New Program Request Form

CA1

General Information

Institution Submitting Proposal	Colby Community College
Name and Title of Contact Person	Paula Davis, Vice President of Academic Affairs
Title of Proposed Program	Sustainable/Renewable Energy
Proposed Suggested CIP Code	14.9999
Degree/Certificate Program Description	Associate of Applied Science Certificate 1: Sustainable/Renewable Energy Certificate 2: Small Wind Technology
Number of Credits for the degree and/or certificate	66 Credit Hours (AAS) 37 Credit Hours (Certificate 1) 37 Credit Hours(Certificate 2)
Academic Unit	Applied Technologies
Proposed Date of Initiation	August 2010
Specialty Accrediting Agency	NA
Location(s) of Program	Colby, Kansas
Summary of Demand for the Program (including source of data)	Predictions on the expansion of demand for alternative energy sources, predictions of the expansion of these sources in northwest Kansas, and the plentiful supply of wind, sun, and crops in northwest Kansas, has created this urgency. CCC also conducted a feasibility study to determine the number of potential traditional students in the CCC service area. CCC developed a questionnaire that was distributed to ninth through twelfth grade students. Based on the input from 14 schools, 225 students are interested in the program. Non-traditional students will come from northwest Kansas and surrounding border states where industry is already developing.
Listing of other similar programs in state/region (including enrollments and capacity)	No other similar program is located within 100 miles and the target population would be unable to travel farther to attend school. Colby Community College will be the test

	site for small wind development and is in the hot zone for wind, has plentiful sun, and existing geothermal and bio-fuel projects in the area. With the planned transmission line expansion, planned projects, and the test site, CCC will need to provide training as infrastructures are developed, adopted, and implemented to meet the shortage in workforce to implement and support the projects. The challenge for academic institutions will be preparing workforce to meet the demands.
Date Institution entered into Program Inventory	04/13/10

Signature of College Official_____ Date

Signature of KBOR Official_____ Date

Program Description

- **Catalog description:**
  This program is divided into the following two one-year certificate categories from which the student may choose; Sustainable/Renewable Energy or Small Wind Technology and includes additional completion of a 12 credit hour track (Wind, Solar Photovoltaic, Solar Thermal, Geothermal, Bio-Fuel) to work toward the AAS. The curriculum provides specific skill sets along with business and general education needed in the field. Students will be prepared to work with diversity of Alternative Energy sectors and need a variety of courses to improve their skills in the working field

  To complete the AAS, students must complete either the Sustainable/Renewable Energy or Small Wind Technology Certificate (37 hours), including an additional technical track (12 credit hours) and 17 hours of General Education Courses.

  See Appendix A(flow chart)

- **Admission requirements and the graduation requirements:**
  Admission Requirements are the same for this program as other CCC programs. Students entering the AAS will use the same guidelines as those entering other programs. All students are required to take the Compass Test and advised accordingly based on scores. Advisory Committee members have told us that continued professional development and study are required for employees to stay current with the changing technology. Therefore, the ability to read and comprehend is essential, and writing and math skills are often used on the job. Admission and graduation Requirements are included in the Catalog Description.

- **Specific objectives for the proposed program:**

  - To train employees to meet the anticipated need for workers in the Sustainable/Renewable Energy Fields.
  - To provide the foundation for future learning and certifications to assure quality to employers in the field.
  - To provide specific training to prepare students for a variety of jobs in the field and for future education
  - The student will learn and demonstrate the principles of energy efficient and energy design analysis and construction. Students will analyze energy systems and learn the principles and skills to develop systems and manage them.
  - To prepare students to be knowledgeable and proficient in all aspects of design, construction, analysis, and certification testing of small wind turbines.
  - To gain a comprehensive understanding of the mechanical, electrical, and theory behind energy.
  - To gain the ability to advise on energy projects, manage projects, and consult with sustainable/renewable companies and construction planners and developers.

CCC uses the NABCEP to help guide the college in competencies and based on tracks selected students will gain competencies in:

- Small Wind
    1. Conducting a Wind Energy Site Assessment
    2. Working Safely with Small Wind Energy Systems
    3. Selecting a Final System Design
    4. Adapting the Mechanical Design
    5. Adapting the Electrical Design
    6. Installing Subsystems and Components at the Site
    7. Performing a System Checkout and Inspection
    8. Maintaining and Troubleshooting
- Solar Photovoltaic
    1. How to work safely with PV Systems
    2. Conduct a site assessment
    3. Select a system design
    4. Adapt the mechanical design
    5. Adapt the electrical design
    6. Install subsystems and components at the site
    7. Perform a system checkout and inspection
    8. Maintain and troubleshoot a system
    9. Project management of projects
    10. Understanding of off-grid and grid-tied PV system design
    11. Organizational, team, and leadership skills
- Solar Thermal
    1. Site assessment as it pertains to system performance
    2. Photovoltaic cell and module characteristics as they apply to design and performance of integrated systems
    3. Calculating system characteristics, such as wire sizes to minimize power losses and maximize energy production
    4. Wiring methods and technologies
    5. Mounting techniques and technologies
    6. Maintenance, diagnostic and troubleshooting techniques
    7. Customer education practices
    8. Project management of projects
    9. Organizational, team, and leadership skills
- Geothermal
    1. Adjust power production systems to meet load and distribution demands.
    2. Apply coatings or operate systems to mitigate corrosion of geothermal plant equipment or structures.
    3. Backfill piping trenches to protect pipes from damage.
    4. Calculate heat loss and heat gain factors for residential properties to determine heating and cooling required by installed geothermal systems.
    5. Collect and record data associated with operating geothermal power plants or well fields.

6. Design and lay out geothermal heat systems according to property characteristics, heating and cooling requirements, piping and equipment requirements, applicable regulations, or other factors.
7. Determine the type of geothermal loop system most suitable to a specific property and its heating and cooling needs.
8. Determine whether emergency or auxiliary systems will be needed to keep properties heated or cooled in extreme weather conditions.
9. Dig trenches for system piping to appropriate depths and lay piping in trenches.
10. Identify and correct malfunctions of geothermal plant equipment, electrical systems, instrumentation, or controls.
11. Identify equipment options, such as compressors, and make appropriate selections.
12. Install and maintain geothermal plant electrical protection equipment.
13. Install and maintain geothermal system instrumentation or controls.
14. Install, maintain, or repair ground or water source-coupled heat pumps to heat and cool residential or commercial building air or water.
15. Integrate hot water heater systems with geothermal heat exchange systems.
16. Maintain electrical switchgear, process controls, transmitters, gauges, and control equipment in accordance with geothermal plant procedures.
17. Maintain, calibrate, or repair plant instrumentation, control, and electronic devices in geothermal plants.
18. Monitor and adjust operations of geothermal power plant equipment or systems.
19. Operate equipment such as excavators, backhoes, rock hammers, trench compactors, pavement saws, grout mixers or pumps, geothermal loop reels, and coil tubing units (CTU).
20. Perform pre- and post-installation pressure, flow, and related tests of vertical and horizontal geothermal loop piping.
21. Place geothermal system pipes in bodies of water, weighting them to allow them to sink into position.
22. Prepare and maintain logs, reports, or other documentation of work performed.
23. Prepare newly installed geothermal heat systems for operation by flushing, purging, or other actions.
24. Test water sources for factors such as flow volume and contaminant presence.
25. Verify that piping placed in bodies of water is situated to prevent damage to aquaculture and away from potential sources of harm, such as boat anchors.

26. Weld piping, such as high density polyethylene (HDPE) piping, using techniques such as butt, socket, side-wall, and electro-fusion welding.

- Biofuel
    1. Assess the quality of biofuels additives for reprocessing.
    2. Calculate, measure, load, or mix refined feedstock used in biofuels production.
    3. Calibrate liquid flow devices and meters including fuel, chemical, and water meters.
    4. Clean biofuels processing work area, ensuring compliance with safety regulations.
    5. Collect biofuels samples and perform routine laboratory tests or analyses to assess biofuels quality.
    6. Coordinate raw product sourcing or collection.
    7. Inspect biofuels plant or processing equipment regularly, recording or reporting damage and mechanical problems.
    8. Measure and monitor raw biofuels feedstock.
    9. Monitor and record biofuels processing data.
    10. Monitor and record flow meter performance.
    11. Monitor batch, continuous flow, or hybrid biofuels production processes.
    12. Monitor stored biofuels products or secondary by-products until reused or transferred to users.
    13. Operate chemical processing equipment for the production of biofuels.
    14. Operate equipment, such as a centrifuge, to extract biofuels products and secondary by-products or reusable fractions.
    15. Operate valves, pumps, engines, or generators to control and adjust biofuels production.
    16. Perform routine maintenance on mechanical, electrical, or electronic equipment or instruments used in the processing of biofuels.
    17. Preprocess feedstock in preparation for physical, chemical, or biological fuel production processes.
    18. Process refined feedstock with additives in fermentation or reaction process vessels.
    19. Rebuild, repair, or replace biofuels processing equipment components.

- **Program linkage to mission:**
  Programs that prepare our stakeholders for jobs meet Colby Community College's mission to “provide effective tools to advance learning opportunities that fulfill the educational goals of all students, while supporting lifelong learning experiences to meet the needs of the communities it serves.” And by statute, one of the primary purposes of a community college to provide technical education. Colby Community College takes this role seriously and believes it is the college's responsibility to be proactive in meeting those needs.

Colby Community College is strategically located on Interstate 70, three hours east of Denver. We are 50 miles from the Colorado border, placing us in the middle of the "wind corridor" extending from Texas to Minnesota, high rate of sun for solar power, and crop production for other forms of energy. CCC's northwest area of Kansas is a renewable energy harvest area, resulting in the opportunities to provide new opportunities for employment to Kansas residents. Our proximity to Colorado provides us with a ready pool of potential students as Colorado races forward to lead the country in renewable energy development.

The programming will offer different entry and exit points. This will allow a student to accelerate training. Individuals who only need a brush-up on a component, such as those with previous mechanical training, may test out of that portion. This will accommodate the diverse population anticipated.

Demand for the Program

- **Student Demand for Program and Method Used:**
  Colby Community College (CCC), over the past two years, has been researching and preparing to meet the demand of industry predicted to happen in our service area. PBS ran a series on the Wind Corridor and the hot zones that predicted tremendous growth in northwest Kansas. Colorado and Texas have not been able to keep up with the demand for workers in these fields. Northwest Kansas is the ideal location for wind, solar, geothermal, and biofuels. CCC will serve all of northwest Kansas and surrounding states to help meet the demand for workers in these fields. CCC also conducted a survey of the college's service area and the results indicate that students in 9th through 12th grades are interested in this field. Out of the first fourteen surveyed, a total of 225 students were interested in this field. This is a clear indication that there is demand for this coursework.

  Bureau of Labor Statistics (www.bls.gov/oco/cg/cgs018.htm, 2010-11 Edition) states the following significant points in regard to utility opportunities:
  - Baby-boomer retirements will lead to excellent opportunities for qualified entrants.
  - Persons with college training or advanced technical education will have the best opportunities.
  - Skills development in one segment of the industry may be transferable to other segments because the utility industry consists of many different companies and products.
  - Earnings for production workers are significantly higher than in most other industries

  They also state that all utilities continue to be affected by the anticipated baby boom retirements, which are expected to dramatically reduce the supply of domestic utility workers. As a result, the utility industry is teaming up with universities, community colleges, and trade schools to train new workers and prepare the utility workforce of the future.

Professional and managerial occupations in this area plan, organize, direct, and coordinate company activities. They often are responsible for maintaining negotiations with government regulators, labor organizations and suppliers.

Based on IREC (August 2008), renewable energy generates more jobs than the fossel fuel-based energy sector per unit of energy developed. Worldwatch Institute's July 2008 report, **Jobs in Renewable Energy Expanding** by Michael Renner states that "Renewables tend to be a more labor-intensive energy source than the still-dominant fossel fuels, which rely on expensive pieces of production equipment. A transition toward renewable thus promises job gains.

CCC's program is designed to give students many exit points to provide for production and skilled workers as well as managerial skills. Students may gain entry level skills through certification, management skills through the AAS.

- **Identify employer demand/labor market need, employment trends and projections (existing and anticipated openings), and estimated starting wages. Provide sources of data.**

  According to American Wind Energy Association, western Kansas is rich in resources including wind, solar, and bio-power. A primary initiative for the American Wind Energy Association is the Super Highways to transport energy. One of these is projected to run through western Kansas. Also, according to NWREC's latest publication (March 2010), a transmission line has been proposed and will stretch from Topeka into Colorado (referred to as the 'Green Mile'). This will open up northwest Kansas to develop its sustainable/renewable energy sources and export it through the grid. It is predicted that when this occurs, the growth in development of these projects and the need for workers to support them will increase quickly.

  Tom Stundza, Purchasing.com, said that wind power installation is centered in the top 10 "windiest states" of Texas, Kansas, Montana, Nebraska, South Dakota, North Dakota, Iowa, Wyoming, Oklahoma and New Mexico--although offshore developments could boost wind power generations off such other states as Massachusetts, Oregon and California. It is projected that 10,000 MW of new wind power will be added in 2010 to the 10,000 new created in 2009.

  Colby Community College serves the 14 northwest counties and will need to provide the necessary training for these needs. And, while the economic downturn has stunted job growth, as a result of baby-boomers retiring, jobs in the field will grow. CCC presently has in its service area a geothermal plant, one wind farm, and as many as 15-20 planned projects in wind alone. Colby also has an increasing demand for managers who have an understanding of sustainable/renewable applications and who can guide construction and offer their expertise in cost/benefit comparisons. In an area that has yet to develop many projects in energy, it will definitely lead the demand for trained employees. Predictions from national sources as well as in-state sources are that once the transmission line is in place, the number of projects and the demand for workers will grow quickly. This program will prepare the college to meet this demand and will focus on training of

sustainable/renewable energy employees with technical and project management skills to meet the demands of industry.

