engineering gold sticker.

### Topics Covered:

The schedule below and likely reading assignments of the textbooks are subject to change. Roughly equivalent sections in the optional textbook are also listed in parentheses. The textbooks are abbreviated as: “Engineering Mechanics: Dynamics” by Hibbeler (EMD; the primary textbook); “Engineering Mechanics: Statics” by Hibbeler and Yap (EMS); and “Fundamentals of Physics” by Halliday, Resnick, and Walker (FoP)

Lectures	Dates	Topic	Reading
1–2	Sep 1, 6	Introductory Material	EMS: 1.1–1.5 (FoP: 1.1–1.3)
2–5	Sep 6, 8, 13 & 15	Kinematics of Rectilinear Motion of a Particle	EMD: 12.1–12.3 (FoP: 2.1–2.6)
6–9	Sep 20, 22, 27, & 29	Kinematics of Planar Motion of a Particle	EMD: 12.4–12.7, 12.9–12.10 (FoP: 4.1–4.7)
10–13	Oct 4, 6, 11, & 13	Dynamics of a Particle and a System of Particles	EMD: 13.1–13.5 (FoP: 5.1–5.3, 6.1–6.3)
14	Oct 18	Midterm	
15–18	Oct 20, 25, 27; Nov 1	Work and Energy	EMD: 14.1–14.6 (FoP: 7.1–7.6, 8.1–8.5)
19–22	Nov 3, 15, 17, & 22	Linear Momentum and Impulse	EMD: 15.1–15.4 (FoP: 7.1–7.6, 8.1–8.5)
23–25	Nov 24 & 29; Dec 1	Rigid Body: Kinematics, Dynamics,	EMD: 16.1–16.4, 17.1–17.5, 18.1 (FoP: 10.1–10.7, 11.1–11.4)
26	Dec 6	Angular Momentum and Impulse	EMD: 15.5–15.7 (FoP: 11.5–11.8)

## Grading:

Class Participation:	5%*	Over the entire term
Seminars:	10%	Approximately every week
Assignments:	15%*	Assigned approximately every week
Labs	15%	Five labs over the term
Midterm Test:	20%	October 18 (Location TBD)
Final Exam:	35%**	December 12, 09:00*** (Location TBD)

\*All students are responsible for all class participation and assignments from Sep 1.

\*\* There is no possibility of a reexamination in this course as the Final Exam weight is < 40%.

\*\*\* Students must verify this date/time on BearTracks when the Final Exam Schedule is posted.

## Grade Assignment:

Grades are assigned by taking the score for each course component and calculating a total course percentage score using the component weights given in the course syllabus. This overall mark is then used to assign course grades. ***Grade boundaries will be decided based on a combination of historical student performances and the instructor's expectations and judgment.*** Where possible natural grade boundaries will be used. The absolute percentage scores to secure a particular grade will vary from year to year because it is not possible to write unique exams with consistently identical difficulty levels. Historically, the median letter grade / mean GPA for this course is a B- / 2.61.

## Ace Clause:

If your Final Exam score is greater than any of the following class components (Class Participation, Assignments, and the Midterm Test), then the Final Exam score will be used in your average instead of that component. This replacement will not be applied to any category where disciplinary actions have been taken. Example: if you miss the Midterm Test and (technically) receive a 0 on it, your Final Exam score will be used in place of the missed midterm when calculating your final average. However, if you cheat on the Midterm Test and are given a reduced disciplinary grade, that disciplinary grade will not be replaced by your Final Exam. ***Important Warning: My Midterm Test and Final Exam scores are typically 20% below the course averages in other components, so do not rely on this clause.***

## Class Participation:

Participation on interactive TopHat questions during class lectures forms the participation grade. Before students answer most questions, they will have a short amount of time to discuss the question with their neighbour. If there is significant disagreement between the class on the submitted response, students may get a second chance to discuss and respond. These questions provide the instructor with instant feedback on whether students understand the concepts, allowing them to adapt their lecture. In addition, the best person to explain a concept is often someone who has just grasped the concept and thus understands the parts of the concept that were hardest to grasp. Although the four individual class participation grades with the lowest percentage marks will be dropped when calculating the contribution to the final grade, students are highly encouraged to attend every lecture.

