DEGREE/PROGRAM CHANGE
FORM C
Form Number: C1371

Fields marked with * are required

Name of Initiator: Charles Fleddermann **Email:** cbf@unm.edu **Phone Number:** 505 277-5521 **Date:** 12-19-2013

Associated Forms exist? No Initiator's Title Associate Dean: School of Engineering

Faculty Contact Charles Fleddermann Administrative Contact C. Fleddermann

Department SoE Admin Email cbf@unm.edu

Branch Admin Phone 7-1423

Proposed effective term

Semester Fall Year 2015

Course Information

Select Appropriate Program Undergraduate Degree Program

Name of New or Existing Program Core Course ME 217

Select Category UG Core Course Degree Type BS

Select Action New

Exact Title and Requirements as they should appear in the catalog. If there is a change, upload current and proposed requirements.
See current catalog for format within the respective college (upload a doc/pdf file)

☐ **Does this change affect other departmental program/branch campuses? If yes, indicate below.**

Reason(s) for Request (enter text below or upload a doc/pdf file)
See attachment in Form C section on justification, impact, etc. [REGISTRAR'S NOTE: PER DISCUSSION IN UG COMMITTEE, INITIATOR AGREED THAT STUDENTS MAY NOT TAKE BOTH ME 217 AND ENG 200 TO MEET CORE REQUIREMENT. ALSO, A FORM A HAS BEEN SUBMITTED BY ENGINEERING TO AOA GEOG 217 WITH ME 217.

ME 217 Syllabus.pdf

Upload a document that inlcudes justification for the program, impact on long-range planning, detailed budget analysis and faculty workload implications.(upload a doc/pdf file)

ME 217 Syllabus.pdf
ME 217 UNM Core Supplemental Information.pdf

☐ **Are you proposing a new undergraduate degree or new undergraduate certificate? If yes, upload the following documents.**

Upload a two-page Executive Summary authorized by Associate Provost. (upload a doc/pdf file)

Upload memo from Associate Provost authorizing go-ahead to full proposal. (upload a doc/pdf file)

ME 217 Energy, Environment and Society
Fall 2013 Semester

Andrea Mammoli - 436A Mechanical Engineering
Office hours: Tuesday 3:30P to 6:00P

Description

During the past two centuries, social and economic systems in the industrialized world have been transformed by massive use of energy, and are now dependent on its increasing supply. The ease of extraction and use of fossil fuel resources, and to a smaller extent, nuclear resources, has resulted in tremendous advances in science, technology and medicine, but has also caused a range of environmental and social problems, ranging from geopolitical instability to urban pollution and global climate change. Alternative resources, including efficiency improvements and various forms of renewables, also pose their own set of economic, technical, environmental and social challenges. In the next few decades, humanity will need to design and implement a truly sustainable energy infrastructure. The impacts of our choices of energy resource mix and utilization technologies on the environment, the economy and society are tremendous. Designing, adopting and implementing policies that will minimize the adverse impacts of energy conversion and use requires knowledge of the relevant scientific, technological, economic and socio-political issues. This course will provide a comprehensive and integrated approach to energy - its conversion, use, and impacts - and will create the interdisciplinary knowledge base that is essential for making informed decisions about emerging energy-related issues, both on a personal and a societal level.

Note: this course can be used in place of American Studies 182 in the Mechanical Engineering curriculum.

Topics Covered

1. Introduction and motivation
2. Systems tools
3. Economic tools
4. Climate change and climate modeling
5. Fossil fuel resources
6. Stationary combustion systems and the electric power grid
7. Carbon sequestration
8. Nuclear energy systems
9. Solar Resource
10. Photovoltaics
11. Solar thermal
12. Wind energy systems
13. Biomass & biofuels
14. Transportation
15. Options for the future
16. Geoengineering

Grading

Midterm exam (30%)
Final exam (40%)
Homework (30%)

Bibliography

Energy Systems Engineering - Evaluation and Implementation by Francis Vanek, Louis Albright and Largus Angenent. 2nd edition (2012) McGraw Hill **(required textbook**)

Principles of Sustainable Energy by Frank Kreith and Jan Kreider. 1st edition (2011) CRC Press ISBN-10: 1439814074

Sustainable Energy Without the Hot Air by David JC MacKay FRS (2008), UIT Cambridge Ltd, Cambridge, England, ISBN 9780954452933 / 978-1-906860-01-1. (**highly recommended second textbook**, free download available online at www.withouthotair.com)

Energy: Principles, Problems, Alternatives by Joseph Priest. 6th edition (2006), Kendall Hunt Pub Co. ISBN 9780757520716 (suggested textbook).