- **Local Community and Support:**
  The community is very supportive of this initiative, as is indicated through the attached letters of support (See Appendix C). And, the Chamber of Commerce has conducted meetings to discuss the need to prepare for the expansion of energy into the area.

- **Business and Industry Partnerships:**
  CCC received a Perkins Innovative Grant earlier this year to begin developing energy coursework. This resulted in partnering with John Deere, Woofer Pump and Well, Inc. and Kansas State University through the Wind for Schools to develop initial courses to stimulate interest and conduct training. The first class has been completed successfully, with 19 participants. Two additional courses are scheduled and the curriculum has been developed. The Business and Industry Advisory Committee is in place and has been meeting.

Duplication of Existing Programs

- **Similar programs in the state based on CIP code, title and content:**
  No similar programs exist in the state.

  Cloud Community College has a program that focuses on training technicians for large wind turbines. This proposed program will focus on Small Wind Technology, Sustainable/Renewable Energy, and Management of Energy Projects to include Wind, Solar Photovoltaic, Solar Thermal, Geothermal, and Bio-fuels. The curriculum is designed to complete with one or more certificates, with the ability to return to add additional tracks and certifications. The program is expandable and designed to meet the needs of Business and Industry quickly through additional tracks and levels of training. Cloud Community College has verbally agreed to allow students to complete climbing certification through their college. This will add additional skills to the learning received at Colby Community College. Colby Community College has also agreed to collaborate with Neosho County Community College's Green Technology programming to allow students to receive training in energy efficiency.

- **Since this is not a duplication of programming:**
  Extensive collaboration was not possible. Also, companies would not be willing to send workers that they need on a regular basis across the state to take programming. This programming will be partially online with boot-camp (short-term) labs that may be offered in a variety of formats to meet employer's needs.

Program Information

- Identify by prefix, number, title, and description (including prerequisites) courses to be required or elective in the proposed program.
  See Appendix B (program information)

- **Provide a copy of the competency profile or a comprehensive list of competencies developed for the proposed program:**

- **Specific objectives for the proposed program:**

  - To train employees to meet the anticipated need for workers in the Sustainable/Renewable Energy Fields.
  - To provide the foundation for future learning and certifications to assure quality to employers in the field.
  - To provide specific training to prepare students for a variety of jobs in the field and for future education
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  - Solar Photovoltaic
    1. How to work safely with PV Systems
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    9. Project management of projects
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    11. Organizational, team, and leadership skills
  - Solar Thermal
    1. Site assessment as it pertains to system performance
    2. Photovoltaic cell and module characteristics as they apply to design and performance of integrated systems
    3. Calculating system characteristics, such as wire sizes to minimize power losses and maximize energy production

4. Wiring methods and technologies
5. Mounting techniques and technologies
6. Maintenance, diagnostic and troubleshooting techniques
7. Customer education practices
8. Project management of projects
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- Geothermal
    27. Adjust power production systems to meet load and distribution demands.
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    29. Backfill piping trenches to protect pipes from damage.
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    31. Collect and record data associated with operating geothermal power plants or well fields.
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    33. Determine the type of geothermal loop system most suitable to a specific property and its heating and cooling needs.
    34. Determine whether emergency or auxiliary systems will be needed to keep properties heated or cooled in extreme weather conditions.
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    37. Identify equipment options, such as compressors, and make appropriate selections.
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    39. Install and maintain geothermal system instrumentation or controls.
    40. Install, maintain, or repair ground or water source-coupled heat pumps to heat and cool residential or commercial building air or water.
    41. Integrate hot water heater systems with geothermal heat exchange systems.
    42. Maintain electrical switchgear, process controls, transmitters, gauges, and control equipment in accordance with geothermal plant procedures.
    43. Maintain, calibrate, or repair plant instrumentation, control, and electronic devices in geothermal plants.
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51. Verify that piping placed in bodies of water is situated to prevent damage to aquaculture and away from potential sources of harm, such as boat anchors.
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- Biofuel

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23. Clean biofuels processing work area, ensuring compliance with safety regulations.
24. Collect biofuels samples and perform routine laboratory tests or analyses to assess biofuels quality.
25. Coordinate raw product sourcing or collection.
26. Inspect biofuels plant or processing equipment regularly, recording or reporting damage and mechanical problems.
27. Measure and monitor raw biofuels feedstock.
28. Monitor and record biofuels processing data.
29. Monitor and record flow meter performance.
30. Monitor batch, continuous flow, or hybrid biofuels production processes.
31. Monitor stored biofuels products or secondary by-products until reused or transferred to users.
32. Operate chemical processing equipment for the production of biofuels.
33. Operate equipment, such as a centrifuge, to extract biofuels products and secondary by-products or reusable fractions.
34. Operate valves, pumps, engines, or generators to control and adjust biofuels production.
35. Perform routine maintenance on mechanical, electrical, or electronic equipment or instruments used in the processing of biofuels.

36. Preprocess feedstock in preparation for physical, chemical, or biological fuel production processes.
37. Process refined feedstock with additives in fermentation or reaction process vessels.
38. Rebuild, repair, or replace biofuels processing equipment components.

- **Provide a Program of Study/Degree Plan:**
  4-term plan for each Program:

  Small Wind Technology Certificate*

Term 1:	
Career Success	1
Introduction to Energy Technology	3
Wind Basics	3
Basic Electronics	3
Electrical Safety	3
Career Math or College Level Math	3
Total for term 1	**16**

Term 2:	
Engineering	3
Small Wind Turbine	3
Intermediate Wind	3
Wind Installation	3
Technical Elective	3
Total for term 2	**15**

Summer Term:	
Advanced Wind	3
Capstone	3
Total for summer	**6**

*This is based on a standard offering but can be modified to meet industry needs.

Sustainable/Renewable Certificate:

Term 1:	
Career Success	1
Introduction to Energy Technology	3
Technical Elective**	3
Basic Electronics	3
Electrical Safety	3
Career Math or College Level Math	3
Total for term 1	**16**

Term 2:	
Engineering	3
Technical Elective	3
Technical Elective**	3
Technical Elective**	3

Technical Elective	3
Total for term 2	**15**

Summer Term:

Technical Elective**	3
Capstone	3
Total for summer	**6**

*This is based on a standard offering but can be modified to meet industry needs.
** Based on the track selected.

Sustainable/Renewable Energy AAS
Students will complete one of the two certificates above in the order it is listed.
Then the student will select a 2nd track to complete and take the remaining general education. This will be completed in their sophomore year. Suggested plan of study for sophomore year as follows:
Term 3:

Technical Elective (based on additional track)	3
Technical Elective (based on additional track)	3
Technical Writing or English Comp.	3
Environmental Science or Physics	5
Total for term	**14**

Term 4:

Technical Elective (based on additional track)	3
Technical Elective (based on additional track)	3
Speech or Interpersonal Communications	3
General Education Electives	6
Total for Term	**15**
TOTAL CREDIT HOURS FOR AAS	**66**

- **Indicate any internship and/or opportunities for students to apply the knowledge and skills attained:** As indicated in earlier information, the college will offer boot-camp type laboratory experiences and through collaboration with other institutions will offer additional training. This is all provided throughout the coursework and in the capstone course, which will be conducted through an employer in the field.

- Identify the career cluster and pathway to which the proposed program belongs.
  This career falls under both Engineering and Agriculture.

- **Describe the proposed program's curriculum integration/articulation plan (tech prep, 2+2 etc.).**
  CCC has developed a one-credit hour course that is intended to stimulate interest in the program and a three-credit hour course that can be a concurrent course offered to high school students. CCC has also been working with Ruth Miller at Kansas State University on the content of coursework to develop transferability if the student should decide to further their education.

- **Specialized accreditation:**
  Since this is a fairly new field of study, the primary focus will be on gaining the employability skills. However, as national or international trends become aligned, the college will monitor and follow that development.

- **Identify any existing industry-recognized credentials related to this program:**
  While there appears to be some agreement in the marketplace for each of these tracks, the innovation of new technologies and methods of sustainable/renewable energy development continue to change and grow. CCC has built a network of experts to communicate with in order to stay current with changes and opportunities.

Faculty

- **Faculty qualifications:**
  CCC has been sending faculty to training activities to gain the training skills for this field. The degree requirements are not in place at this time. Most faculty members are people in the field or people with science or engineering backgrounds. CCC has chosen to train from within for initial coursework but will hire faculty to develop the advanced coursework. Presently, we have three individuals who have attended trainings and continue to gain certifications. One of these faculty members has built his own solar systems and continues to develop new and innovative projects. Another is a member of AWEA and NWKREC. He also attended the following trainings: Kid Wind Corporation, National Renewable Energy Lab, Small Wind Turbine, and two AWEA Conferences (turbine sittings and transmission lines)

- **Describe and list current faculty and their credentials:** **(See Appendix E).**

- **Identify the number and credentials of new faculty to be hired.**
  New faculty will include one faculty member with engineering background to teach the mechanical and electrical background in the program. Since the coursework will be rotated, and the internal faculty used for some of the coursework, this will be sufficient for the start-up. However, as the demand grows additional faculty will be added as needed.

- **Full-time to part-time faculty ratio; student to faculty ratio; and number of adjunct faculty required for program start up and sustainability:**
  CCC has always worked toward quality. Full-time faculty will be used for all the start-up coursework along with Business and Industry Partners. As the demand grows, adjuncts may be used for some coursework. However, it is more likely that Business and Industry professionals or additional full-time faculty will be used for these courses due to the limited number of individuals in our area with the background to teach this coursework.

Cost and Funding for Proposed Program

- Adequate resources including projected staff requirements, advising services, physical facilities, instructional equipment, instructional materials, library requirements, contractual services or clinical placements to support and sustain the proposed program:

CCC has one assistant for each division and all faculty members have access to that service. The college also has advising services through the Learning Center, Student Support Services, and Program Faculty. John Deere has provided a classroom for the mechanical portion of the curriculum. And due to CCC phasing out one program, two additional classrooms are available. Since most of the theory will be online, this will be sufficient for the start-up programming. The College is also planning to build a new facility this year and move some programming to that building. The vacated space can be used as well.

CCC also received an Innovative Grant that has provided some of the equipment and instructional materials for this program. Faculty have reviewed the published materials for library purposes and will be requiring specific magazines and publications be purchased in preparation for their coursework:

- Magazine – Home Power, Publishers – Richard & Karen Perez, Executive Editor & CEO – Joe Schwartz

Colby Community College will conduct boot-camp type laboratories using existing equipment, working with Business and Industries in the area, surrounding states, and schools. CCC will also develop an online laboratory model to use for some of the training through online services and two-way video communications.

CCC has funding for faculty and start-up costs through grant, college, and business and industry partners. Additional funding will be sought through stimulus grant money.

Program Review and Assessment

- **Describe the process and frequency for review of the program content including competencies:**
  Through the Business and Industry Advisory Committee the program content, competencies, and equipment will be reviewed annually and improvements will be made. A comprehensive program review will be conducted every 3-5 years and will include Business and Industry Advisory Committee input, student outcomes assessments, literature research of the field, support services including library, budget dollars, technology, and student success in their field.

- **Describe the process and frequency for review of the level of program success (see above) and process for remediation of areas of concern:**
  The remediation for areas of concern are done immediately when an area of concern is identified through a plan for improvement developed through an agreement between the Vice President of Academic Affairs and the faculty when the concern is identified. Online curricula support is provided by faculty member(s), the learning center. Technical support is provided through the IT Department where a full-time support person is available to serve online students and faculty.

Program Approval at the Institution Level

- **Summarize the institutional process undertaken for approval of the proposed program:**

Colby Community College uses the Curriculum Committee to approve coursework that is designed to meet the needs of students and other stakeholders. When a full program is proposed, it goes through the President and Board of Trustees to determine if the program is a fit for the college's mission and stakeholder needs.

- **Provide copies of the Program Advisory Board Minutes (including a list of the members and business connection to program), Curriculum Committee Minutes, Governing Board Minutes for the meeting at which the new program was approved.**

This curriculum has been presented to each of the groups mentioned above. It has been approved by the Curriculum Committee, Advisory Board, and the Board of Trustees.

See Appendix G-I (meeting minutes)

List of Advisory Board:

Mike Woofter – Owner of Oasis Travel Center (Geothermal System installed)
Chris Sramek – Owner of Weather Decision
Fred Taylor – Manager of Colby's Midwest Energy
Eric Sperher – Manger of Colby's Cornerstone Ag
Bryce Barton – Project manager at Trade Wind Energy
Ryan Ortner – Manger of Colby's John Deere
Barry Kaaz – Dean of External Affairs at CCC

If requesting Perkins approval for the proposed program, submit a completed Perkins Program Verification form.
See Perkins Forms

Submit the completed application and supporting documents to the following:

Director of Technical Programs & Curriculum
Kansas Board of Regents
1000 SW Jackson, Ste. 520
Topeka, KS 66612-1368

IMPLEMENTATION YEAR 2010

Fiscal Summary for Proposed Academic Programs

Institution: Colby Community College
Proposed Program: Sustainable/Renewable Energy-AAS, Certificates - Small Wind Technology & Sustainable/Renewable Energy

art I. Anticipated Enrollment	Implementation Year	
	Full-Time	Part-Time
. Headcount:	15	
. Total SCH taken by all students in program	240	
art II. Program Cost Projection		
. In implementation year one, list all identifiable General Use costs to the academic unit(s) and how they will be funded..		
	Implementation Year	
ase Budget Salaries	50,000	
Other Expenses	150,000	
Total	200,000	

Indicate source and amount of funds:
Local and State Funding. Additional funding will be sought through stimulus grant funding.

