

ETES 5060/7060

Energy Systems CTL Report

The Energy Systems course is a split level technical content course required for technology education majors. This course integrates several of the major components of conceptualized teaching and learning (CTL) including problem based learning, project based learning, and inquiry learning. A review of the syllabus and affiliated instructional material documents will provide evidence for each of these CTL components.

Problem Based Learning

The structure and nature of this course requires students to develop technical problem solving skills by solving a variety of problems associated with the creation and use of energy. Students are required and encouraged to apply theoretical knowledge to specific laboratory problems that are organized around energy production, measurement, conversion, and application. Problem solving is a central feature of each of the major assignments and all of the laboratory experiments and activities within the course. See the course syllabus for a detailed description of these problem solving assignments.

Project Based Learning

This course requires students to develop several tangible learning projects during the academic term. Each of the laboratory experiments or activities has an associated project connected to it that requires students to create a physical artifact (e.g., Metric 500 R&D – compressed air car, solid fuel rocket to carry a predesigned payload, solar powered oven for cooking food) or conduct a research activity in the lab (e.g., measuring power from motors, calculating efficiency in energy conversion, disassembling and reassembling an internal combustion engine). The terminal project/presentation requires students to develop and present an energy related educational demonstration device that they can use in their future or current classroom. This project serves as both an initial learning experience as well as a practical tool for future educational use. Projects created in past classes have included: working model of a hydroelectric dam, windmill, solar powered vehicles, geothermal experiments, electrical circuit display, cut-away internal combustion engine, pipelines demonstration, nuclear power model, alternative energy development demonstration. See the syllabus for a more detailed description of these project based learning assignments.

Inquiry Based Learning

As part of the energy systems course, students are encouraged to seek a variety of authoritative sources to solve the given problems. Sources such as technical manuals, resource books and journal publications, web-based data and information, as well as expert testimony from technical professionals are the primary sources for students to determine appropriate solutions to the given problems they are addressing. Students are required to submit documented evidence of the technical data they have used in solving their problems.

Energy Systems

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Course Description: This course introduces concepts and applications of energy systems, including their present and future applications, as well as advantages and disadvantages of the technical, economic, and environmental aspects of each system. Alternative energy systems will be addressed: wind, water, solar, photovoltaic, energy conservation and bio-fuels will be the primary focus. Special attention will be given to appropriate technology in power production.

Course Objectives: At the completion of this course, students should be able to:

1. Identify the various energy sources that provide useful power
2. Differentiate between various methods of controlling energy
3. Compare and contrast energy sources based on the four major classifications of energy
4. Research and develop a paper on the effects and/or sources of energy in our society
5. Compare methods of measuring energy and power
6. Identify and experiment with control devices involved in the transmission of power
7. Develop and construct a terminal project used for teaching energy and power systems using student developed materials
8. Define terminology associated with power and energy systems
9. Identify the device parts that make up the various power systems that are addressed in the course
10. Have knowledge of and apply safety precautions as they relate to the various power systems that are addressed in the course

Textbook:
Power Surge by Flavin, C. & Lensen, N. (1994) Worldwatch Institute & W. W. Norton & Co., New York
Energy Technology: Sources of Power by Schwaller & Gilberti (1996) Thompson Learning Tools, Cincinnati, OH

Major Course Assignments

Energy Sources Alternatives

In this requirement you will have three (3) options that you may choose from. Select any one (1) of the options below to fulfill this assignment.

1. Develop a short research paper (6-8 pages, typed & double spaced) depicting and describing the source and effect of a particular power/energy source. This paper is to contain information relating to the history, development, and uses of a power source; it should also include how the power source has impacted on our society (both positive and negative perspectives). Your paper should be well documented (use more than 3 reference sources) and include your reference list at the conclusion of the paper. *APA* style format is required for this assignment (APA Manual may be purchased in any reputable book store). Your paper will be evaluated based on its readability, completeness, and references.
2. Develop a book report based from a biography or autobiography of one of the worlds great technological inventors, scientists, engineers of energy systems (e.g., Nikola Tesla, Thomas Edison, Rudolf Diesel, Felix Wankel, George Westinghouse, etc.). The book report should summarize the contribution(s) that the individual(s) has made in the area of energy technology. The book report should be no less than 7 pages in length. *APA* style format is required for this assignment (APA Manual may be purchased in any reputable book store).
3. Join and actively participate in UGA-TECA (Technology Education Collegiate Association) and GITEA (Georgia Industrial Technology Education Association). Both of these professional associations represent technology education at their respective levels. The cost is minimal and participation is well within the limits of most college students. Request application materials from the instructor for further information.

This assignment is worth 5% of your grade.

Electronics Module

Conduct all activities associated with the ScanTech2000 Electronics Module. This will include all student work as prescribed in the module documentation. All assignments will need to be completed using appropriate documentation (i.e., electronic or paper & pencil). In addition, develop a critical analysis of the module (3-5 page paper) describing its strengths and weaknesses as well as your recommendation for ways the module could be improved to better serve a technology education program. **Caution:** There is only one electronics module in the class therefore, students will need to share time on the module to allow everyone adequate time to complete this assignment. A weekly sign up sheet will be available during each class meeting.