Sustainable Energy: Choosing Among Options by Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, and Michael W. Golay, (2005) MIT Press, Cambridge, USA, ISBN-10: 0-262-20153-4 ISBN-13: 978-0-262-20153-7.

IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland.

Student Learning Outcomes

1) An understanding of the economics of power generation.

   Assessed using an assigned essay; evaluated using rubric shown below.

2) Knowledge of scientific theory and observations of global warming.
   a. Knowledge of sources of information on global warming.
   b. Knowledge of impact of greenhouse gases on global warming.
   c. Knowledge of future societal impacts of potential solutions to global warming.

   Assessed using an assigned essay; evaluated using rubric shown below.

3) An understanding of individual energy footprint though a personal energy audit.
    a. Familiarity with sources of information on societal impact of individual energy use.
    b. Ability to discuss how engineering solutions to energy problems impacts society.

   Assessed using personal energy audit project; evaluated using rubric below.

4) Knowledge of socio-economic issues related to energy production.

   Assessed using an assigned essay; evaluated using rubric shown below.

5) Knowledge of political issues related to energy production.

   Assessed using an assigned essay; evaluated using rubric shown below.

Note: Course learning outcomes are linked to the program outcomes for the Mechanical Engineering BS program, based upon the ABET program criteria. (ABET is the Accreditation Board for Engineering and Technology which accredits the engineering and computer science programs at UNM.) ME program criteria relevant to this course: 1) An understanding of the impact of engineering solutions in a global, economic, environmental and societal context; and 2) Knowledge of contemporary issues.

Student Learning Outcomes Assessment Rubric

	Poor(1)	**Inadequate (2)**	**Adequate (3)**	**Exemplary (4)**
1) Power generation economics	Cannot identify economic drivers in power generation	Can name economic issues, but cannot link to technology	Can describe basic relationships between technology and economics	Has advanced understanding of impact of technology and economics, can analyze different solutions
2a) Sources of information on global warming	Is not aware of environmental impacts of engineering solutions	Is aware of environmental impacts but cannot identify sources of information	Is aware of impacts and some sources of information	Has detailed knowledge of sources of information for environmental impacts
2b) Impact of GHG emissions	Is not aware of greenhouse effect in atmosphere	Is aware of greenhouse effect but does not understand physical basis	Can describe GH effect causes, relation to energy infrastructure	Knowledge of GHG emission causes, mitigating solutions
2c) Future environmental impacts of engineering solutions	Is not aware of environmental impacts of current engineering solutions	Is aware of current environmental impacts but cannot extrapolate progression	Is aware of current and future impacts of engineering solutions	Is aware of future engineering solutions to ameliorate current environmental impacts, and the societal adjustments required to implement them
3a) Sources of information	Cannot identify any societal impacts	Can identify societal impacts but not sources of information	Can name sources of societal impact knowledge	Can identify and compare sources of information on societal impact
3b) Impacting engineering solutions	Cannot name any engineering solutions that have had an impact on society. May not understand meaning of societal	Can enumerate only one or two impacting engineering solutions	Can enumerate several engineering solutions which have had an impact on society	Can enumerate several engineering solutions that have had an impact on societies and is aware of how impact vary
4) Socio-economic issues	Cannot identify most socio-economic issues	Can identify issues but has no clear understanding of them	Can list and analyze socio-economic issues, e.g. global warming, overpopulation, depletion of natural resources, nuclear waste, etc.	Able to identify and discuss issues, and take and defend a position.
5) Political issues	Is unaware of most political issues	Is aware of few political issues, but does not know politicians' position on issues	Is aware of most political issues and politicians position on these issues	Can identify and discuss political issues at all levels, from local to global

ME 217 Energy, Environment and Society
Fall 2013 Semester

Andrea Mammoli - 436A Mechanical Engineering
Office hours: Tuesday 3:30P to 6:00P

Description

During the past two centuries, social and economic systems in the industrialized world have been transformed by massive use of energy, and are now dependent on its increasing supply. The ease of extraction and use of fossil fuel resources, and to a smaller extent, nuclear resources, has resulted in tremendous advances in science, technology and medicine, but has also caused a range of environmental and social problems, ranging from geopolitical instability to urban pollution and global climate change. Alternative resources, including efficiency improvements and various forms of renewables, also pose their own set of economic, technical, environmental and social challenges. In the next few decades, humanity will need to design and implement a truly sustainable energy infrastructure. The impacts of our choices of energy resource mix and utilization technologies on the environment, the economy and society are tremendous. Designing, adopting and implementing policies that will minimize the adverse impacts of energy conversion and use requires knowledge of the relevant scientific, technological, economic and socio-political issues. This course will provide a comprehensive and integrated approach to energy - its conversion, use, and impacts - and will create the interdisciplinary knowledge base that is essential for making informed decisions about emerging energy-related issues, both on a personal and a societal level.