Submit the completed document to the following:

Director of Academic Services
Kansas Board of Regents
1000 SW Jackson, Ste. 520
Topeka, KS 66612-1368

Revised June 2009

Associate of Applied Science: Sustainable/Renewable Energy

Appendix A

Completion Requirements For the AAS

Technical Track 12 Hours
See tracks below

Natural Science	5
English Comp I	3
Public Speaking or Interpersonal Communications	3
Electives	6
Total Credit Hours	17

Technical Certificate Requirement

Sustainable/Renewable Energy

Student Success Seminar	1
Intro to Energy Technologies	3
Basic Electronics	3
Electrical Safety	3
Math Gen Ed	3
Capstone	3
Technical Electives	9
Technical Track	12
Engineering	3
Total Credit Hours	37

Small Wind Technology

Student Success Seminar	1
Intro to Energy Technologies	3
Small Wind Turbines	3
Electronics	3
Math Gen Ed	3
Capstone	3
Technical Electives	3
Wind Technical Track	12
Electrical Safety	3
Total Credit Hours	37

Students will complete a Technical Track of 12 hours within the Certificate
In addition to completing another 12 hour Technical Track to complete the AAS

Solar Thermal Technical Track

Solar Thermal Basics	3
Solar Thermal Intermediate	3
Solar Thermal Advanced	3
Solar Thermal Installation	3
Total Credit Hours	12

Biofuel Technical Track

Biofuel Basics	3
Biofuel Intermediate	3
Biofuel Advanced	3
Biofuel Installation	3
Total Credit Hours	12

Wind Technical Track

Basic Wind	3
Intermediate Wind	3
Advanced Wind	3
Wind Installation	3
Total Credit Hours	12

Solar Photovoltaic Technical Track

Small Photovoltaic System Basics	3
Solar Photovoltaic Intermediate	3
Solar Photovoltaic Advanced	3
Solar Installation	3
Total Credit Hours	12

Geothermal Technical Track

Geothermal Basics	3
Geothermal Intermediate	3
Geothermal Advanced	3
Geothermal Installation	3
Total Credit Hours	12

Program Information - Appendix B

Identify by prefix, number, title, and description courses to be required or elective in the proposed program: **(R-required / E-Elective)**

AAS Sustainable/Renewable Energy

R-Natural Science Gen Ed (see attached Gen Ed list)

R – EN177 English Comp I

Prerequisite: Appropriate COMPASS or ACT score or successfully completed Fundamentals of Writing II and Reading & Writing Skills II with a "C" or better. This course begins with personal essays, then emphasizes expository writing, and concludes with an essay based on one source. Vocabulary development is also emphasized.

R – SP176 Public Speaking or SP106 Interpersonal Communications

SP176 Public Speaking

Speech is an introductory oral communications course emphasizing skills in speaking, listening, audience analysis, and speech writing/deliver. The course is designed to increase awareness of the importance of oral communication in today's society and to develop competent speakers.

SP106 – Interpersonal Communications

This course focuses on communication between two or several persons. Specific work on self-concept, listening behavior, verbal and non-verbal communication and improving relationships are covered by lecture, text and structured exercises in class.

R – 6 hours of Gen Ed Electives (see attached Gen Ed list)

Technical Certificates – Sustainable/Renewable Energy or Small Wind Technology

Small Wind Technology

R – SO 100 Student Success Seminar

The student orientation program is designed to facilitate transition into college life. All first-time students, including students who have college credit earned while they were in high school and students who have not earned more than 12 hours of previous college credit, are involved in this orientation process. Through this program, students become more familiar with peers, college faculty, career objectives and advisors.

R – Math Gen Ed (see attached Gen Ed list)

R – AG170 Electrical Safety

This course focuses on training that is 100% practical and deals with every important aspects of OSHA's electrical safety-related work practices and how they apply. The course teaches the safe installation and maintenance of electrical equipment and covers the use of personal protective equipment.

R – AE276 Introduction to Energy Technologies

This course covers the basic concept of the interconnection and integration of non-wind and electrical systems and exposes the student to the many facets of the renewable energy sources. It covers the history and development of the solar, geothermal, biofuel industries, terminology used in these industries, and applications within society. It also covers environmental and economic issues of each of these renewable energy sources and the future of each industry.

R – AE190 Electronics

This course covers basic terminology, basic power electronics, and power supplies for machines, electronic test equipment usage, variable speed controllers and electronic lighting controls.

R – EG200 Engineering

Students will learn what it means to engineer projects. This will explore how engineers examine topics, how they learn and communicate. The traditional projects will be examined but an emphasis will be placed on energy projects. At the end of the course, the student will have a beginning understanding of the field and its relationship to other fields.

R – Capstone

R – AE181 Small Wind Turbine (required elective for this course)

This course covers the basic concept of the interconnection of integration of wind and electrical systems and exposes the student to the many facets of the wind industry. It covers the history and development of the small wind industry, terminology used in the industry, types and applications of various small wind turbines. It also covers environmental and economic issues of the wind industry and the future of the industry.

R – AE177 Basic Wind

The student will be exposed to the many facets of the wind industry. The course will cover the history and development of the wind industry, terminology used in the industry, types and applications of various wind turbines, environmental and economic issues of the wind industry, the future of the wind industry and other topics that are appropriate.

R – AE178 Intermediate Wind

The student will be introduced to the aspects of industry standards, requirements and issues that are a part of working in the field with a wind turbine. Information to be covered will include all but not limited to safety training, working around cranes and riggings, turbine sitting, tower climbing, fasteners and lubricants used in the industry and other subject matter that may be appropriate.

R – AE179 Advanced Wind

The student will be introduced to the generation of electrical power with a wind turbine generator, moving that power through a local transmission system to a substation where a customer will purchase the generated power. This course will cover all aspects of working with components of a high voltage transmission system and, hands on experience with wind energy.

R – AE180 Wind Installation

This course will cover the basic wind turbine technology that is essential to understanding over all layout, installation, operation, maintenance, troubleshooting and repair of electrical, electromechanical and electronic equipment systems. This course will also cover technical support manuals, computer maintenance databases and supervisor control and data acquisition

E – AE240 Data Analysis and Reporting

This course covers basic literature and procedures used in data analysis and reporting techniques.

E – AE241 Power Storage/Transmission and Conversion

This course covers basic literature and procedures used in Power Storage and transmission conversion techniques and students gain the skills to work with these systems.

Sustainable/Renewable Energy

R – SO 100 Student Success Seminar

The student orientation program is designed to facilitate transition into college life. All first-time students, including students who have college credit earned while they were in high school and students who have not earned more than 12 hours of previous college credit, are involved in this orientation process. Through this program, students become more familiar with peers, college faculty, career objectives and advisors.

R – Math Gen Ed (see attached Gen Ed list)

R – AG170 Electrical Safety

This course focuses on training that is 100% practical and deals with every important aspects of OSHA's electrical safety-related work practices and how they apply. The course teaches the safe installation and maintenance of electrical equipment and covers the use of personal protective equipment.

R – AE276 Introduction to Energy Technologies

This course covers the basic concept of the interconnection and integration of non-wind and electrical systems and exposes the student to the many facets of the renewable energy sources. It covers the history and development of the solar, geothermal, biofuel industries, terminology used in these industries, and applications within society. It also covers environmental and economic issues of each of these renewable energy sources and the future of each industry.

R – AE190 Electronics

This course covers basic terminology, basic power electronics, and power supplies for machines, electronic test equipment usage, variable speed controllers and electronic lighting controls.

R – EG200 Engineering

Students will learn what it means to engineer projects. This will explore how engineers examine topics, how they learn and communicate. The traditional projects will be examined but an emphasis will be placed on energy projects. At the end of the course, the student will have a beginning understanding of the field and its relationship to other fields.

R – Capstone

E – AE240 Data Analysis and Reporting

This course covers basic literature and procedures used in data analysis and reporting techniques.

E – AE241 Power Storage/Transmission and Conversion

This course covers basic literature and procedures used in Power Storage and transmission conversion techniques and students gain the skills to work with these systems.

E – AE181 Small Wind Turbine

This course covers the basic concept of the interconnection of integration of wind and electrical systems and exposes the student to the many facets of the wind industry. It covers the history and development of the small wind industry, terminology used in the industry, types and applications of various small wind turbines. It also covers environmental and economic issues of the wind industry and the future of the industry.

E - Technical Tracks

Wind Track

AE177 Basic Wind

The student will be exposed to the many facets of the wind industry. The course will cover the history and development of the wind industry, terminology used in the industry, types and applications of various wind turbines, environmental and economic issues of the wind industry, the future of the wind industry and other topics that are appropriate.

AE178 Intermediate Wind

The student will be introduced to the aspects of industry standards, requirements and issues that are a part of working in the field with a wind turbine. Information to be covered will include all but not limited to safety training, working around cranes and riggings, turbine sitting, tower climbing, fasteners and lubricants used in the industry and other subject matter that may be appropriate.

AE179 Advanced Wind

The student will be introduced to the generation of electrical power with a wind turbine generator, moving that power through a local transmission system to a substation where a customer will purchase the generated power. This course will cover all aspects of working with components of a high voltage transmission system and, hands on experience with wind energy.

AE180 Wind Installation

This course will cover the basic wind turbine technology that is essential to understanding over all layout, installation, operation, maintenance, troubleshooting and repair of electrical, electromechanical and electronic equipment systems. This course will also cover technical support manuals, computer maintenance databases and supervisor control and data acquisition.

Solar Photovoltaic Track

AE278 Small Photovoltaic Basics

Basics of Small Photovoltaic Systems cover the basic principles of Photovoltaic, the design of installation, and evaluation of residential and commercial photovoltaic (PV) system. This course provides the basics of how to effectively incorporate photovoltaic systems into stand-alone or interconnected electrical systems.

AE279 Solar Photovoltaic Intermediate

This course will teach the student how to layout an installation for maximum performance using standard industry tools such as a Solar Path Finder, while utilizing conduit bending, wiring and roof penetration techniques.

AE280 Solar Photovoltaic Advanced

This advanced course will cover the proper design and installation of NEC code-compliant solar photovoltaic (PV) systems for use on residential and commercial buildings. Topics include sizing of solar electric systems; specifications of system components and sizing of DC/AC wiring. This course will prepare the student for the North American Board of Certified energy Practitioners (NABCEP) Solar Photovoltaic (PV) System Installer certification exam.

AE281 Solar Installation

This advanced course will expose the student using participation in labs to dealing with understanding load and functionality, panel racking, battery storage, usage calculations leading up to physical installation of a solar photovoltaic system

Solar Thermal Track

AE282 Solar Thermal Basics

This course will teach the student basic terminology and identification of the basic system components for solar thermal systems in both passive and active systems. The student will determine system layout, location and configuration of solar thermal installations.

AE283 Solar Thermal Intermediate

This course will elevate student awareness of solar thermal systems through determination of steps for appropriate site assessment and installation. The student will be able to identify manufacturer specifications, mounting and materials for intended installation. This course includes component demonstration, fieldtrips off-campus where necessary.

AE284 Solar Thermal Advanced

The focus of this course is to show how a solar thermal system can be integrated into a building and cooperate with the building main energy system. Important aspects of this course are to instruct the student how to use simulation programs for investigating the performance of the solar thermal systems as well as ensuring structural integrity and on-site penetrations meet all appropriate codes.

AE285 Solar Thermal Installation

This course will be a “hands-on” practical application by the student of solar technology utilizing various installation techniques for both active and passive solar thermal systems. The student will apply the principles of site analysis, coast vs. payback, energy audit and solar system design into a student or class project.

Geothermal Track

AE200 Geothermal Basics

This course will introduce the student to characteristics and types of geothermal systems, types and characteristics of surface manifestations, conceptual models, rock and fluid properties, scope and survey of geothermal projects, production facilities and utilization of geothermal energy for electricity generation.

AE201 Geothermal Intermediate

This course will elevate student awareness of utilization of geothermal energy for electricity generation for direct uses, types of energy conversion cycles/systems applied in the varying types of geothermal power plants, types of turbines, condensers, cooling towers, gas extraction systems and calculation of power output or steam consumption for the main types of power plants

AE202 Geothermal Advanced

This course will introduce the student to the principles of heat transfer, boiling and condensation their application to geothermal energy technology from the reservoir to the well, to the steam, water and two phase transmission pipe, condensation traps to the power plant including condensers, cooling tower, types and selection of heat exchangers for direct application for geothermal fluid for heating, cooling and drying.

AE203 Geothermal Installation

This course will detail for the student a 'drilling plan' covering well site preparation, planning of well target, well geometry, drilling equipment, casing design, drilling fluid cementing, rock mechanics, directional drilling, measurements and monitoring during drilling and well control.

Biofuel Track

AE220 Biofuel Basics

This course is designed for both biofuel majors and non-science majors. The first unit will cover basic terminology and concepts involved with biofuels and the second unit covering material and principles of general plant biology, biochemistry and plant ecology relevant to understanding the process of conversion of plant biomass to biofuel. The third unit will introduce the student to the pros and cons of corn-versus-cellulosic ethanol.

AE221 Biofuel Intermediate

This course will restate fundamental concepts in understanding biofuel/bioenergy, renewable feedstock, production, availability and attributes for biofuel production but elevate student awareness of thermo chemical conversion of biomass to fuel, biodiesel production and resulting environmental impacts of biofuel production.

AE222 Biofuel Advanced

This advanced course will cover the evolving biofuel technologies of biodiesel, alcohol, cellulosic products and methane to displacing fossil fuels – diesel, gasoline, natural gas and coal. The course will introduce the student to the concepts, tools, techniques and materials needed to assess, design and construct biofuel technology systems.

AE223 Biofuel Installation

This course will address the planning and construction of bio-refineries that convert renewable feedstock to fuels, chemicals and other value-added products that offer many opportunities for applying multi-disciplinary technologies that produce the biofuel. The enabling technologies, their recent improvements and commercialization status of this rapidly evolving field will be covered.

The following 5 pages are Appendix C (letters of support)

Woofter Pump & Well, Inc.
1024 Oak Ave.
P. O. Box 689
Hoxie, KS 67740
PH: 785-675-3991
FAX: 785-675-3990

November 12, 2009

Dean Barry B. Kaaz
Colby Community College
1255 South Range
Colby, KS 67701

Dear Dean Kaaz:

Woofter Pump & Well has been active in the installation of geothermal systems in northwest Kansas. The Oasis Travel Center in Colby has such a system installed for their heating and cooling.