This assignment is worth 15% of your grade.

CTL – Problem Based Learning, Project Based Learning, Inquiry Learning

Terminal Project/Presentation

Develop a project that can be used to demonstrate, relate, teach, or stimulate learning in energy & power systems. The project should consist of both hardware and software. The following criteria should be addressed in your terminal project.

- A. Be prepared to demonstrate your project using the hardware and software you developed. Hardware would be considered the actual project while software would be handout materials, slides, charts, videos, overhead transparencies, audio tapes, bulletin boards, etc.
- B. Prepare a 2-4 page written overview of the terminal project explaining the project, its importance in power & energy systems, and how it will be used in your classroom. The overview should include the following:

1. Description of the project; what principle you are going to prove or teach; how it will work and how you will use it your classroom.
 2. Specific information about the project including descriptions, technical drawings, materials used, and costs.
 3. Specific software that you intend to use to explain or enhance your project.
- C. The terminal project must be constructed in such a manner as to be used or operated by anyone. It must implement sound construction practices, it must be clean and neat, and it must be accurate and saveable.

Examples/Suggestions for Terminal Projects:

Hydroelectric Dam Working Model
 Windmill
 Solar Powered Vehicles
 Geothermal Experiments
 Greenhouse Effect
 Electrical Circuit Display
 Cut-Away Engine (jet, rocket, rotary, reciprocating)
 Pipelines
 Fossil Fuel Production
 Nuclear Energy
 Alternative Energy Development
 Aerodynamics Testing Device

This assignment is worth 20% of your grade.

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Laboratory Experimentation/Activities:

During the course of the term you will be conducting 6 laboratory experiments/activities. Each experiment/activity will be accomplished via in-class work and out-of-class work. Some experiments/activities will incorporate either small team efforts or be accomplished individually. Specific instructions/explanations will be provided for each experiment/activity. The following is a list of the experiments/ activities and their due dates.

<u>ACTIVITIES/EXPERIMENTS</u>	<u>DUE DATE</u>
Metric 500 R&D Activity	1/30
Power from Air Motors Experiment	2/6
Efficiency from Motors and Generators Experiment	2/20
Rocketry Activity	3/13
Internal Combustion Engine Activity	3/27
Solar Power – Appropriate Technology Experiment	4/17

Each experiment/activity will be worth 5% and will have a cumulative effect accounting for 30% of your grade.

Final Examination:

A final exam will be administered approximately at the end of the semester and will cover text readings and class lectures and discussions from the beginning of the term to the date of the test. The examination will be a combination of objective and subjective questions.

This assignment is worth 30% of the course.

Graduate Student Supplemental:

Each graduate student will be responsible for leading the class discussion during a specified class period. This discussion will include a complete development of the topic assigned for the specific date. Graduate students are required to read, research, and design a well developed lesson plan which will include hand-outs, overheads (preferably electronic presentations – PowerPoint, Harvard Graphics, Freelance, etc.), as well as class lecture/discussion. Specific topical areas will be based on established course outline and will be available on a first-come basis. Evaluation will be based on the level of comprehensiveness, logical presentation, and innovation/interest generation.

This assignment is worth 10% of your grade and will be added to the standard curriculum assignments.

Grades

GRADE	PERCENTAGE %
A	90-100
B	80-89
C	70-79
D	60-69
F	0-59

This scale will be used objectively in assigning grades. There is no grading curve in this course. For example, a student with a final percentage of 89.9% will receive a "B" regardless of how "close" it may be to an "A." You are responsible to give yourself whatever "safety zone" you feel is necessary to attain your targeted grade.

Lab Fees:

Lab fee for this class will be \$20.00, make checks payable to: University of Georgia. Payment is to be given to instructor and made no later than the third class meeting.

Attendance/Participation:

Attendance is crucial especially considering the density of facts, concepts, principles, and procedures covered in each class. Missing even one class could set you seriously behind. Realize that if you are absent, even for valid reasons, you are responsible for the material and assignments discussed in each and every class. In addition, I expect each participant to take an active role by contributing and sharing thoughts and ideas, taking initiative, and seeking to help other members of the class. Each participant is expected to remain open to new ideas and different points of view.

Attendance records will be recorded at the beginning and at the conclusion of each class meeting. *Your grade in this class will be dropped 3% points for the first unexcused absence and you will be removed from the class role after two (2) unexcused absences. In addition, tardiness will result in a 3% point reduction in grade if more than two (2) unexcused tardy attendances occur.*

Late Assignments:

I expect assignments to be completed on time. My standard policy regarding assignments is 10% penalty for late assignments turned in within 1 week of due date and 50% penalty for assignments turned in thereafter until the end of the course (defined as the last regular class session). I use this system even in the event of "excusables," such as minor sicknesses or other unforeseen conflicts. However, any exceptions to this policy are made at my discretion.

Honesty:

Cheating on class assignments, examinations, or other serious forms of academic activities will result in a grade of an "F" (and a required report to University officials). Persons "borrowing" someone else's work on an assignment will receive a zero on that assignment if it is the first offense. A second offense will be considered a serious form of academic dishonesty. (Borrowee is equally subject to penalties.)

Drop Policy:

Drop policy is as described in the university catalog, page 45.