Note: this course can be used in place of American Studies 182 in the Mechanical Engineering curriculum.

Topics Covered

1. Introduction and motivation
2. Systems tools
3. Economic tools
4. Climate change and climate modeling
5. Fossil fuel resources
6. Stationary combustion systems and the electric power grid
7. Carbon sequestration
8. Nuclear energy systems
9. Solar Resource
10. Photovoltaics
11. Solar thermal
12. Wind energy systems
13. Biomass & biofuels
14. Transportation
15. Options for the future
16. Geoengineering

Grading

Midterm exam (30%)
Final exam (40%)
Homework (30%)

Bibliography

Energy Systems Engineering - Evaluation and Implementation by Francis Vanek, Louis Albright and Largus Angenent. 2nd edition (2012) McGraw Hill **(required textbook**)

Principles of Sustainable Energy by Frank Kreith and Jan Kreider. 1st edition (2011) CRC Press ISBN-10: 1439814074

Sustainable Energy Without the Hot Air by David JC MacKay FRS (2008), UIT Cambridge Ltd, Cambridge, England, ISBN 9780954452933 / 978-1-906860-01-1. (**highly recommended second textbook**, free download available online at www.withouthotair.com)

Energy: Principles, Problems, Alternatives by Joseph Priest. 6th edition (2006), Kendall Hunt Pub Co. ISBN 9780757520716 (suggested textbook).

Sustainable Energy: Choosing Among Options by Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, and Michael W. Golay, (2005) MIT Press, Cambridge, USA, ISBN-10: 0-262-20153-4 ISBN-13: 978-0-262-20153-7.

IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland.

Student Learning Outcomes

1) An understanding of the economics of power generation.

   Assessed using an assigned essay; evaluated using rubric shown below.

2) Knowledge of scientific theory and observations of global warming.
   a. Knowledge of sources of information on global warming.
   b. Knowledge of impact of greenhouse gases on global warming.
   c. Knowledge of future societal impacts of potential solutions to global warming.

   Assessed using an assigned essay; evaluated using rubric shown below.

3) An understanding of individual energy footprint though a personal energy audit.
    a. Familiarity with sources of information on societal impact of individual energy use.
    b. Ability to discuss how engineering solutions to energy problems impacts society.

   Assessed using personal energy audit project; evaluated using rubric below.

4) Knowledge of socio-economic issues related to energy production.

   Assessed using an assigned essay; evaluated using rubric shown below.

5) Knowledge of political issues related to energy production.

   Assessed using an assigned essay; evaluated using rubric shown below.

Note: Course learning outcomes are linked to the program outcomes for the Mechanical Engineering BS program, based upon the ABET program criteria. (ABET is the Accreditation Board for Engineering and Technology which accredits the engineering and computer science programs at UNM.) ME program criteria relevant to this course: 1) An understanding of the impact of engineering solutions in a global, economic, environmental and societal context; and 2) Knowledge of contemporary issues.