We support Colby Community College in their development of a renewable energy program and we would be willing to assist them by letting students tour the Oasis facility to learn how a geothermal system works. Also, if you would be interested in taking pictures or video during a geothermal system construction, you are welcome to do that in order to support your curriculum and program development.

Sincerely,

Jay Woofter
President

February 4, 2009

Barry B. Kaaz
Dean of External Affairs
Colby, KS 67701

Mr. Kaaz,

In reference to our recent meeting to discuss wind technology training at Colby Community College, Colby Implement, your local John Deere Dealer would like to assist and lend support wherever we can.

As we discussed, we are open to consider the possibilities of assisting the college with instruction in your wind technology program. Colby Implement is currently constructing a new building which may have some potential space to assist with training. You had mentioned the possibility of Colby Implement providing hydraulic training for your program. Dependent on course descriptions and content, we are willing to consider this as a means of partnership and support.

Certainly, Colby Implement would we willing to assist in an advisory capacity in the development of your curriculum. John Deere is currently involved in project management and financing as our farm customers become engaged in this rapidly developing technology on their properties. These areas may be something to consider in the development of your training.

It is our understanding that you are applying for a Workforce Solutions Grant. Depending on the specifics and details of an agreement, Colby Implement would consider financial support in terms of some kind of matching funds arrangement. We certainly support your efforts in developing this new technology training for our workforce development in northwest Kansas.

Sincerely,

Gen Mgr/Partner

acciona Energy

ACCIONA Energy North America Corporation

333 West Wacker Drive, Suite 1500
Chicago, Illinois 60606 USA

Tel: 312.673.3000
Fax: 312.673.3001
www.acciona-energy.com

April 13, 2009

Barry B. Kaaz
Dean of External Affairs
Colby Community College
Colby, KS 67701

RE: Colby Community College Wind Energy Education & Training Program

Dear Dean Kaaz:

I am writing to offer ACCIONA Energy North America's ("ACCIONA") support of Colby Community College's proposed wind energy education and training programs. As a world leader in all facets of renewable energy, ACCIONA truly understands the need to expand wind energy education and training programs. This need is especially great within communities located in the core of the nation's "wind belt". Colby Community College is perfectly poised to develop a quality program for the wind energy sector, delivering skilled professionals to an industry expected to garner great growth in the surrounding area. In fact, ACCIONA has recognized the superior wind resources in Thomas County as we continue to pursue the development of the Solomon Forks Wind Farm.

As a world leader in renewable energy, ACCIONA has installed 6,037 MW of wind energy worldwide. In addition to the Solomon Forks Project, ACCIONA has several hundred MW of wind energy in the final stages of development, under construction, or in operations in the United States. ACCIONA is also a leading wind turbine manufacturer; in 2007, ACCIONA Windpower North America, LLC ("ACCIONA Windpower"), an affiliate of ACCIONA, opened a wind turbine manufacturing plant in West Branch, Iowa, which has an annual output capacity of 450 wind turbine generators and currently employs more than 150 people. Additionally, ACCIONA has a major presence in other renewable energy technologies. The company has installed a 65 MW concentrating solar power plant in Southern Nevada, 115 MW of solar photovoltaic power, and 15 MW of solar hot water. ACCIONA owns and operates several biomass plants, 19 small hydropower stations, and biofuel production facilities that produce biodiesel from vegetable oils and bioethanol from wine-surplus alcohol.

ACCIONA is one of the world's most experienced wind energy developers, with nearly 20 years of experience developing and building wind projects. ACCIONA employs nearly 300 wind power professionals here in North America and more than 1,000 employees worldwide, drawing together a tremendous base of knowledge. Our professionals have industry-leading experience in site development, environmental site diligence, permitting, wind resource measurement, civil and electrical engineering, wind farm construction, and turbine operation and maintenance.

As Colby Community College programs develop, and in conjunction with the development, construction, and operation of the Solomon Forks Wind Farm we would like to work with the college to look for ways to align ACCIONA's resources with the college's needs. Please keep us informed as the development of your program progresses and I look forward to discussing ways ACCIONA can support your curriculum.

Sincerely,

Tom Hiester
Vice President, Development (Central Region)
Acciona Energy North America Corp.

Peter Kennon
Project Developer – Solomon Forks Wind Farm
Acciona Energy North America Corp.

NW Kansas Regional Energy Collaborative

145 S Lane Avenue/PO Box 575, Dighton, KS 67839

620.397.5553 voice
620.397.5608 Fax
dightonlaneecodevo@st-tel.net

Member Counties

Cheyenne
Decatur
Gove
Greely
Graham
Logan
Lane
Ness
Norton
Pawnee
Rawlins
Scott
Sheridan
Sherman
Thomas
Trego
Wallace
Wichita

Other Members

Colby Community College
Westwind Energy
Sierra Club Int'l

November 12, 2009

Barry B. Kaaz
Dean of External Affairs
Colby Community College
1255 South Range
Colby, KS 67701

Dear Mr. Kaaz:

As the facilitator and a member of the Northwest Kansas Collaborative, we support Colby Community College in its efforts to develop sustainable/renewable energy training for our region. It is our understanding that the college has a Wind for Schools Grant aimed at developing a wind turbine on campus.

We feel that a renewable energy program has excellent potential for growth in western Kansas and are willing to assist the college in the educational development of this field for economic development of our region.

It is our opinion that the renewable energy industry sector, specifically wind conversion, will experience significant growth throughout the next decade resulting in even more critical demands for the skilled technicians Colby Community College will produce through their training program.

Please let us know how we might partner or assist to open new opportunities for course development in the region.

Sincerely,

Dan Hartman

Dan Hartman, BD
Facilitator

USD 315 COLBY PUBLIC SCHOOLS

600 West Third Street • Colby, KS 67701-1901
785.460.5000
785.460.5050 fax

February 9, 2009

Dr Paula Davis
Vice President Academic Affairs
Colby Community College
1255 S Range
Colby, KS 67701

Dear Dr. Davis:

We commend Colby Community College for researching and pursuing new programs and curriculums, which will provide training and careers for our high school graduates. It is our understanding the college is currently applying for a Workforce Solutions Grant enabling you to develop wind technology training.

USD 315 would like to work with Colby Community College as you develop the curriculum so that we can ensure our high school graduates are prepared with the proper math and science for this technical training. We are currently researching and evaluating programs such as Kidwind and Wind in the Schools through K-State University to see how we might further prepare our students for these careers.

Recently, I met with Colby Community College Dean of External Affairs, Colby High School Principal, Curriculum Director, and Counselor to discuss enhancing partnerships between USD 315 and CCC that would open new opportunities for students. Wind technology would have multiple applications under our sixteen career cluster model. We also are taking into consideration the possibility of jointly working with CCC on a wind generator project for the high school.

USD 315 supports CCC as it pursues the wind technology program. We are eager to support and assist the college so that in northwest Kansas we can provide a seamless transition from K-12 through higher education to provide new careers and economic growth in our region.

Sincerely,

Terrel Harrison

Terrel Harrison
Superintendent

KANSAS BOARD OF REGENTS
PERKINS APPROVED PROGRAM VERIFICATION

FY2010

Name of Institution: Colby Community College **Date of Submission:** 4/13/2010

Program CIP Code: **Program Name:** Sustainable/Renewable Energy

Program Status: ☐ Active ☐ Inactive

Award Level: ☒ AAS ☐ AS **Credit Hours Required:** 66 **Total Technical Cr, Required:** 49

☐ Technical Certificate **Credit Hours Required:** **Total Non-Tech Cr. Required:** 17

Certificates of Completion

☐ Adult-Short Term Training **Credit Hours Required:**

☐ Business & Industry Training **Credit Hours Required:**

☐ Apprenticeship **Credit Hours Required:**

Associate degree programs must have at least 55% of the total program credit hours from technical courses for Perkins approval.

R-Required E-Elective	T-Technical G-General Education	Course Name	Credit Hours
R	G	Natural Science Gen Ed	5
R	G	English Comp I	3
R	G	Public Speaking or Interpersonal Communications	3
R	G	Electives	6
R	T	Technical Certificates	37
		Sustainable/Renewable Energy	
		Small Wind Technology	
R	T	Additional Technical Track	12

Signature of Administrator Title Date

Submit one copy to the Career and Technical Education office, Kansas Board of Regents, 1000 SW Jackson Street, Suite 520, Topeka, KS 66612-1368.

FOR STATE USE ONLY: ☐ **Approved for Perkins Funding** ☐ **Not Approved for Perkins Funding**

Director, Career and Technical Education Date

Revised June 2009

KANSAS BOARD OF REGENTS
PERKINS APPROVED PROGRAM VERIFICATION

FY2010

Name of Institution: Colby Community College **Date of Submission:** 4/13/10

Program CIP Code: **Program Name:** Sustainable/Renewal Energy

Program Status: ☐ Active ☐ Inactive

Award Level: ☐ AAS ☐ AS **Credit Hours Required:** 37 **Total Technical Cr, Required:** 33

☒ Technical Certificate **Credit Hours Required:** **Total Non-Tech Cr. Required:** 4

Certificates of Completion

☐ Adult-Short Term Training **Credit Hours Required:**

☐ Business & Industry Training **Credit Hours Required:**

☐ Apprenticeship **Credit Hours Required:**

Associate degree programs must have at least 55% of the total program credit hours from technical courses for Perkins approval.

R-Required E-Elective	T-Technical G-General Education	Course Name	Credit Hours
R	G	SO100 Student Success Seminar	1
R	G	Math Gen Ed	3
R	T	Introduction to Energy Technologies	3
R	T	Electronics	3
R	T	Electrical Safety	3
R	T	Capstone	3
R	T	Engineering	3
R	T	Technical Electives	6
R	T	Technical Track	12
		Technical Elective Choices (each course is 3 credit hours)	
		Small Wind Turbines	
		Power Storage/Tansmission and Conversion	
		Data Analysis and Reporting	

Signature of Administrator Title Date

Submit one copy to the Career and Technical Education office, Kansas Board of Regents, 1000 SW Jackson Street, Suite 520, Topeka, KS 66612-1368.

FOR STATE USE ONLY: ☐ **Approved for Perkins Funding** ☐ **Not Approved for Perkins Funding**

Director, Career and Technical Education Date

Revised June 2009

KANSAS BOARD OF REGENTS
PERKINS APPROVED PROGRAM VERIFICATION

FY2010

Name of Institution: Colby Community College **Date of Submission:** 4/13/2010

Program CIP Code: **Program Name:** Small Wind Technology

Program Status: ☐ Active ☐ Inactive

Award Level: ☐ AAS ☐ AS **Credit Hours Required:** 37 **Total Technical Cr, Required:** 33

☒ Technical Certificate **Credit Hours Required:** **Total Non-Tech Cr. Required:** 4

Certificates of Completion

☐ Adult-Short Term Training **Credit Hours Required:**

☐ Business & Industry Training **Credit Hours Required:**

☐ Apprenticeship **Credit Hours Required:**

Associate degree programs must have at least 55% of the total program credit hours from technical courses for Perkins approval.

R-Required E-Elective	T-Technical G-General Education	Course Name	Credit Hours
R	G	SO 100 Student Success Seminar	1
R	G	Math Gen Ed	3
R	T	Electrical Safety	3
R	T	Introduction to Energy Technologies	3
R	T	Electronics	3
R	T	Engneering	3
R	T	Capstone	3
R	T	Wind Technical Track	12
		Basic Wind (3 credit hours)	
		Intermeditae Wind (3 credit hours)	
		Advanced Wind (3 credit hours)	
		Wind Installation (3 credit hours)	
R	T	Technical Electives	3
		Power Storage/Transmission and Conversion	
		Data Analysis and Reporting	
R	T	Required Technical Elective - Small Wind Turbines	3

Signature of Administrator Title Date

Submit one copy to the Career and Technical Education office, Kansas Board of Regents, 1000 SW Jackson Street, Suite 520, Topeka, KS 66612-1368.

FOR STATE USE ONLY: ☐ **Approved for Perkins Funding** ☐ **Not Approved for Perkins Funding**

Director, Career and Technical Education Date

Revised June 2009

KANSAS BOARD OF REGENTS
PERKINS APPROVED PROGRAM VERIFICATION

FY201

Name of Institution: Colby Community College **Date of Submission: 4/13/10**

Program CIP Code: **Program Name:**

Program Status: ☐ Active ☐ Inactive

Award Level: ☐ AAS ☐ AS **Credit Hours Required:** **Total Technical Cr, Required:**

☐ Technical Certificate **Credit Hours Required:** **Total Non-Tech Cr. Required:**

Certificates of Completion

☐ Adult-Short Term Training **Credit Hours Required:**

☐ Business & Industry Training **Credit Hours Required:**

☐ Apprenticeship **Credit Hours Required:**

Associate degree programs must have at least 55% of the total program credit hours from technical courses for Perkins approval.

R-Required E-Elective	T-Technical G-General Education	Course Name	Credit Hours
R	T	Technical Tracks (each track is 12 credit hours)	
		Wind Technical Track (each course is 3 credit hours)	
		Basic Wind	
		Intermediate Wind	
		Advacned Wind	
		Wind Installation	
		Solar Photovoltaic Technical Track (each course is 3 credit hours)	
		Small Photovoltaic System Basics	
		Solar Photovoltaic Intermediate	
		Solar Photovoltaic Advanced	
		Solar Installation	
		Solar Thermal Technical Track (each course is 3 credit hours)	
		Solar Thermal Basics	
		Solar Thermal Intermediate	
		Solar Thermal Advanced	
		Solar Thermal Installation	
		Geothermal Technical Track (each course is 3 credit hours)	
		Geothermal Basics	
		Geothermal Intermediate	
		Geothermal Advanced	
		Geothermal Installation	
		Biofuel Technical Track (each course is 3 credit hours)	
		Biofuel Basics / Biofuel Intermediate / Biofuel Advanced / Biofuel Installation	

Signature of Administrator Title Date

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FOR STATE USE ONLY: ☐ **Approved for Perkins Funding** ☐ **Not Approved for Perkins Funding**

Director, Career and Technical Education Date

Faculty - Appendix E

Derek Reilley
Master of Science Degree
11 years of teaching experience
5 years of industry experience
Mr. Reilley will be teaching the Photovoltaic Technical Track and the Basic Solar Thermal course

Tom Moorhous
Masters of Arts Degree
28 years of teaching experience
Mr. Moorhous will be teaching the Introduction to Energy Technologies, Basic wind, Basic Geothermal, and the Biofuel Basics

David Kruse
Ph.D
42 years of teaching experience
Mr. Kruse will be teaching the Natural Science courses.