## Seminars:

Seminars are held weekly, starting September 6, 2016; there will be no session the week of the mid-term. There will be twelve graded seminar sessions where students will be required to solve a number of problems. These problems must be handed in at the end of the seminar for marking. No seminar sheets should be removed from the session, and cell phones, etc. should be turned off. Students are permitted to bring their notes and textbooks. Help during the seminar is available from the teaching assistant. While you will be allowed to work with up to three partners, every student is responsible for handing in their own work. The individual seminar grade with the lowest percentage

mark will be dropped when calculating the contribution to the final grade. *The Ace Clause does not apply to this component.*

#### **Assignments:**

Students will be regularly assigned to read sections or chapters of the book. It is important to do the reading because some topics may only be covered in the book and not in lectures. Topics emphasized in lecture are more likely to be emphasized on exams, but students are responsible for all assigned reading material. Student will also have to complete online assignments (through MasteringEngineering) that have been designed to provide students with feedback on the areas of the course they are having trouble understanding. The questions are intended to give students some feedback if they fall into common misconceptions and may be tried multiple times, with no penalty, until they get it correct. Students are very strongly encouraged to keep trying until they correctly answer the questions, seeking help if required (from peers — within the limitations of the Code of Student Behaviour — or from the instructor during office hours). Do not be afraid to ask for help.

#### **Online Assignment Deadline Policy:**

Assignments will be graded online (students may try questions multiple times with no penalty until they get a question correct) with immediate feedback. Deadlines are strictly enforced by the site, with late assignments earning a zero. Individual extensions will not be made. To mitigate this strong enforcement in the case of incapacitating illness, severe domestic affliction, or religious convictions, the two student's online assignments with the lowest percentage marks will be dropped when calculating the contribution to the final grade. In the case of longer-term issues due to incapacitating illness, severe domestic affliction, or religious convictions, contact the instructor as soon as is possible.

Although online assignments will be assigned approximately once per week, you will typically have about two weeks to complete each online assignment. The final online assignment that covers material from about the last week of classes will not be graded. *Students are highly encouraged to completed the online assignments at a rate of about one per week.*

#### **Online Class Participation & Assignment Disclaimer:**

Online class participation and assignments are components of this course and are provided by third-party companies. Please be aware that these companies will be storing assessment information that may be associated with you. To protect your personal information, you have been assigned an Anonymous ID in BearTracks. You must use this Anonymous ID as part of your username to identify yourself on these systems (if your Anonymous ID is "XXXXXXXXXX", you must use "XXXXXXXXXX@ualberta.ca" as your username). You are not required to provide any additional personal information to these companies. To protect your privacy, you should also use the "Anonymous" for your Last Name and consider creating a University of Alberta alias to your e-mail that corresponds to your Anonymous ID for use on any third-party platform. This ensures that only the Anonymous ID, performance on the on-line homework, and the affiliation to the University of Alberta for this Anonymous ID is conveyed to the company. If you have any concerns about this, please contact the instructor of the course.

Students who wish to opt out of the use of the fee-for-service online interactive system during class lectures (where students pay the fee directly to the third party provider and have unlimited access) have multiple options to complete course participation for no-cost. Students who wish to opt out of the use of the fee-for-service online homework system (where students pay the fee directly to the third party provider and have unlimited access) have the option to access the assignments for no charge on computers housed in Cameron Library. *You must e-mail your instructor if you wish to adopt any of these options.* The instructor notes that the access code to the online homework system was provided at no extra cost with the textbook package available in the University Bookstore.