Student Learning Outcomes Assessment Rubric

	Poor(1)	**Inadequate (2)**	**Adequate (3)**	**Exemplary (4)**
1) Power generation economics	Cannot identify economic drivers in power generation	Can name economic issues, but cannot link to technology	Can describe basic relationships between technology and economics	Has advanced understanding of impact of technology and economics, can analyze different solutions
2a) Sources of information on global warming	Is not aware of environmental impacts of engineering solutions	Is aware of environmental impacts but cannot identify sources of information	Is aware of impacts and some sources of information	Has detailed knowledge of sources of information for environmental impacts
2b) Impact of GHG emissions	Is not aware of greenhouse effect in atmosphere	Is aware of greenhouse effect but does not understand physical basis	Can describe GH effect causes, relation to energy infrastructure	Knowledge of GHG emission causes, mitigating solutions
2c) Future environmental impacts of engineering solutions	Is not aware of environmental impacts of current engineering solutions	Is aware of current environmental impacts but cannot extrapolate progression	Is aware of current and future impacts of engineering solutions	Is aware of future engineering solutions to ameliorate current environmental impacts, and the societal adjustments required to implement them
3a) Sources of information	Cannot identify any societal impacts	Can identify societal impacts but not sources of information	Can name sources of societal impact knowledge	Can identify and compare sources of information on societal impact
3b) Impacting engineering solutions	Cannot name any engineering solutions that have had an impact on society. May not understand meaning of societal	Can enumerate only one or two impacting engineering solutions	Can enumerate several engineering solutions which have had an impact on society	Can enumerate several engineering solutions that have had an impact on societies and is aware of how impact vary
4) Socio-economic issues	Cannot identify most socio-economic issues	Can identify issues but has no clear understanding of them	Can list and analyze socio-economic issues, e.g. global warming, overpopulation, depletion of natural resources, nuclear waste, etc.	Able to identify and discuss issues, and take and defend a position.
5) Political issues	Is unaware of most political issues	Is aware of few political issues, but does not know politicians' position on issues	Is aware of most political issues and politicians position on these issues	Can identify and discuss political issues at all levels, from local to global

Request to Add ME 217 to UNM Core

UNM core area: Social/Behavioral Sciences

Justification for adding to UNM core: ME 217 is a required course in the mechanical engineering undergraduate curriculum, created as a means for satisfying accreditation requirements in the areas of awareness of the impact of technology and engineering on society. Specifically, ABET (the Accreditation Board for Engineering and Technology) requires two program outcomes related to this: the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context; and, a knowledge of contemporary issues. Currently, ME students who take this course are allowed to use it in place of one of the UNM Social Science core courses. (Transfer students are allowed to use the equivalent of AmSt 182 to replace this course.)

Inclusion of ME 217 in the UNM core will accomplish four goals: 1) ME students only become aware that ME 217 substitutes for the core through advising in the School of Engineering or the ME department. It is not unusual for students to take another Social Science core course not realizing that ME 217 is a substitute allowed by SoE. If ME 217 is part of the UNM core, students will be better able to plan their curriculum and avoid taking unnecessary courses. 2) If ME 217 is part of the core, we will be able to open it up to other engineering or computer science students as a means for satisfying the ABET requirements for those students as well. This will benefit these departments in that it will be clearer to our accreditors how these program outcomes are attained if students take the ME 217 course. 3) Currently there is only one other SoE course in the UNM core, so students not majoring in engineering or computer science do not have the opportunity to take courses taught by engineering faculty. In our technology-driven society, it would be beneficial for students in other disciplines to have access to interactions with faculty from engineering or computer science to obtain a different perspective on technology if they so desire. 4) Students transferring to SoE from other institutions are not aware that ME 217 substitutes for the UNM social science core and often take another social science course before arriving at UNM in its place. Making ME 217 explicitly part of the UNM core would solve this problem. It is also anticipated that some two-year schools in New Mexico that participate in the New Mexico state-wide engineering transfer module would be interested in offering this course as a means to facilitate seamless transfer of students to 4-year engineering programs throughout the state.

Although this course is taught by engineering faculty, the content is such that it can be easily understood by any UNM student. The content is designed to help students understand the impact of technology on society and the environment, and learn how to make decisions regarding technology taking into account societal and political issues. As such, this course would be valuable for any student seeking an understanding of how technology affects our lives and how decisions regarding technology can be made.

Impact on other departments at UNM: The impact on other departments at UNM will be minimal. Currently, ME students already take this course and so do not take their 2nd social science core course in other departments. (ME students currently are required to take Econ 105 as their other social science core course.) If other SoE departments choose to use ME 217 as a means for satisfying the UNM social science core, UNM departments teaching in the social science core will see a modest drop in enrollments in these courses.

Enrollments: ME 217 has been taught for several years, with approximate enrollments of 150 students each year. If this becomes a UNM core course, we would expect the enrollment to increase only modestly to perhaps 200 students per year assuming students from outside engineering become interested in the course.

Budget/Faculty Load: Since this course is already a requirement for the ME curriculum and has been taught for several years, the budget and faculty required to offer the course are already in place. We do not anticipate this changing if ME 217 becomes part of the UNM core.

Student Learning Outcomes: See attached course syllabus.

HED Core Competencies: ME 217 directly addresses two of the NM HED Area IV core competencies: Competency 3 Students will describe ongoing reciprocal interactions among self, society, and the environment; and Competency 4 Students will apply the knowledge base of the social and behavioral sciences to identify, describe, explain, and critically evaluate relevant issues, ethical dilemmas, and arguments.