The upper level wind, solar thermal, biofuel, and geothermal will be taught by the new faculty that will be hired.

Curriculum Committee Meeting
April 12, 2010
3:00 pm
Appendix G

Present: Troy Bielser, Chriss Ellison, Joyce Washburn, Megan Augustine, Allen Russell, Ruth Wolfram

Guest: Barry Kaaz

Sustainable/Renewable Energy Program

In Dr. Paula Davis absence Barry Kaaz presented the Sustainable/Renewable Energy Program.

The committee were presented with the program curriculum, course descriptions of classes, feasibility study questions and summary.

Course Descriptions Reviewed:

AE177 Basic Wind
AE178 Intermediate Wind
AE179 Advanced Wind
AE180 Installation Wind
AE181 Small Wind Turbines
AE190 Basic Electronics
AE191 Basic Electronics Off-Grid
AE277 Small photovoltaic System Basics
AE279 Solar Photovoltaic Intermediate
AE280 Solar Photovoltaic Advanced
AE281 Solar Installation
AE282 Solar Thermal Basics
AE283 Solar Thermal Intermediate
AE284 Solar Thermal Advanced
AE285 Solar Installation
AE200 Geothermal Basics
AE201 Geothermal Intermediate
AE202 Geothermal Advanced
AE203 Geothermal Installation
AE220 Biofuel Basics
AE221 Biofuel Intermediate
AE222 Biofuel Advanced
AE223 Biofuel Installation

Barry presented the following partnerships/collaboration development for the Sustainable/Renewable Energy

Fort Hays State University
- Leadership
- Geographic Information Systems (GIS)

Kansas State University
- Wind Energy
  - Wind for Schools Program
  - MET Tower
  - NREL proposal Small Wind Turbine Test Site
- Architectural engineering students, pool enclosure heat loss

Midwest Energy
- Energy efficiency workshop (HouseSmart)
- NREL proposal Small Wind Turbine test Site

Flint Hills Technical College
- Audio podcast on energy efficiency construction

United States Air Force Academy
- Initially for leadership class development on campus
- Leadership Conference

Indian Nations: Haskell Indian University, Kansa and Arapahoe tribes in Oklahoma

Kansas Department of Wildlife & Parks
- Successful Grant
- 1st Annual kids Fishing Derby

City of Colby, USD 315, Schools in Northwest Kansas
- Wind for Schools Proposal
- 1st CCC wind Energy conference

Discussion was held concerning the offering of the new program and what it would mean by going forward with the program.

Chriss made a motion that CCC move forward with the Sustainable/Renewable Energy Program. Ruth seconded the motion. All approved.

Respectfully Submitted

Penny Cline
Recording Secretary

Appendix H

Advisory Committee for Energy Programs

An Advisory Committee for Energy Programs was formed in September, 2008 to provide assistance, counseling, and guidance to CCC in the development of an alternative energy program. The seven (7) person committee has had discussions on small wind, solar photovoltaic's, solar thermal, geothermal, and bio fuels as possible avenues of course and programs growth for the college. Development of these courses were seen as not only instrumental to the future of CCC but the economic growth and development of the service area.

Appendix I

RECORD OF THE PROCEEDINGS OF THE GOVERNING BODY

Energy Curriculum Report

Dr. Paula Davis talked with the board about offering sustainable/ renewable energy programs because northwest Kansas is a prime location for energy sources and growth. Barry Kaaz, Derek Reilley, and Tom Moorhous have been working with Dr. Davis to prepare a curriculum. The first class was presented March 15-19 by Tom Moorhous. Everyone was extremely pleased with the full class and interest shown by students. (Part of this course has been put on the Facebook profile.) Derek Reilley said this is the future of CCC.

Dr. Davis has received a Kansas Innovative Technology grant which will partner CCC with John Deere and Woofter Pump and Well, Inc. and the Oasis facility. Grant funds will be used to purchase wind, solar, and bio-fuel models for use in introductory sustainable/renewable energy courses. Since green energy is being pushed by the Obama administration, federal funds are available. The recently passed Health Care bill also contained money for this purpose.

Dr. Davis would like to offer a Sustainable/Renewable Certificate, a Wind Energy Certificate and an A.A.S. degree in Sustainable/Renewable Energy for fall, 2010. Off-Grid Technology and Solar Photovoltaic would be offered fall 2011. Solar Thermal, Geo-Thermal and Bio-Fuel courses and certification would be added in 2012. Two certificates will be offered for 26 credit hours; five certificates will have 22 credit hours.

Budget projections and challenges were shared by Dr. Davis. [See attachment.] A transmission line will be going from Hays, Kansas to Colorado which Dr. Davis thinks will cause businesses to boom in this area. CCC has been named one of four test sites chosen in the United States. (The other three sites are research institutions.) The CCC test site is located 1.5 miles west of the campus and the wind turbine there is tested over a 2500-hour period. This will also be a good resource and useful for additional training in the new sustainable/renewable energy programs. It will give CCC an opportunity to publicize the college and sell wind testing to other wind manufacturers. Barry Kaaz credited Dr. Kreider with direction in making the wind project a reality. CCC has a three-year contract with KSU, then CCC becomes the sole owner of the contract.

Dr. Davis said forming the sustainable/renewable energy program has been a huge team effort and she thanked Dr. Kreider, Derek Reilley and Barry Kaaz for their help. She plans to submit the CCC plans to the Kansas Board of Regents soon. The feasibility study has been done and she is working on state information. It was the consensus of the board that Dr. Davis proceed with the sustainable/renewable energy program.

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title:AG170 **Year: Fall, 2010**

ELECTRICAL SAFETY

Department: Applied Technologies **Credit Hours: 3**

Required Text: Supplied Materials **Days/Time:**

Instructor: **Room #:**

Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: none**

Course Description
This course focuses on training that is 100% practical and deals with every important aspect of OSHA's electrical safety-related work practices and how they apply. The course teaches the safe installation and maintenance of electrical equipment and covers the use of personal protective equipment.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline and Competencies
Students will be able to:
1. Define basic terminology such as OSHA and other safety terms
2. Analyze and understand the importance of safety to self and customers
3. Communicate effectively problems and solution integration
4. Understand the importance of policies to meet safety guidelines

Course Learning Objectives
1. The student will have a solid understanding of the laws, terms, and safety equipment
2. The student will be able to define basic terms, analyze and understand the profession
3. The student will acquire practical skills in safety, policy making, and compliance.

Method of Instruction: Lecture on-site and/or online utilizing lab for training.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)

Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and complete a report and develop a policy on electrical safety.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

* In accordance with the mission of Colby Community College to provide for the development of better futures for its students-it is essential that the principles of academic honesty and professional ethics be stressed throughout the educational process. The college, faculty, and student share responsibilities in addressing this issue. Student responsibilities are twofold: 1. Complete class assignments to the best of their ability without plagiarizing, cheating or in any way misrepresenting their work. 2. Refrain from participating in any form of academic dishonesty as an individual or in combination with other individuals. (Student Handbook p.22)* If you must miss a writing assignment/test, please make prior arrangements with me, as soon as possible, during my posted office hours only. **Makeup writing assignment/tests will not be accepted later than one week after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment. *No exceptions.***

Attendance Policy

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Weather Policy

Due to state requirements mandating the number of instruction hours, Colby Community College rarely cancels regularly scheduled classes due to inclement weather. The decision to attend class during hazardous weather conditions rests with each individual student. Commuters should check with civil authorities for weather and road conditions (Student Handbook, p. 17). ***In the event of foul weather or cancellation of school, the student can participate through the college online website.***

Final Examinations

*Final examinations are required in all courses and are to be taken at the scheduled time and location. These are printed in the schedule booklet. Changes in the schedules can only be made by the Vice President of Academic Affairs (Student Handbook, p. 17).

Academic Probation and Suspension

* A student registered for a minimum of seven credit hours who does not maintain a semester grade point average of 2.0 will be placed on probation the following semester of enrollment. If at the close of that semester the student has not raised the grade point average, the student may be placed on suspension, during which time

the student may not be recommended for admission to any other academic institution. Failure to make satisfactory academic progress may impact financial aide recipients. (Student handbook, p. 23)

Syllabus Information Disclaimer *"I reserve the right to change any information contained in this document, when necessary, with adequate notice given to the student. Notice shall be given in the classroom during class. No other notice is required. It is the students' responsibility to keep up with any changes, modifications, adjustments or amendments that are made to this document."*

Accommodations for Students with Disabilities Use *the following statement: "According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."*

Equipment: Current audio/visual and or digital media whether in the classroom or online.

Bibliography

Useful Websites
OSHA

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE177 Basic Wind **Year: Fall 2010**

Department: Applied Technologies **Credit Hours: 3**

Required Text: Introduction to Wind, 2nd ed. **Days/Time:**

by Paul Gipe, Chelsea Green, 2009

Instructor: **Room #:**

Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: none**

Rationale

With the world turning away from fossil fuels because of environmental concerns, wind power has become an attractive alternative energy source for the twenty-first century and beyond.

Course Description

The student will be exposed to the many facets of the wind industry. The course will cover the history and development of the wind industry, terminology used in the industry, types and applications of various wind turbines, environmental and economic issues of the wind industry, the future of the wind industry and other topics that are appropriate.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Historical overview of global wind power development from ancient times into the 21st century
2. Technical design of commercial and small wind turbines and resulting environmental impact
3. Classification of the many sizes of wind turbines
4. The two types of small wind turbines
5. Grid connection of wind turbines
6. Basic terminology of the wind energy field

Course Learning Objectives

1. Attain an historical overview of wind power usage since ancient times
2. Identify the wind turbines components
3. Calculate the available wind power and estimate electrical power generation.

4. Simulate the Wind Turbine dynamic system behavior
5. Study the basics on turbine siting
6. View the 400+ small wind turbines in the marketplace today.
7. Address the future of wind energy in the U.S. and globally

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness and knowledge of wind energy systems
2. Engage student learners with fieldtrips to residential and industrial size turbines
3. Define general wind terminology
4. Describe various components of wind turbines
5. Analyze blade efficiencies
6. Analyze the anatomy of a wind farm and wind turbine siting
7. Address environmental impacts upon wind, land and human resources

Method of Instruction Lecture on-site and/or online utilizing fieldtrips of business and industry sites.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a renewable energy project.

Attendance (See Attendance Policy on next page) 15% of final grade

Written Assignment/Test Policy
* In accordance with the mission of Colby Community College to provide for the development of better futures for it's students-it is essential that the principles of academic honesty and professional ethics be stressed throughout the educational process. The college, faculty, and student share responsibilities in addressing this issue. Student responsibilities are twofold: 1. Complete class assignments to the best of their ability without plagiarizing, cheating or in any way misrepresenting their work. 2. Refrain from participating in any form of academic dishonesty as an individual or in combination with other individuals. (Student Handbook p.18)* If you must miss a writing assignment/test, please make prior arrangements with me, as soon as possible, during my posted office hours only. **Makeup writing assignment/tests will not be accepted later than one week after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment. *No exceptions.***

Attendance Policy

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Weather Policy

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Final Examinations

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Academic Probation and Suspension
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Syllabus Information Disclaimer *Use the following statement: "I reserve the right to change any information contained in this document, when necessary, with adequate notice given to the student. Notice shall be given in the classroom during class. No other notice is required. It is the students' responsibility to keep up with any changes, modifications, adjustments or amendments that are made to this document."*

Accommodations for Students With Disabilities *Use the following statement: "According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."*

Equipment Current audio/visual and or digital media whether in the classroom or online.

Bibliography
Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press
Isbn# 0120885107

Useful Wind Energy Websites

Wind Basics	www.nrel.gov/learning/re_wind.html
Wind energy tutorial	www.awea.org/faq/
Wind resource maps	www.nrel.gov/wind/resource_assessment.html
Wind energy technology	www.world-wind-energy.info/
Wind energy manual	www.energy.iastate.edu/renewable/wind/wem-wem-02_toc.htmal
Small wind	www.awea.org/smallwind/
Wind energy for kids	www.alliantenergykids.com

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 178 **Year: Fall, 2010**

Intermediate Wind

Department: Applied Technologies **Credit Hours: 3**

Required Text: Wind Energy Basics **Days/Times**

By Paul Gipe, Chelsea Green, 2009

Instructor: **Room #:**

Office Hours: **Phone:**

Course Placement: Freshman/Sophomores **Pre-requisite: AE 176, AE 177**

Rationale

With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description

The student will be introduced to the aspects of industry standards, requirements and issues that are a part of working in the field with a wind turbine. Information to be covered will include all but not limited to safety training, working around cranes and riggings, turbine siting, tower climbing, fasteners and lubricants used in the industry and other subject matter that may be appropriate.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Explore an historical overview of wind energy from the 1990s into the 21st century
2. Examine the twelve major Industrial size wind turbine companies
3. Appraise the 400+ small wind turbines on the marketplace today
4. Examine developments in this wind energy field at NREL from the 1990s to the 21st Century

Course Learning Objectives

1. View an historical overview of wind energy since the 1990s
2. Explore current developments in industrial size turbine technology
3. Attain knowledge concerning recent developments in small horizontal axis turbines

4. Appraise recent developments in small vertical axis turbines
5. Summarize the future for wind in the U.S. and Globally
6. Develop and implement wind project

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness and understanding of bid and small wind energy systems
2. Engage student learners in hands-on experimentation with big and small wind turbines
3. Engage the student in basic understanding of anemometers
3. Examine the application of wind energy systems in residential and commercial settings
4. Explain the installation techniques for transitioning to wind energy systems
5. Explore the future of embracing wind energy technologies globally.
6. Ability to develop and work on wind projects.

