Welcome! Let’s discuss energy!

Physics 400 provides an energetic overview of energy science/technology and its complex connections throughout our world. This is an area of great importance! Dependable, clean, affordable energy is vital to the functioning of our modern world. This general education capstone course strives to give you an understanding of energy sources and uses. You will see, from various perspectives, the global-to-local economic, environmental, political, and societal impacts associated with energy. Together, we will examine the critical interface between science/technology and public policy, within an energy context.

Physics 400 is designed to satisfy the following requirements:

- Silver Core Curriculum **Science, Technology & Society** (CO9)
- Silver Core Curriculum **Global Contexts** (CO11)
- Silver Core Curriculum **Integration and Synthesis** (CO13)

Course (catalog) description: Production and use of energy and the effects on society and the environment. (General capstone class designed for students of any major.) Prerequisites: MATH 120 or another Core Curriculum Mathematics course; CH 201; ENG 102; junior or senior standing. 3 units.

Textbook: *Sustainable Energy*, Richard A. Dunlap (Cengage Learning, 2015). In the first two thirds of the semester, we will cover about one chapter every couple of weeks. Then, in the final portion of the semester, we will have student and instructor presentations on topics from the remaining chapters and beyond (see course calendar, below).

**Tip:** Read the assigned sections of the text prior to each class meeting!

You may also enjoy these suggested supplementary sources:


Classes and Tests: Tuesday and Thursday, 2:30–3:45 pm, in Schulich Lecture Hall, Room 3.

Instructor Office Hours: Leifson Physics Rm 210, Tuesdays & Thursdays 3:45–5:00 pm, and by appointment: 784-1363, bbauer@physics.unr.edu.

WebCampus: This course is enhanced with WebCampus online learning. You have an account at https://wcl.unr.edu/. Using a web browser, you can download course materials (including lecture slides), submit homework, take practice exams, and access your grades. In addition, you may post questions and exchange information with other students on the Discussion Board. You can access WebCampus from computers in the library, in computer labs, at home, etc.

Online student teaching evaluation: Toward the end of the semester, an online student teaching evaluation for the class will appear on your WebCampus home page. Completion of this survey will yield a bonus credit of 1% of the semester grade, which will be posted toward the end of Final Exam Week. (The instructor will not receive student comments until the semester is over, but will be informed toward the end of Final Exam Week of which students have completed the survey. He will never see individual survey results, but will be given a composite summary sometime after the semester is over.)

Webcampus gradebook: The gradebook contains all your scores for all course elements. The total number of points you have accumulated is given in "11 Weighted Total". In general, this will not go down, except for corrections or because of cheating. (The 2-digit number at the start of each gradebook entry is just there to control the order of presentation by WebCampus.) Your Accumulated Letter Grade is just based on the total number of points you have accumulated so far (given in "11 Weighted Total"), assuming a denominator of 100. This grade will be “F” until you have scored 50 points. At the end of the semester, it will become your final grade. For information on each gradebook entry, including how it is calculated, please click on the links "Expand Grade Details" (a downward pointing arrow) and "Grading Criteria", under each of the posted grades on WebCampus.

WebCampus Help: A comprehensive set of tutorials is available on the WebCampus site. Please make sure you have a supported browser, with appropriate settings, and that you’re using the latest releases of your browser and of Java. If you have difficulties, please contact the UNR Campus Computing Help Desk by phone (682-5000), via e-mail (help@unr.edu), or in person (at the Knowledge Center).

Course Objectives: Physics 400 is part of the UNR Core Curriculum, with the objective to build upon your previous studies to analyze, quantitatively and in writing, important scientific and social issues affecting the world community. It also integrates the following Core Objectives (COs) of the new Silver Core Curriculum (http://www.unr.edu/provost/curriculum-central/silver-core-general-education-requirements/silver-core-objectives):

✓ CO1: Effective Composition & Communications. Students will be able to effectively compose written, oral, and multimedia texts for a variety of scholarly, professional, and creative purposes.
✓ CO2: Quantitative Reasoning. Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.

✓ CO3: Critical Analysis & Use of Information. Students will be critical consumers of information, able to engage in systematic research processes, frame questions, read critically, and apply observational and experimental approaches to obtain information.

