This course is intended for non-physics majors and assumes no prerequisites. It's an introduction to a broad range of physics concepts at a beginner's level, selected based on the question: What's the basic science on which the internet is built? It's not an engineering or computer-science course — this course is for you if you want to learn some of the principles governing all your devices and the infrastructure that connects them.

With this motivation, our survey of physics ranges from 17th-century mechanics all the way to present-day quantum physics.

To cover this range, I'll refer to two freely downloadable textbooks for most of the readings.

- Benjamin Crowell, Conceptual physics, available at http://lightandmatter.com/cp/ (a backup copy is also also stored on this Canvas site: cp.pdf)
- Urone & Hinrichs, College Physics, available from OpenStax for free at this link: https://openstax.org/details/books/college-physics (backup copy on Canvas: College_Physics-WEB_2s5sHvR.pdf)
- The first reading will be my own introduction to acceleration and force, available here: Forces.pdf

(I may post additional material, if necessary)

We'll use only selected chapters from these books. There will be no trigonometric functions, only some algebra (mostly proportions). The readings will skip any exercises that go beyond that level of difficulty, and will be guided by the following approximate breakdown of topics:

**Topics**

- Navigation apps, latency: velocity, acceleration
- Accelerometer: Newton's Laws
- Satellite internet: gravity
- SpaceX: rockets, recoil, centripetal force, drag
- Data centers: energy and power
- Circuits: Electricity, charge, drift velocity
- Batteries: voltage, current
- Heating: resistance
- Materials: ionic and metallic bonds
- Data storage: capacitors
- Touchscreens: electric fields
- Loudspeaker: magnetism
- Microphone: induction
• Clocks: harmonic motion
• Cell phone: electromagnetic waves
• LCD screens: polarization
• Backlighting: quantum physics
• Microchips: semiconductors, diodes
• Fiber optics: reflection, refraction, lasers
• Networks: interference, bandwidth

The topics covered in this course are well represented in most introductory physics books; only the path through the material in this course will be guided by how relevant it is to the internet.

**Administrative details**

**Instructor:** Prof. Jens Noeckel (noeckel@uoregon.edu),

**Office hour:** I'll publish weekly posts on the Canvas Discussion board, and will be on the Canvas Chat page live between 1:30 and 2:30 pm every Wednesday. To contact me with issues that you don't want to post publicly, send me a message via email or from the Canvas Inbox. *Don't* use the discussion feature within Panopto's video player to contact me. The system doesn't notify me of new messages posted there.

**Website:** All course materials will be on **Canvas**

**Lectures:** Classes are delivered as video assignments with embedded quizzes on Canvas. The videos are hosted on Panopto, but you have to access them by following the link from the corresponding Canvas assignment. Otherwise your lecture quiz score won't be recorded in the Canvas grade book. Each lecture has to be watched by a **deadline** posted with the assignment.

If you can't finish watching the video in one session, Panopto lets you **bookmark** specific points in the video, and you can resume watching or revisit topics at any time. Each lecture video comes with a list of chapters that you can access by clicking at the bottom of the screen.

**Grading**

Grades for the course will be based on quizzes in the lectures and in separate assignments. **There will be no midterms or final exam** because I don't see an equitable and cheat-proof way of having such exams online. The relative weights will be as follows:

In-lecture quizzes: 10%

Reading quizzes: 50%

Homework quizzes: 40%

I will drop your lowest 3 reading quiz scores and your lowest quantitative quiz score in computing your final grade (missed quizzes count as zero scores).
You're allowed to work together or use external resources to answer any of the quiz questions.

The score for all quizzes is based on the number of correct answers. You don't get points for incorrect answers, but you don't get penalized for them either.

**In-lecture quizzes** will appear at certain times during the lecture video. The deadline for answering the lecture quizzes is posted under "Assignments". You have two attempts to answer each in-lecture question. This is because I will sometimes make you take a guess between two alternatives. So if you get it wrong the first time, it will not hurt your score because you can then re-do the question and pick the other choice.

**Reading quizzes** go along with the reading assignments for each module. They are multiple choice. You have only one attempt to answer the reading quiz questions. This is intended to make you read carefully before answering the questions. The questions are designed to be conceptual and simple, provided that you have read the material.

**Quantitative quizzes** (labelled as "Problem sets" to distinguish them from the other quizzes) will be posted separately on Canvas with their own deadlines. You have two attempts to answer each question on a quantitative quiz.

The quantitative quizzes can be multiple choice or may require numerical calculations. This means you will need a calculator! The quantitative quizzes will also have a link to the Canvas Discussion board where you can ask questions about the assignment.

**Late policy for all quizzes:**

**Canvas will automatically deduct 20% per day for late submissions. I can override this on a case-by-case basis if you have a valid excuse.**

**Pass/fail grading option:** a passing grade requires the equivalent of a C grade on all course work (quizzes, homework, midterms, and final).

**Grading scale:** the nominal grading scale for this course is below. If the final class average is excessively low, I may apply a curve for a higher average final grade. However, you are guaranteed at least the grade listed below based on your final average; you are not competing with others in the class for your grade.

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\begin{align*}
\geq 97 & : A+, \geq 93 & : A, \geq 90 & : A-, \geq 87 & : B+, \geq 83 & : B, \geq 80 & : B-, \geq 77 & : C+, \geq 73 & : C, \geq 70 & : C-, \geq 67 & : D+, \geq 63 & : D, \geq 60 & : D-, < 60 & : F
\end{align*}
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Note that the total score listed in Canvas for the in-lecture quizzes is not always accurate: it doesn't show missing lecture quiz scores as zero points. That seems to be a bug in the system. If you have no missing lecture scores, then your Canvas total does give the correct score.

**Academic Honesty**