Method of Instruction Lecture on-site and/or online utilizing fieldtrips and guest speakers where necessary.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and develop an implementation plan for a wind project using the knowledge gained.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

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Attendance Policy

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Weather Policy

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Final Examinations

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Academic Probation and Suspension
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Equipment Current audio/visual and or digital media whether in the classroom or online along with equipment purchased for this course and business and industry partner's equipment and sites.

Bibliography
Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press
Isbn# 0120885107

Useful Renewable Energy Websites

Wind Basics	www.nrel.gov/learning/re_wind.html
Wind energy tutorial	www.awea.org/faq/
Wind resource maps	www.nrel.gov/wind/resource_assessment.html
Wind energy technology	www.world-wind-energy.info/
Wind energy manual	www.energy.iastate.edu/renewable/wind/wem-wem-02_toc.htmal
Small wind	www.awea.org/smallwind/
Wind energy for kids	www.alliantenergykids.com

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 179 **Year: Fall, 2010**

Advanced Wind

Department: Applied Technologies **Credit Hours: 3**

Required Text: Wind Energy Basics **Days/Time:**

by Paul Gipe, Chelsea Green, 2009

Instructor: **Room #:**

Office Hours: **Phone:**

Course Placement: Freshman/Sophomores **Pre-requisite: AE 177, AE 178**

Rationale

With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description

The student will be introduced to the generation of electrical power with a wind turbine generator, moving that power through a local transmission system to a substation where a customer will purchase the generated power. This course will cover all aspects of working with components of a high voltage transmission system. And, hands on experience with wind energy.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Assess an overview of the generation of wind power from the 1970s into the 1990s
2. Historical overview of development of regional transmission organizations since 1995
3. Current update on transmission line developments in the since 2005
4. Future trends in the field.
5. Projects that are making change and anticipated capacity of tomorrow.
6. [CAES] Compressed Air Energy Storage Technology

Course Learning Objectives

1. Acquire working knowledge about the American Recovery and Reinvestment Act of 2009

2. Attain working knowledge of current transmission line infrastructure in the U.S.
3. Study proposed transmission projects underway in the WTT, EITS and SWW pools
4. Continue the development, implementation of wind project and have competencies to enter the field.

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness and understanding of acronym terminology systems
2. Fortify basic knowledge of current U.S. transmission lines for student learners
3. Advise the student on transmission projects underway in the United States
4. Critique projects increases in power production for residential and commercial settings
4. Explain the installation techniques for transmission line systems
5. Explore the impact of new federal guidelines on transmission line technology
6. Demonstrate skills in wind technology, grid and battery storage, tower installation and maintenance. Through boot-camp lab project.

Method of Instruction Lecture on-site and/or online utilizing lab, fieldtrips where necessary, and boot-camp to gain competencies.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a project demonstrating competencies gained and present the project.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

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after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment. *No exceptions.*

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Academic Probation and Suspension
* A student registered for a minimum of seven credit hours who does not maintain a semester grade point average of 2.0 will be placed on probation the following semester of enrollment. If at the close of that semester the student has not raised the grade point average, the student may be placed on suspension, during which time the student may not be recommended for admission to any other academic institution. Failure to make satisfactory academic progress may impact financial aide recipients. (Student handbook, p. 23)

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Accommodations for Students With Disabilities *Use the following statement: "According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."*

Equipment Current audio/visual and or digital media whether in the classroom or online, current technical equipment and equipment and space donated.

Bibliography
Fundamental or Renewable Energy Processes
Aldo Da Rosa
Revised & Approved May 2003

Elsevier Academic Press
Isbn# 0120885107

Useful Renewable Energy Websites

Wind Basics	www.nrel.gov/learning/re_wind.html
Wind energy tutorial	www.awea.org/faq/
Wind resource maps	www.nrel.gov/wind/resource_assessment.html
Wind energy technology	www.world-wind-energy.info/
Wind energy manual	www.energy.iastate.edu/renewable/wind/wem-wem-02_toc.htmal
Small wind	www.awea.org/smallwind/
Wind energy for kids	www.alliantenergykids.com

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 180 **Year: Fall, 2010**

WIND INSTALLATION

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomores **Pre-requisite: AE179**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description

This course will cover the basic wind turbine technology that is essential to understanding over all layout, installation, operation, maintenance, troubleshooting and repair of electrical, electromechanical and electronic equipment systems. This course will also cover technical support manuals, computer maintenance databases and supervisor control and data acquisition

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Historical overview of wind energy from the 1980s into the 21st century
2. Historical overview of the creation of the Department of Energy and NREL in 1977
3. Big and Small turbine technology developments
4. Field trip to Smoky Hill Wind Farm in Saline and Ellsworth Counties, Ks.
5. Field trip to Quinter High School, Quinter, Ks.
6. Sitting and construction of residential and commercial sized turbines

Course Learning Objectives

1. Complete a tower climb test
2. Use general wind turbine terminology
3. Describe the evolution of wind turbine technology
4. Explain air flow, blade efficiencies and environmental impacts on each
5. Define the anatomy of a wind farm, parts of a turbine and plant, and components of the team
6. Identify safety regulations, personal protection equipment and practices
7. Examine site construction, foundation roads and substation development
8. Discuss environmental, ethical and legal obligations of the wind farm
9. Complete installation procedures and mapping the project.

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness and understanding on siting wind turbines
2. Engage student learners in hands-on visits with field trips to small and large wind turbines
3. Engage the student in awareness of industry safety standards
4. Examine the application of construction methods to turbine sites
5. Exhibit awareness of local, state and federal rules and regulations on environmental impact and 'footprint' of the construction and installation of a wind turbine.
6. Exhibit the ability to develop and implement installation procedures.

Method of Instruction Lecture on-site and/or online utilizing lab, fieldtrips where necessary, and a boot-camp will be held to gain competencies.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a feasibility study to bring a renewable energy system to the area and determine the best site and installation procedures.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty
* In accordance with the mission of Colby Community College to provide for the development of better futures for it's students-it is essential that the principles of academic honesty and professional ethics be stressed throughout the educational process. The college, faculty, and student share responsibilities in addressing this

issue. Student responsibilities are twofold: 1. Complete class assignments to the best of their ability without plagiarizing, cheating or in any way misrepresenting their work. 2. Refrain from participating in any form of academic dishonesty as an individual or in combination with other individuals. (Student Handbook p.22)* If you must miss a writing assignment/test, please make prior arrangements with me, as soon as possible, during my posted office hours only. **Makeup writing assignment/tests will not be accepted later than one week after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment. *No exceptions.***

Attendance Policy

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Weather Policy

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Final Examinations

*Final examinations are required in all courses and are to be taken at the scheduled time and location. These are printed in the schedule booklet. Changes in the schedules can only be made by the Vice President of Academic Affairs (Student Handbook, p. 17).

Academic Probation and Suspension
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Equipment Current audio/visual and or digital media whether in the classroom or online.

Bibliography

Fundamental or Renewable Energy Processes

Aldo Da Rosa

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Useful Renewable Energy Websites

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Wind energy technology	www.world-wind-energy.info/
Wind energy manual	www.energy.iastate.edu/renewable/wind/wem-wem-02_toc.htmal
Small wind	www.awea.org/smallwind/
Wind energy for kids	www.alliantenergykids.com

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE181 Small Wind Turbine **Year: Spring 2011**

Department: Applied Technologies **Credit Hours: 3**

Required Text: Introduction to Wind, 2nd ed. **Days/Time:**

by Paul Gipe, Chelsea Green, 2009

Instructor: **Room #:**

Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: none**

Rationale

With the world turning away from fossil fuels because of environmental concerns, wind power has become an attractive alternative energy source for the twenty-first century and beyond.

Course Description

This course covers the basic concept of the interconnection and integration of wind and electrical systems and exposes the student to the many facets of the wind industry. It covers the history and development of the small wind industry, terminology used in the industry, types and applications of various small wind turbines. It also covers environmental and economic issues of the wind industry and the future of this industry.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Historical overview of global wind power development from ancient times into the 21st century
2. Technical design of commercial and small wind turbines and resulting environmental impact
3. Grid connection of grid-tie small wind turbines
4. Overview on the two types of small wind turbines – Horizontal and vertical axis turbines
5. Advantages and disadvantages of both horizontal and vertical axis wind turbines
6. Siting issues with horizontal and vertical axis wind turbines
7. The future of the small wind turbine industry

Course Learning Objectives

1. An historical overview of wind power usage since ancient Persia

2. An historical overview of small wind turbine development and usage since the 1930s
3. Attaining knowledge of small Wind Turbine design and siting
4. Viewing the working parts of a small wind turbine generator
5. Studying the two types of small wind turbines – Horizontal and vetical axis turbines
6. Attaining knowledge of the advantages and disadvantages of all small wind turbines
7. The future of small wind turbines in the U.S. and Globally

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness of small wind turbine component terminology
2. Engage student learners in hands-on experimentation with small wind turbines
3. Examine the application of small wind turbines in residential and commercial settings
4. Explain the risks involved with transitioning to mini and micro turbine systems
5. Explore the future implications of embracing small wind turbines globally.

Method of Instruction Lecture on-site and/or online utilizing lab, fieldtrips where necessary, and onsite training

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a project demonstrating competencies learned on small turbines.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

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after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment. *No exceptions.*

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Equipment Current audio/visual and or digital media whether in the classroom or online, equipment available in lab/classroom and donated items.

Bibliography

Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press
Isbn# 0120885107

Useful Wind Energy Websites

Wind Basics	www.nrel.gov/learning/re_wind.html
Wind energy tutorial	www.awea.org/faq/
Wind resource maps	www.nrel.gov/wind/resource_assessment.html
Wind energy technology	www.world-wind-energy.info/
Wind energy manual	www.energy.iastate.edu/renewable/wind/wem-wem-02_toc.htmal
Small wind	www.awea.org/smallwind/
Wind energy for kids	www.alliantenergykids.com

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 190 Electronics Year: Fall, 2010

Department: Applied Technologies **Credit Hours: 3**

Required Text: Basic Electronics **Days/Time:**

By Bernard Grob and M.E. Schultz,

9th ed., Glencoe/McGraw Hill Ed., 2009

Instructor: **Room #:**

Office Hours: **Phone:**

Course Placement:Freshman/Sophomore **Pre-requisite: none**

Rationale

With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and need a work force trained the basics of electronics to meet the need.

Course Description

This course covers basic terminology, basic power electronics, power supplies for machines, electronic test equipment usage, variable speed controllers and electronic lighting controls.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Define basic terminology in the field of power electronics
2. Analyze and understand power electronic circuits
3. Analyze models of electrical machines suitable for deriving current, torque and speed regulators

Course Learning Objectives

1. The student will have a solid understanding of the basic principles of electronics
2. The student will be familiar with electronic devices and basic testing equipment
3. The student will acquire practical skills in designing, analyzing, building and trouble shooting basic electronic circuits.

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Describe basic electrical and electronic terminology
2. Analyze simple circuitry using basic laws as Ohm's and Kirchoff's laws of electricity
3. Identify basic electronic components and use them to construct simple projects
4. Distinguish between electrical energy and power.
5. Predict behavior of simple transient circuits and filters
6. Demonstrate knowledge of computers in order to build and analyze virtual electronic circuits
7. Possess knowledge of career paths utilizing basic electronic skills

.

Method of Instruction Lecture on-site and/or online utilizing hands on projects and business and industry sites for activities.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will develop a project demonstrating their knowledge of electronics, electronic testing, and applied skills.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

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Attendance Policy
Revised & Approved May 2003

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Final Examinations

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Equipment Current audio/visual and or digital media whether in the classroom or online and laboratory equipment and simulators.

Bibliography
Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press
Isbn# 0120885107

Useful Renewable Energy Websites (TBD)

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 200 **Year: Fall, 2011**

GEOTHERMAL BASICS

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomores **Pre-requisite: none**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will introduce the student to characteristics and types of geothermal systems, types and characteristics of surface manifestations, conceptual models, rock and fluid properties, scope and survey of geothermal projects, production facilities and utilization of geothermal energy for electricity generation.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Historical overview of geothermal energy use from the 1860s into the 21st century
2. Historical overview of geothermal research at the U.S. Department of Energy since 1977
3. Basic geothermal terminology
4. Overview of the four basic types of geothermal installation systems
5. Characteristics of the four basic geothermal installation systems
6. Geothermal energy processes and systems
7. Overview of ground source heat pumps for residential or commercial usage
8. Overview of career paths and employment in geothermal related fields

Course Learning Objectives

1. Historical overview of geothermal usage since the 1860s
2. Current global geothermal usage from natural and man-made sources
3. Explore geothermal energy from the Earth
4. Introduce to geothermal dynamics
5. Geothermal dynamics
6. Geothermal processes for residential and/or commercial application
7. Ground source heat pump energy systems
8. Career opportunities and employment in geothermal related fields
9. The future of geothermal energy in the U.S. and Globally

Course Competencies A *set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness of geothermal theory and terminology
2. Emphasize student awareness of basic natural geothermal processes
3. Highlight the four geothermal commercial system applications
4. Engage student learners in hands-on experimentation with geothermal energy processes
5. Engage the student in a geothermal class project
6. Examine the application of geothermal systems in residential and commercial settings
7. Explain the installation techniques for transitioning to geothermal energy systems
8. Explore the future of embracing geothermal energy technologies globally.

Method of Instruction Lecture on-site and/or online utilizing guest speakers and fieldtrips where necessary.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a feasibility study on a geothermal project.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

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Equipment Current audio/visual and or digital media whether in the classroom or online.