✓ CO9: Science, Technology & Society. Students will be able to connect science and technology to real-world problems by explaining how science relates to problems of societal concern; be able to distinguish between sound and unsound interpretations of scientific information; employ cogent reasoning methods in their own examinations of problems and issues; and understand the applications of science and technology in societal context.

✓ CO11: Global Contexts. Students will apply and evaluate modes of academic inquiry, creative expression, or results of research to problems in historical and contemporary global contexts. Students will articulate connections among local, national, and international contexts and evaluate the ways that historical and contemporary global influences affect their current situations.

✓ CO13: Integration & Synthesis. Students will be able to integrate and synthesize Core knowledge, enabling them to analyze open-ended problems or complex issues.

In particular, Physics 400 aims to satisfy Core Objectives 9, 11, and 13 of the Silver Core Curriculum.

Student Learning Outcomes (SLOs) addressing Silver Core Objectives (COs, above):

As a Core Capstone course, Physics 400 will broadly integrate your prior and current learning and development. Students that successfully complete this course will be able to:

✓ Generate a well-supported argument, based on credible, cited evidence, and then clearly and expressively communicate it to the entire class, orally and in writing, with logically organized viewgraphs and a detailed written report that directly articulate and support a thesis. (CO1 and CO13)

✓ Apply mathematics to analyze a real-world situation, calculating important quantities, and soundly interpreting the results. (CO2, CO9, and CO13)

✓ Find appropriate primary and secondary sources, differentiating and integrating information from books, governments, the popular press, peer-reviewed journals, trade publications, and/or the web. (CO3, CO9, CO11, and CO13)

✓ Employ cogent reasoning methods to examine interdisciplinary issues, evaluating evidence and arguments, and distinguishing between sound and unsound interpretations of scientific information. (CO3, CO9, CO11, and CO13)

✓ Explain science and technology connected to energy issues and associated economic, political, and/or environmental choices, identifying the historical, economic, and/or societal impacts of those choices. (CO9 and CO11)

✓ Demonstrate an understanding of complex global issues surrounding energy acquisition and use, by placing them in a global historical context and identifying, analyzing, and
articulating connections between local, national, and international events and/or perspectives. (CO11)

✓ Analyze complex, open-ended, interdisciplinary questions through research, calculations, and literature review, applying broad knowledge and skills from current and previous coursework to both obtain answers and identify gaps in knowledge. (CO13)

To measure student learning related to these SLOs and report it to the UNR Core Curriculum Board, as required, student results on tests will be statistically aggregated, and student papers and presentations collected, without personally identifiable information.

**Evaluation of Student Performance:** The course components will be weighted in the final grade as follows:

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<th>Component</th>
<th>Weightage</th>
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<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Research Papers, Presentations, Participation</td>
<td>40%</td>
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<tr>
<td>Midterm Exam</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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<td><strong>Total</strong></td>
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Student scores will be rounded up to the nearest percentage (out of 100 points), and the final course grade assigned according to the following table:

- A : 90 and above
- A - : 86-89
- B + : 82-85
- B : 78-81
- B - : 74-77
- C + : 70-73
- C : 66-69
- C - : 62-65
- D + : 58-61
- D : 54-57
- D - : 50-53
- F : 49 and below

The class grade distribution will not be forced onto a Bell curve.

**Homework (20%)**: Practice makes perfect! Homework (HW) problems will be assigned periodically during the semester. Together, they will constitute 20% of the final grade. Most of the homework will be on WebCampus, enabling you to complete problem assignments and receive instant feedback over the Web. Look in the “Homework Problems” WebCampus course area for these assignments. The assignment number is the last two digits of the assignment name (e.g., “HW400_05” is the 5th HW assignment). You have an unlimited number of attempts to answer each problem set assignment, up until 11:59 pm the day of the Final Exam (no extensions!). Unless otherwise indicated in the question text, numerical answers must be within 10% of the correct answer in order to be graded correct.