**Labs:**

There are five laboratory sessions that introduce experimental procedures and report writing. Students must refer to <http://uofa.ualberta.ca/physics/undergraduate-laboratories/schedules> (click on EN PH 131 under the heading Fall 2016) for lab information (e.g., schedule of experiments, location of lab, etc.). ***A mark of at least 50% in the lab component is required to pass the lab. Students must (independently) pass the lab in order to pass the course.*** If a student has taken EN PH 131 in a previous term and has passed the lab portion but failed the course, he/she may apply for a transfer for the lab mark from the previous term. Applications are made in the Physics General Office at the beginning of the term. As the Physics department centrally administers these laboratories, the instructor does not control any aspect of the laboratory experience and does not mark any laboratory report. Details about the grading associated with the laboratory sessions are included in the Physics Laboratory Manual. While you will be allowed to work during the lab session with a partner, every student is responsible for handing in their own work. ***The Ace Clause does not apply to this component.***

**Format for Answering Seminar / Exam Questions:**

Like essays and scientific papers, answering a seminar or exam problem should have an introduction, body, and a conclusion. The introduction should include clearly identifying the variables (both symbols and numerical values) and drawing a labelled diagram whenever possible. The body should include *algebraic manipulation*, with the necessary steps to illustrate that manipulation, until a *single formula* is derived that one can plug numbers into. The penultimate step is plugging in the numbers while keeping track of units, when applicable. Your answer should be clearly boxed; however, this is not the entirety of the conclusion. The conclusion should also include a concise (no more than three sentence) evaluation of whether the answer makes sense, or an acknowledgment that the answer does not make sense. For instance, you should always comment if you got the expected units. For numerical questions, some effort should be made to check if the sign and order of magnitude for the answer is reasonable; in this class this can be done via analogy to known answers or the scale of the problem. While it will not be required for this course, a second option for checking the order of magnitude can be done via illustrating a hand-check on the order of magnitude (i.e., a check made without a calculator). This final stage of checking units, sign and order of magnitude for an answer is crucial because while seminar/exam questions may have known answers, real-world problems rarely do. All of the above steps must be completed to earn full marks on seminar and exam questions.

**Midterm Test:**

There will be an in-class, closed-book test on October 18, 2016 that will be on all the course work covered up to that point. Students will be informed of the room location near the midterm date. Students should bring an allowed (see below) electronic calculator, writing implements, and their student photo I.D. to the test. Formula sheets will be provided and all calculators will be checked during the test.

**Final Exam:**

The final exam will cover the entire course material. Every student is responsible for confirming the final exam time and location with the University exam schedule: it may change and is not under the control of the instructor. Students should bring an allowed (see below) electronic calculator, writing implements, and their student photo I.D. to the test. Formula sheets will be provided and all calculators will be checked during the test.

**Rules for Tests & Exams:**

This class follows the Faculty of Engineering's Calculator policy for non-programmable calculators. ***Only calculators with a Faculty of Engineering gold sticker are allowed in either the midterm test or the final exam.*** Students can purchase calculators at the University Book Store with stickers already affixed to them or can bring calculators purchased elsewhere to the Office of the Dean of the Faculty of Engineering (ETLC E6-050) where the appropriate sticker will be affixed to the calculator. Devices with any remote communication or reception capabilities are explicitly forbidden (e.g., but not limited to iPods, PDAs, pagers, cell phones, and laptops). If in doubt ask before using a device in an exam because ignorance of these rules will not be an acceptable excuse. The instructor will distribute formula sheets during the Midterm Test and Final Exam. Only these formula sheets will be allowed for use during the exam. Using an illegal formula sheet or device on the Midterm test or Final Exam will result in your case being forwarded to the associate dean with a minimum recommendation of 25% penalty of your earned grade on the test/exam. In addition, your formula sheet, illegal device, or exam may be seized.

Your student photo I.D. is required to verify your identity. Students will not be allowed to begin an examination after it has been in progress for 15/30 minutes (for the Midterm/Final). Students must remain in the exam room until at least 15/30 minutes (for the Midterm/Final) has elapsed.

**Midterm Test Deferral Policy:**

If you are absent for the Midterm Test for any reason, your grade will be replaced with your Final Exam score; there is no make up Midterm Test. (See the Ace Clause above.)