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Fundamental or Renewable Energy Processes

Aldo Da Rosa
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Isbn# 0120885107

Useful Renewable Energy Websites

Geothermal

www.eere.energy.gov/geothermal

www.geo-energy.org

www.geoexchange.org

www.igshpa.okstate.edu

http://geothermal.ed.doe.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 201 **Year: Fall, 2011**

GEOTHERMAL INTERMEDIATE

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomores **Pre-requisite: AE 200**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will elevate student awareness of utilization of geothermal energy for electricity generation for direct uses, types of energy conversion cycles/systems applied in the varying types of geothermal power plants, types of turbines, condensers, cooling towers, gas extraction systems and calculation of power output or steam consumption for the main types of power plants

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Review of geothermal energy use from the 1860s into the 21st century
2. Review of geothermal research at the U.S. Department of Energy since 1979
3. Review of geothermal terminology
4. Differences between geothermal and petroleum systems
5. Characteristics of rock and fluid properties
6. Scope of geothermal projects
7. Geothermal exploration covering geology, geochemistry and geophysical exploration

Course Learning Objectives

1. Utilization of geothermal energy for electricity generation and for direct uses

2. Types of energy conversion cycles/systems applied in a number of geothermal plants
3. Types of turbines, condensers, cooling tower and gas extraction systems
4. Introduce to geochemistry and geophysical theory and terminology
5. Rock and fluid dynamics
6. Geothermal processes for residential and/or commercial application
7. Calculation of power output or steam consumption
8. The future of geothermal energy in the U.S. and Globally

Course Competencies A *set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness of geothermal theory and terminology
2. Emphasize student awareness of basic natural geothermal processes
3. Highlight the four geothermal commercial system applications
4. Engage student learners in hands-on experimentation with geothermal energy processes
5. Engage the student in a geothermal class project
6. Examine the application of geothermal systems in residential and commercial settings
7. Explain the installation techniques for transitioning to geothermal energy systems
8. Explore the future of embracing geothermal energy technologies globally.
9. Ability to develop and implement a project.

Method of Instruction Lecture on-site and/or online utilizing lab, fieldtrips where necessary, and boot-camp to develop skills.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a geothermal project from planning to implementation.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

* In accordance with the mission of Colby Community College to provide for the development of better futures for its students-it is essential that the principles of academic honesty and professional ethics be stressed throughout the educational process. The college, faculty, and student share responsibilities in addressing this issue. Student responsibilities are twofold: 1. Complete class assignments to the best of their ability without plagiarizing, cheating or in any way misrepresenting their work. 2. Refrain from participating in any form of academic dishonesty as an individual or in combination with other individuals. (Student Handbook p.22)* If you

must miss a writing assignment/test, please make prior arrangements with me, as soon as possible, during my posted office hours only. **Makeup writing assignment/tests will not be accepted later than one week after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment.** ***No exceptions.***

Attendance Policy
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Weather Policy
Due to state requirements mandating the number of instruction hours, Colby Community College rarely cancels regularly scheduled classes due to inclement weather. The decision to attend class during hazardous weather conditions rests with each individual student. Commuters should check with civil authorities for weather and road conditions (Student Handbook, p. 17). ***In the event of foul weather or cancellation of school, the student can participate through the college online website.***

Final Examinations
*Final examinations are required in all courses and are to be taken at the scheduled time and location. These are printed in the schedule booklet. Changes in the schedules can only be made by the Vice President of Academic Affairs (Student Handbook, p. 17).

Academic Probation and Suspension
* A student registered for a minimum of seven credit hours who does not maintain a semester grade point average of 2.0 will be placed on probation the following semester of enrollment. If at the close of that semester the student has not raised the grade point average, the student may be placed on suspension, during which time the student may not be recommended for admission to any other academic institution. Failure to make satisfactory academic progress may impact financial aide recipients. (Student handbook, p. 23)

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Accommodations for Students with Disabilities "*According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."*

Equipment Current audio/visual and or digital media whether in the classroom or online.

Bibliography

Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press

Isbn# 0120885107

Useful Renewable Energy Websites

Geothermal

www.eere.energy.gov/geothermal

www.geo-energy.org

www.geoexchange.org

www.igshpa.okstate.edu

http://geothermal.ed.doe.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 202 **Year: Fall, 2011**

GEOTHERMAL ADVANCED

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE201**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will introduce the student to the principles of heat transfer, boiling and condensation their application to geothermal energy technology from the reservoir to the well, to the steam, water and two phase transmission pipe, condensation traps to the power plant including condensers, cooling tower, types and selection of heat exchangers for direct application for geothermal fluid for heating, cooling and drying.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Review of new technological changes within geothermal energy usage in the 21st century
2. Update on geothermal research at the U.S. Department of Energy
3. Update on geothermal projects both in the U.S. and globally
4. Calculation of power output or steam consumption for power plants with dry steam cycles
5. Calculation of power output or steam consumption for power plants with separated steam, Single flash, double flash or binary cycle systems.
6. Direct uses of geothermal energy for drying agricultural products
7. Environmental impact created by geothermal technologies

Course Learning Objectives
1. Utilization of geothermal energy for electricity generation and for direct uses

2. Types of energy conversion cycles/systems applied in a number of geothermal plants
3. Types of turbines, condensers, cooling tower and gas extraction systems
4. Introduce to geochemistry and geophysical theory and terminology
5. Rock and fluid dynamics
6. Geothermal processes for residential and/or commercial application
7. Calculation of power output or steam consumption from single, double or binary cycle systems
8. Environmental impact of various geothermal system usages

Course Competencies A *set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness of multiple geothermal cycle/systems
2. Emphasize mathematical calculation of energy output from varying geothermal systems
3. Highlight the environmental impact from development and utilization of geothermal
4. Engage student learners in hands-on experimentation with geothermal energy processes
5. Engage the student in a geothermal class project in a residential or commercial setting
6. Examine the application of geothermal systems in an agricultural setting
7. Explore sitting and installation issues for ground source heat pump systems
8. Explore land subsidence, heat emission, ecosystem disturbance and CDM issues
9. Student will demonstrate the ability to plan, develop, and implement a geothermal project.

Method of Instruction Lecture on-site and/or online utilizing fieldtrips where necessary, and a boot-camp to gain competencies.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams to plan, develop, and implement a project.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

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you must miss a writing assignment/test, please make prior arrangements with me, as soon as possible, during my posted office hours only. **Makeup writing assignment/tests will not be accepted later than one week after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment.** ***No exceptions.***

Attendance Policy
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Weather Policy
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Final Examinations
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Academic Probation and Suspension
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Accommodations for Students with Disabilities "*According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."*

Equipment Current audio/visual and or digital media whether in the classroom or online, laboratory, and boot camp activities.

Bibliography
Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press

Isbn# 0120885107

Useful Renewable Energy Websites

Geothermal

www.eere.energy.gov/geothermal

www.geo-energy.org

www.geoexchange.org

www.igshpa.okstate.edu

http://geothermal.ed.doe.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 203 **Year: Fall, 2011**

GEOTHERMAL INSTALLATION

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomores **Pre-requisite: AE201, AE202**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will detail for the student a 'drilling plan' covering well site preparation, planning of well target, well geometry, drilling equipment, casing design, drilling fluid cementing, rock mechanics, directional drilling, measurements and monitoring during drilling and well control.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Review of recent developments globally in geothermal installation in the 21st century
2. Overview of rock dynamics and site issues for geothermal well exploration
3. Variance in production facility infrastructure at selected sites globally
4. Component structural elements for geothermal plant construction
5. Consideration of environmental impact (ground, noise, air pollution) by geothermal installation
6. Disturbances in the ecosystem.
7. Mitigation and monitoring techniques
8. Creation of a (CDM) Clean Development Mechanism

Course Learning Objectives
1. Learn basic construction components and issues of a dry steam power plant
2. Explore basic construction components and issues of a single flash power plant
3. Address basic construction components and issues of a double flash power plant

4. Attain working knowledge of construction components and issues of a binary cycle power plant
5. Calculation of power output or steam consumption from single, double or binary cycle systems
6. Environmental impact of various geothermal system usages (gas emissions, noise and water pollution)
7. Disturbances

Course Competencies A *set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate awareness of construction components of geothermal cycle/systems
2. Emphasize mathematical calculation of energy output from varying geothermal systems
3. Highlight the environmental impact from development and utilization of geothermal
4. Engage students in hands-on experimentation with geothermal plant construction
5. Introduce the student to geothermal plant construction by fieldtrip
6. Examine a geothermal dry cycle system in an agricultural setting
7. Explore site and installation issues for ground source heat pump systems
8. Explore land subsidence, heat emission, ecosystem disturbance and CDM issues
9. Demonstrate the ability to install and map installation.

Method of Instruction Lecture on-site and/or online utilizing fieldtrips where necessary. Boot-camp to gain competencies

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)

Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and complete an installation of the system.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

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the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment. *No exceptions.*

Attendance Policy
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Weather Policy
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Final Examinations

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Academic Probation and Suspension
* A student registered for a minimum of seven credit hours who does not maintain a semester grade point average of 2.0 will be placed on probation the following semester of enrollment. If at the close of that semester the student has not raised the grade point average, the student may be placed on suspension, during which time the student may not be recommended for admission to any other academic institution. Failure to make satisfactory academic progress may impact financial aide recipients. (Student handbook, p. 23)

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Equipment: Current audio/visual and or digital media whether in the classroom or online.

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http://geothermal.ed.doe.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE220 **Year: fall, 2011**

BIOFUEL BASICS

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomores **Pre-requisite: none**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course is designed for both biofuel majors and non-science majors. The first unit will cover basic terminology and concepts involved with biofuels and the second unit covering material and principles of general plant biology, biochemistry and plant ecology relevant to understanding the process of conversion of plant biomass to biofuel. The third unit will introduce the student to the pros and cons of corn-versus-cellulosic ethanol.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Historical overview of global energy crises from the 1970s into the 21st century
2. Historical overview of the creation of the Department of Energy in 1977
3. Historical overview of biofuel production and usage since the 1980s
4. Overview of the scientific basis for the greenhouse effect as it relates to climate change
5. Describe basic terminology in this field
6. Overview of how ethanol, biodiesel, methane and biomass are produced and used as energy sources
7. Analyze knows and potential carbon and water 'footprints' of various fuels
8. Analyze known and potential economic and environmental costs and benefits of each energy source

Course Learning Objectives

1. Historical overview of biofuel energy sources since the 1980s
2. Current global energy usage from biofuel related energy sources
3. Recent technological updates in the biofuel related energy fields
4. BioEnergy and Biomass defined
5. Biofuel production for commercial application
6. Understanding the scientific basis for the Greenhouse Effect causing climate change
7. Explore the production process and potential of ethanol, biodiesel and methane as fuel sources.
8. Address the carbon footprint of each biofuel energy source.
9. Discuss the advantages and disadvantages of each biofuel energy source.
10. The future of biofuel technologies in the U.S. and Globally

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness and understanding of renewable energy systems
2. Engage student learners in hands-on experimentation with alternative energy processes
3. Engage the student in energy resource management
3. Examine the application of alternative energy systems in residential and commercial settings
4. Explain the installation techniques for transitioning to alternative energy systems
5. Explore the future of embracing renewable energy technologies globally.
6. Demonstrate basic skills in the biofuel area.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips to business and industry sites and projects to gain competencies.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and complete a feasibility study to bring a bio-fuel project to the area.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

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Attendance Policy
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Weather Policy
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Final Examinations
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Academic Probation and Suspension
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Equipment: Current audio/visual and or digital media whether in the classroom or online and equipment available in the classroom and through business and industry.

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Aldo Da Rosa
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Useful Renewable Energy Websites
Biofuel

www.nrel.gov/biomass

www.eere.energy.gov/biomass

www.biodiesel.org

http://biodoesel.ornl.gov

http://apps3.eere.energy.gov/greenpower

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE221 **Year: Fall, 2011**

BIOFUEL INTERMEDIATE

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE220**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will restate fundamental concepts in understanding biofuel/bioenergy, renewable feedstock, production, availability and attributes for biofuel production but elevate student awareness of thermo chemical conversion of biomass to fuel, biodiesel production and resulting environmental impacts of biofuel production.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Historical overview of global biofuel usage from the 1990s into the 21st century
2. Historical overview of the creation of corn-based ethanol since 1992
3. Historical overview of other biofuel technologies since 2005
4. Overview of the scientific basis for the greenhouse effect as it relates to climate change
5. Impact upon biofuel production by the American Recovery and Reinvestment Act of 2009
6. Overview of cellulosic ethanol, biodiesel, methane production from biomass energy sources
7. Analyze knows and potential carbon and water 'footprints' of various fuels
8. Analyze known and potential economic and environmental costs and benefits of each energy source

Course Learning Objectives
1. Historical overview of biofuel energy usage globally from the 1990s into the 21st Century
2. Current global energy usage from biofuel related energy sources

3. Recent technological updates in the biofuel related energy fields
4. Federal financial incentives and tax credits from the ARRA act of 2009
5. Biomass to Biofuel production for commercial application
6. Understanding the scientific basis for the Greenhouse Effect causing climate change
7. Explore the production process and potential of ethanol, biodiesel and methane as fuel sources.
8. Address the carbon footprint of each biofuel energy source.
9. Discuss the advantages and disadvantages of each biofuel energy source.
10. The future of biofuel technologies in the U.S. and Globally

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness of the types of biofuels (corn, cellulosic, biodiesel, methane)
2. Engage students in learning the structure and function of plants that become biomass
3. Engage the student understanding the structure and function of alga used to make biofuel
3. Explore the potential of biofuel energy usage in residential and commercial settings
4. Explain the installation techniques for transitioning to biofuel systems
5. Explore the future of embracing the various biofuel energy technologies globally.
6. Ability to demonstrate the development and implementation.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary, and a boot-camp to demonstrate competencies.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)

Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and develop and implement a bio-fuel project.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

* In accordance with the mission of Colby Community College to provide for the development of better futures for its students-it is essential that the principles of academic honesty and professional ethics be stressed throughout the educational process. The college, faculty, and student share responsibilities in addressing this issue. Student responsibilities are twofold: 1. Complete class assignments to the best of their ability without plagiarizing, cheating or in any way misrepresenting their work. 2. Refrain from participating in any form of academic dishonesty as an individual or in combination with other individuals. (Student Handbook p.22)* If you

must miss a writing assignment/test, please make prior arrangements with me, as soon as possible, during my posted office hours only. **Makeup writing assignment/tests will not be accepted later than one week after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment.** ***No exceptions.***

Attendance Policy
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Weather Policy
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Final Examinations
*Final examinations are required in all courses and are to be taken at the scheduled time and location. These are printed in the schedule booklet. Changes in the schedules can only be made by the Vice President of Academic Affairs (Student Handbook, p. 17).