Homework not assigned through WebCampus will need to be turned at the start of the due-date class. Solutions will be distributed soon after; no credit will be given for assignments turned in after solutions are distributed. The correctness and completeness of your solutions will be worth 90% of the grade on this HW. The other 10% of the grade will be for presentation quality.
Research Papers, Presentations, and Class Participation (40%): Energy is an enormous, rapidly evolving subject! The textbook has been selected to serve as a general guide to the broad range of topics that will be discussed. You are also expected to pay close attention to the media. You will need to scan newspapers, magazines, the internet, etc. for energy-related items and report on them during class. The NY Times, available on campus at Davidson, Fleishman, McKay, and Leifson, is a valuable resource. Send me your email address and I will arrange for you to have free, unlimited, digital access to nytimes.com for the semester!

We will develop and present supplementary content. You will research topics related to energy and society that you think are interesting and important. If there is a question of relevance, please discuss your proposed topic with the instructor in advance. You will then communicate your findings to the class via written paper(s), oral presentation(s), and conceptual quizzes.

Here are some examples of research topics:

- Describe an innovation in energy technology. What are its pros and cons?
- How does India plan to provide electricity to 600 million people?
- Describe different perspectives on the extraction of oil from Canadian tar sands.
- What is controversial about the Keystone XL Pipeline?
- Why has New York banned hydraulic fracturing?
- What impact will international treaties on climate change have?
- What methods of carbon sequestration are being developed?
- When are alternative energy sources likely to overtake fossil fuels?
- What policies are effective in supporting the development of alternative energy sources?
- Can and should we help developing countries utilize renewable energy?
- What role will nuclear power play around the world?
- How has Japan’s perspective on energy changed since the Fukushima disaster?
- Why does France generate 80% of its electricity with nuclear power?
- Assess the French solution to the nuclear waste problem.
- What is the potential for fusion energy?
- Who is building the International Toroidal Experimental Reactor (ITER), and why?
- Discuss a recent breakthrough in solar energy technology.
- How do Africans living without electricity charge their cell phones?
- Where in the world is wind energy most effective?
- Why does Denmark generate 40% of its electricity with wind power?
- Where can hydroelectric power be further developed?
- When should dams be removed?
- Where does tidal energy have significant potential?
- What opposition is there to geothermal energy?
- What has been Brazil's experience using sugarcane ethanol to fuel transportation?
- What is the potential for biofuels made by algae?
- Why does Sweden import trash from other countries in Europe?
- How is the production of cellulosic ethanol developing?
- What advantages do LEED-certified buildings offer?
- Why is California driving its utilities to spend billions of dollars on energy storage?
- Who has the smartest grid, and what are its benefits?
- How can transportation be made more efficient?
- Are electric vehicles economical? What is the current state of battery technology?
Research papers must show evidence of supplemental reading and fact checking, and must properly reference supporting material via detailed footnotes (including full web addresses, when possible) at the bottom of each page. You will need to do original work, and present your own analysis and viewpoints, in your own words. All papers need to be typewritten — handwritten manuscripts will not be accepted.

All presentations need to follow the slide format given in the sample Microsoft PowerPoint file on the Phys 400 WebCampus Course Content page. Each slide should be headed by an action title.

On your presentation day, please load your presentation onto the classroom computer before the start of class. Alternatively, if you email me your presentation before noon, I will upload it for you. After your presentation, your papers and slides will be posted, along with mine, on the Phys 400 WebCampus Course Content page.

The total denominator for this course element is 40 points, with a score of over 100% earned if this score is exceeded, up to a maximum of 110% (44 points out of 40). You can score points through combinations of the following options:

A. **Research Paper and Presentation (28 points):** Report your results to the class with both a written paper (14 points) and an oral presentation (14 points). Your paper should contain 1000 words, a title and abstract, 2 or more figures, 2 or more quantitative statements, and at least one equation and calculation. Your presentation should be 5-7 minutes long, and should contain 3-7 slides, including at least one figure (color graphics are appreciated!) and one quantitative statement. Please see the detailed grading schemes provided below. To schedule your presentation, email me the title of your paper, along with a brief summary of your main thesis and the facts supporting it.

B. **Short Research Paper and Presentation (12 points):** Your short paper (6 points) should contain 500 words, at least one figure, and at least one quantitative statement. Your short presentation (6 points) should be 3-5 minutes long and contain 1-4 slides. Please see the detailed grading schemes provided below. To schedule your presentation, email me the title of your paper, along with a brief summary of your main thesis and facts.