**Final Examination Deferral Policy:**

A student who cannot write the final examination because of an incapacitating illness, severe domestic affliction, or other compelling reasons may apply for a deferred final examination. Deferral applications must be made to the student's Faculty office within 48 hours of the missed examination and must be supported by a completed University of Alberta Medical Statement Form or other appropriate documentation (§23.3(2) of the University Calendar). For an excused absence where the cause is religious belief, a student must contact the instructor within two weeks of the start of classes to request accommodation for the term. Deferred examinations are a privilege and not a right; there is no guarantee that a deferred examination will be granted. Misrepresenting facts to gain a deferred examination is a serious breach of the Code of Student Behaviour.

The deferred Final Exam will be held on **Saturday, January 21st from 09:00 a.m. to 12:00 noon in CCIS L1-029.**

**Electronic Communication:**

This course outline will be archived at [www.ualberta.ca/~sivakoff/teaching.html](http://www.ualberta.ca/~sivakoff/teaching.html). Primary online content (e.g., deadlines, class lectures, and important class notifications) will be organized through an eClass Moodle course (available at <https://eclass.srv.ualberta.ca/my/>). The eClass will have a few discussion forums that students may participate in; respectful communications at all times is required. Please note that "individual blogs (under the My Profile section) are viewable by the entire UAlberta Moodle community."

E-mail should be the only electronic communication used if a response on the instructor's part is required. As University classes occur in a professional setting, all e-mails for this class should include a formal salutation and signature and should not include internet slang. E-mail not following this convention will be ignored. The instructor will try to respond to all e-mails within 1 "business" day. Please include "EN PH 131:" and the subject of the e-mail as part of the subject line to help the instructor quickly identify the message (e.g., "EN PH 131: Request for appointment").

**Disclaimer:**

Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this syllabus.

**Recording and/or Distribution of Course Materials:**

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

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## **Student Responsibilities:**

### **Academic Integrity:**

“The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at [www.governance.ualberta.ca](http://www.governance.ualberta.ca)) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.”

All forms of dishonesty are unacceptable at the University. Any offence will be reported to the Associate Dean of Science who will determine the disciplinary action to be taken. Cheating, plagiarism and misrepresentation of facts are serious offences. Anyone who engages in these practices will receive *at minimum* a grade of zero for the assignment, paper or exam in question and no opportunity will be given to replace the grade or redistribute the weights. As well, in the Faculty of Science the sanction for **cheating** on any examination will include a **disciplinary failing grade (NO EXCEPTIONS)** and senior students should expect a period of suspension or expulsion from the University of Alberta.

Students are encouraged to discuss assignments with their classmates, friends, family, etc. If students choose to work together on reading and standard assignments, they must submit their own work for grading whether it be submitted online or offline. Direct copying of another’s work is plagiarism.

### **Cell Phones:**

Silenced cell phones may be used in class to answer with the interactive lecture questions. Cell phones are to be turned off during labs and seminars. Cell phones are not to be brought to the Midterm Test or Final Exam.

### **Students Eligible For Accessibility-Related Accommodations: (students registered with Student Accessibility Services - SAS)**

Eligible students have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with SAS deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for U of A to provide accommodations. Contact SAS ([www.ssds.ualberta.ca](http://www.ssds.ualberta.ca)) for further information.

Please note: Students registered with SAS who will be using accommodations in the classroom or the lab, or who will be writing exams through SAS, are required to provide a “Letter of Accommodation” to the instructor as soon as possible. Students are encouraged to make an appointment with the instructor to discuss any required accommodations, ideally within the first two weeks of class.

### **Academic Support:**

As adults, students are expected to take more responsibility for their own education. If a student needs additional assistance in developing strategies for better time management, study skills or examination skills, keeping up with the material, or adjusting to university learning, then they need to seek help themselves. Sources of help include: the instructor, Isaac Isaac (the Physics Undergraduate Advisor, CCIS 4-185), and the Student Success Centre (2-300 Students’ Union Building).

Policy about course outlines can be found in §23.4(2) of the University Calendar.