C. **Short Presentation (6 points):** You may make a short presentation (6 points) without an accompanying research paper. It should be 3-5 minutes long and contain 1-4 slides. E-mail me your PowerPoint file and we'll schedule your presentation of that topic for the start of an upcoming class.

D. **Correctly Answer Conceptual Participation Quizzes (0.5 points each):** Students generally can explain concepts to each other one-on-one better than can a professor to an entire class all at once. In addition, the process of discussing a concept deepens one’s understanding of it (“once taught is twice learned”). Such “active” learning during lectures will be promoted with short two-part quizzes. In the first part, students will answer a question or problem on their own. Then in the second half, students will refine their answer after having discussed it in a small group.

E. **Develop and Field a Conceptual Participation Quiz (12 points, with instructor permission):** You can gain practice as an effective teacher by communicating important concepts with Conceptual Participation Quizzes (see D, above). After presenting your
findings to the class by methods A, B, or C (above), you may distribute a Participation Quiz to the class (6 points) and then grade it (6 points). Your quiz should comprise a simple question that illustrates the concept. The question should be clearly written, focus on a single concept, and be neither too easy nor too difficult for the other students. The solution should be less than a half a page long, and be derivable in less than 5 minutes. The answer should be clearly written and indicate the credit breakdown. All Participation Quizzes and their solutions need to be typewritten and follow the format given in the sample Microsoft Word document on the Phys 400 WebCampus content page. Your quiz should be on the first page of your document, while the answer to your quiz question should be on page 2, below a copy of the question. A draft of your quiz is required at least one week before the presentation date. The instructor will grade your draft, and produce the final version for distribution. The instructor will check your grading of the quiz, assign credit to you for this appropriately, and make corrections to the scores as needed. This option will only be available in the first part of the semester. Get the instructor’s permission to take this option.

F. **Discussion Participation (0.5 points each):** To stimulate broad class participation, credit will be awarded to those contributing to certain class discussions, including meritorious responses to questions on the WebCampus Phys 400 Discussion Board. In particular, please report all errors in the syllabus, in the homework, in the text, and in other course materials on the WebCampus Phys 400 Discussion Board or in class. In addition to the instructor’s sincerest gratitude, you will receive a 0.5-point “bug-finder” bonus, if you are the first to communicate the bug. (The instructor will correct, elaborate, improve, or otherwise modify the syllabus and other materials as necessary and feasible, and will announce the changes on the Discussion Board and/or in class.)

In order to accommodate all students in limited class time available, students may only make 2 presentations each. You may choose any combination of options A, B, or C above. Option E will only be available in the first part of the semester, and may only be used once (if available).

**Research Paper Grading Scheme:**

1. Effectiveness of title, abstract, introduction, and thesis statement 10%
2. Establishment of relevance to energy 10%
3. Establishment of relevance to society 10%
4. Information depth, breadth, and accuracy 10%
5. Figures, equations, calculations, and quantitative statements 10%
6. References; substantiation of information and viewpoints 10%
7. Summary and conclusions 10%
8. Organization and literary style 10%
9. Grammar and spelling 10%
10. Adherence to length and format requirements 10%

Total 100%
Presentation Scoring Grading Scheme:

- **Introduction**
  - Was the relevance to energy & society compelling? 10%
  - Were principles & terms explained? 10%

- **Main body**
  - Were points clearly stated & summarized? 10%
  - Were the points well supported? 10%
  - Were the logical connections between the points evident? 10%

- **Conclusion**
  - Was the summary of technical facts clear? 10%
  - Were the implications for energy & society made clear? 10%

- **Presentation**
  - Were the slides instructive, easy to read, and well designed? 10%
  - Was the delivery clear and smooth? 10%
  - Adherence to length and format requirements 10%

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<tr>
<td>Introduction</td>
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To help you maximize your scores, I am happy to provide you with editing suggestions, provided you email me your draft materials **one week before** your presentation date. (The availability and extent of such feedback will depend upon the overall demands on my time.)

**Deadlines and Process for Submission of Research:**

**Tuesday, November 18 is the deadline to submit Research Papers and Presentations.** If student work is accepted by the instructor after this date, it will incur a **grade penalty of 4% subtracted per subsequent day.** (Penalty applied to individual components separately.)

Once you have finalized your essay, submit it into the WebCampus SafeAssign system (the submission links are in the "Submit Research Papers" course area). Click on the link under "SA Report" and **read the SafeAssign report** for your paper (you may have to wait a few minutes for it to be ready). If necessary, modify your paper to avoid plagiarism (see **Academic Honesty** policy, below), and resubmit it.

Let your instructor know, via email (bbauer@physics.unr.edu), that you have submitted a paper. In addition, email him your presentation.

**Early-bird Bonus:** Research presented in class prior to or on this deadline (Nov. 18, week 13) will receive a **grade bonus of 4% added for each week that it is earlier than week 14.** (E.g., a presentation in week 9 will receive a 20% bonus!) If you submit your slides prior to the deadline, I will check they are ready to be presented, and may make suggestions for improvement. If they are ready, I will schedule your presentation for the next available class, and allocate the bonus based on that date (if you do present at that class). Your associated research paper will receive the same bonus, provided you have submitted a draft of it along with your slides and you submit the final version within a few days of your presentation (but no later than the deadline date).
Exams (40%): There will be a Midterm Exam and a Final Exam, each worth 20% of final grade. Consultation of the text and the student’s own notes (but no xeroxed or printed pages, except text e-book pages) will be permitted during exams. Use of calculators is permitted. The highest score obtained, out of the two exams, will be used for your grade on both exams.

Questions presented at the end of each chapter of the textbook provide an effective way to review the material and concepts. All materials presented during class will be available on WebCampus for review.

Excursions: Excursions to one or more energy-related facilities may be scheduled during the semester. Participation will be outside the regular class meeting time and will be optional.

Academic Honesty: You are encouraged to “stand on the shoulders of others” in order to see further, but you must reference their work, give it proper credit, and comment on it to display your knowledge and understanding. Put an author's words in quotation marks to indicate that it is a direct quote. Attach a footnote, containing the reference for the associated citation, to each quotation, specialized fact, or paraphrased thought. Do not submit someone else’s language, ideas, thoughts, or work as your own. Do not copy text and graphics from the internet without proper attribution. Do not help someone plagiarize by letting them use your work in this way.

From the UNR Administrative Manual, section 6501:

Statement on Academic Dishonesty: "Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include canceling a student's enrollment without a grade, giving an F for the course or for the assignment. For more details, see the University of Nevada, Reno General Catalog."

Statement of Disability Services: "Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Thompson Building, Suite 101) as soon as possible to arrange for appropriate accommodations."

Statement on Audio and Video Recording: "Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may be given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded."

Academic Success Services: Your student fees cover usage of the Math Center (784-4433, www.unr.edu/mathcenter), Tutoring Center (784-6801, www.unr.edu/tutoring), and University Writing Center (784-6030, www.unr.edu/writing_center). These centers support your classroom learning.

“Education is what remains when one has forgotten everything he learned in school”¹
-- Albert Einstein

PHYS 400 – Energy: Principles, Sources and Problems
Fall Course Calendar

Week 1 (8/25): Ch 1: Energy Basics. HW01.


Week 3 (9/08): Ch 1: Energy Basics. HW03.


Week 5 (9/22): Ch 2: Past, Present and Future World Energy Use. HW05.

Week 6 (9/29): Ch 3: Fossil Fuel Resources and Use. HW06.

Week 7 (10/06): Ch 3: Fossil Fuel Resources and Use. HW07.

Week 8 (10/13): Ch 4: Environmental Consequences of Fossil Fuel Use. HW08.

Week 9 (10/20): Ch 4: Environmental Consequences of Fossil Fuel Use. HW09.


Week 12 (11/10): Veteran’s Day Tue 11/11. Student and instructor talks on the above topics and beyond, including (Ch 7-21) nuclear fusion, solar energy, wind energy, hydropower, wave energy, tidal energy, geothermal energy, biomass energy, energy conservation, energy storage, electric vehicles, etc.


Week 15: (12/01): Student and instructor talks.