Academic Probation and Suspension
* A student registered for a minimum of seven credit hours who does not maintain a semester grade point average of 2.0 will be placed on probation the following semester of enrollment. If at the close of that semester the student has not raised the grade point average, the student may be placed on suspension, during which time the student may not be recommended for admission to any other academic institution. Failure to make satisfactory academic progress may impact financial aide recipients. (Student handbook, p. 23)

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Accommodations for Students with Disabilities "*According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."*

Equipment: Current audio/visual and or digital media whether in the classroom or online, laboratory, and boot camp on site.

Bibliography

Fundamental or Renewable Energy Processes
Aldo Da Rosa
Revised & Approved May 2003

Elsevier Academic Press
Isbn# 0120885107

Useful Renewable Energy Websites
Biofuel

www.nrel.gov/biomass

www.eere.energy.gov/biomass

www.biodiesel.org

http://biodoesel.ornl.gov

http://apps3.eere.energy.gov/greenpower

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE222 **Year: Fall, 2011**

BIOFUEL ADVANCED

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE220, AE221**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This advanced course will cover the evolving biofuel technologies of biodiesel, alcohol, cellulosic products and methane to displacing fossil fuels – diesel, gasoline, natural gas and coal. The course will introduce the student to the concepts, tools, techniques and materials needed to assess, design and construct biofuel technology systems.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Historical overview of other biofuel technologies since 2009
2. Carbon Cycle/Life cycle/Greenhouse effect emissions analysis
3. Potential advanced biofuel feedstock (switch grass, sugar cane, and miscanthus)
4. Sustainability issues in biofuel production and commercialization
5. Impact upon biofuel production by the American Recovery and Reinvestment Act of 2009
6. Products made from cellulosic ethanol, biodiesel, methane production
7. Analyze known and potential carbon and water 'footprints' of various fuels
8. Analyze known and potential economic and environmental costs and benefits of each energy source

Course Learning Objectives
1. Historical overview of biofuel energy usage globally in the 21st Century

2. Current global energy usage from biofuel related energy sources
3. Recent technological updates in the biofuel related energy fields
4. Federal financial incentives and tax credits from the ARRA act of 2009
5. Biomass to Biofuel production for commercial application
6. Understanding the scientific basis for the Greenhouse Effect causing climate change
7. Explore the production process and potential of ethanol, biodiesel and methane as fuel sources.
8. Address the carbon footprint of each biofuel energy source.
9. Discuss the advantages and disadvantages of each biofuel energy source.
10. The future of biofuel technologies in the U.S. and Globally
11. Students will demonstrate a working knowledge of bio-fuels and be able to complete development of project.

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness of the structure and function of plants
2. Engage students in learning the structure and function of living cells
3. Engage the student understanding the structure and function of algae used to make biofuel
3. Explore starches and glucose in the production of biofuel
4. Explain biomass recalcitrance (cell wall carbohydrates) – bases, acids, and bacteria
5. Address thermo chemical gasification and pyrolysis
6. Examine the Fischer-Trophe theory and transesterification
7. Explore the use of algae in breaking down biomass into biogas (ALGAL)
8. Discuss the recovery of landfill waste as methane gas for local energy source
9. Students will demonstrate a working knowledge of bio-fuels and be able to complete development of project.

Method of Instruction Lecture on-site and/or online utilizing laboratory, fieldtrips where necessary, and boot camp training on site.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a detailed project using skills gained throughout the course.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

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Attendance Policy

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Weather Policy

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Final Examinations

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Academic Probation and Suspension

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needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."

Equipment: Current audio/visual and or digital media whether in the classroom or online, classroom trainer, and business and industry contributions or equipment/supplies.

Bibliography

Fundamental or Renewable Energy Processes
Aldo Da Rosa
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Useful Renewable Energy Websites
Biofuel

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www.biodiesel.org

http://biodoesel.ornl.gov

http://apps3.eere.energy.gov/greenpower

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE223 **Year: Fall, 2011**

BIOFUEL INSTALLATION

Department: Applied Technologies **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time:**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE 221, AE 222**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will address the planning and construction of bio-refineries that convert renewable feedstock to fuels, chemicals and other value-added products that offer many opportunities for applying multi-disciplinary technologies that produce the biofuel. The enabling technologies, their recent improvements and commercialization status of this rapidly evolving field will be covered.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Update on biofuel technologies and production in the U.S. and globally
2. Update on global climate change analysis
3. Overview of current biofuel production facilities in use for each of the biofuel technologies
4. Sustainability issues for biofuel technologies as a result of construction costs
5. Incentives for biofuel refinery construction in the American Recovery and Reinvestment Act of 2009
6. Terminology, tools and construction knowledge necessary for biofuel facility production
7. Teach students to analyze and design processes for biofuel production.
8. Analyze known and potential economic and environmental costs and benefits of each energy source

Course Learning Objectives

1. Historical overview of the biofuel industry globally in the 21st Century
2. Building an ethanol biofuel economy
3. Methods of ethanol production
4. Federal legislation impacting biofuel production
5. Federal financial incentives and tax credits from the ARRA act of 2009
6. Methods of Fermentation
7. Ethanol vs. Methyl Tertiary Butyl Ether in gasoline
8. Wet mill vs. Dry mill processes
9. Pictorial diagram of the ethanol/biofuel process
10. The future of biofuel technologies in the U.S. and Globally
11. Students will have the skills to plan and install projects.

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Engage students in learning the methods of producing both corn and cellulosic ethanol
2. Engage the student understanding federal legislation impacting the biofuel industry
3. Explore the chemical process of fermentation
4. Explain what wet mill and dry mill processes are
5. Ascertain what thermo chemical gasification and pyrolysis processes are
6. Examine the Fischer-Trophe theory and transesterification
7. Explore the use of algae in breaking down biomass into biogas (ALGAL)
8. Discuss the recovery of landfill waste as methane gas for local energy source
9. Assess second and third generation biofuel production from biomass and other low cost agri-residues and biowastes.
10. Acquire the tools and knowledge necessary for biofuel facility operations.
11. Students will be able to analyze and design processes for biofuel installation.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary, and a boot-camp for skills.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)

Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and plan and complete an install.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty
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Weather Policy
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Final Examinations
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Academic Probation and Suspension
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physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."

Equipment Current audio/visual and or digital media whether in the classroom or online, lab equipment, and business and industry sites.

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http://apps3.eere.energy.gov/greenpower

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 240 **Year: Fall, 2010**

DATA ANALYSIS AND REPORTING

Department: Applied Technologies **Credit Hours: 3**

Required Text: Use current literature **Days/Time:**

Instructor: **Room #:**

Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: none**

Rationale

With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and need a work force trained in the data analysis and reporting procedures to meet the need.

Course Description

This course covers basic literature and procedures used in data analysis and reporting techniques

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Define basic terminology in each energy source and the data needed.
2. Analyze and understand the data
3. Project development and execution

Course Learning Objectives

1. The student will have a solid understanding of the basic principles of data and analysis
2. The student will be familiar with electronic devices and basic testing equipment
3. The student will acquire practical skills in designing, analyzing, building and trouble shooting

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Describe basic electrical and electronic terminology
2. Analyze simple procedures used in each energy method

3. Identify basic electronic components and use them to analyze projects
4. Predict behavior of data and reporting
6. Demonstrate knowledge of computers in order to manipulate data as needed.
7. Possess knowledge of career paths utilizing these skills
8. Possess knowledge on data stream analysis and reporting methods

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary to collect data.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete reporting using analysis of data from various sources.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

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Weather Policy

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Academic Probation and Suspension
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Equipment: Current audio/visual and or digital media whether in the classroom or online.

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Wind Basics	www.nrel.gov/learning/re_wind.html
Wind energy tutorial	www.awea.org/faq/
Wind resource maps	www.nrel.gov/wind/resource_assessment.html
Wind energy technology	www.world-wind-energy.info/
Wind energy manual	www.energy.iastate.edu/renewable/wind/wem-wem-02_toc.htmal
Small wind	www.awea.org/smallwind/
Wind energy for kids	www.alliantenergykids.com

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 241 **Year: Fall, 2012**

Power Storage/Transmission and Conversion

Department: Applied Technologies **Credit Hours: 3**

Required Text: Use current literature **Days/Time:**

Instructor: **Room #:**

Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: none**

Rationale

With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and need a work force trained in the Power Storage/Transmission and Conversion procedures to meet the need.

Course Description

This course covers basic literature and procedures used in Power Storage and transmission conversion techniques and students gain the skills to work with these systems.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Define basic terminology in each energy source and the data needed.
2. Analyze and understand the data
3. Project development and execution

Course Learning Objectives

1. The student will have a solid understanding of the basic principles of data and analysis

2. The student will be familiar with electronic devices and basic testing equipment
3. The student will acquire practical skills in designing, analyzing, building and trouble shooting

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Describe basic electrical and electronic terminology
2. Analyze simple procedures used in each energy method
3. Identify basic electronic components and use them to analyze projects
4. Predict behavior of data and reporting
6. Demonstrate knowledge of power storage and transmission and conversion techniques.
7. Possess knowledge of career paths utilizing these skills

.

Method of Instruction Lecture on-site and/or online utilizing fieldtrips where necessary. Boot-camp to demonstrate skills.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)

Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and complete a feasibility study to bring a renewable energy system to the area.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

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plagiarizing, cheating or in any way misrepresenting their work. 2. Refrain from participating in any form of academic dishonesty as an individual or in combination with other individuals. (Student Handbook p.22)* If you must miss a writing assignment/test, please make prior arrangements with me, as soon as possible, during my posted office hours only. **Makeup writing assignment/tests will not be accepted later than one week after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment.** ***No exceptions.***

Attendance Policy

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Final Examinations

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Academic Probation and Suspension

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Accommodations for Students With Disabilities *Use the following statement: "According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."*

Equipment Current audio/visual and or digital media whether in the classroom or online. Boot-camp using business and industry partners and existing equipment.

Bibliography

Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press
Isbn# 0120885107

Useful Renewable Energy Websites

Wind Basics	www.nrel.gov/learning/re_wind.html
Wind energy tutorial	www.awea.org/faq/
Wind resource maps	www.nrel.gov/wind/resource_assessment.html
Wind energy technology	www.world-wind-energy.info/
Wind energy manual	www.energy.iastate.edu/renewable/wind/wem-wem-02_toc.htmal
Small wind	www.awea.org/smallwind/
Wind energy for kids	www.alliantenergykids.com

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 278 Basics: Small Photovoltaic System **Year:**Fall 2010

Department: Applied Technologies **Credit Hours:** 3

Required Text: James P. Dunlop, In Partnership with NJATC
Photovoltaic Systems, 2nd Edition
American Technical Publishers, Inc.
Orland Park, Illinois 60467-5756

Days/Time: Lecture TBA
Lab

Instructor:
Office Hours:
Course Placement: Freshman/Sophomore

Room #:
Phone:
Pre-requisite: None

Rationale

With growing concerns about the future and security of the world's energy supply, renewable resources such as solar power are becoming increasingly important. Photovoltaic (solar) is a rapidly growing sector of the energy market. This course is intended for students with little or no solar (photovoltaic) background.

Course Description

Basics of Small Photovoltaic Systems cover the basic principles of Photovoltaic, the design of installation, and evaluation of residential and commercial photovoltaic (PV) system. This course provides the basics of how to effectively incorporate photovoltaic systems into stand-alone or interconnected electrical systems.

CCC Student Learning Outcomes Addressed in This Course

1. Effective communication skills
2. Ability to solve problems using a variety of techniques and methods
4. Ability to utilize the technology relevant to the learner's discipline

Course Outline

1. Introduction to Photovoltaic Systems.
2. Solar Radiation.
3. Site Surveys and Preplanning.
4. System Components and Configurations
5. Cell, Modules, and Array

Course Learning Objectives and Competencies

The overall objective of this course is to provide an introductory course of photovoltaic systems in an interesting, accessible and understandable format for the beginning student.

Students will gain the competencies to do the following:

Chapter 1

- Compare the advantages and disadvantages of installing a PV system.
- List some of the factors that have motivated the growth of PV technology worldwide.
- Evaluate the design priorities for PV systems in different types of applications.

- Identify why it is important for installers to be well trained.
- Differentiate between flat-plate collectors and concentrating collectors.
- Explain how the different types of solar energy technologies utilize solar radiation.

Chapter 2

- Differentiate between solar irradiance (solar power) and solar irradiation (solar energy).
- Identify the factors affecting the quantity and composition of solar energy received on Earth's surface.
- Identify the factors affecting the sun's apparent position and path through the sky.
- Calculate the differences between solar time and standard time.
- Evaluate how array orientation affects solar energy received by modules.
- Demonstrate how solar radiation data is used in sizing and estimating performance for PV systems.

Chapter 3

- Identify issues to be discussed to determine customer needs, concerns, and expectations.
- Identify factors to consider in a preliminary assessment, including the local solar resource, environmental conditions, and building code and utility interconnection requirements.
- Explain the process of determining potential array locations.
- Describe methods for determining and diagramming shading patterns.
- Discuss considerations in determining the suitability and condition of existing roofing, structural systems, and electrical systems and equipment.
- Explain the function of an energy audit and identify opportunities for conservation and energy efficiency.
- Indentify factors to be considered when preparing a proposal, including estimates for cost, size, performance, and value of a PV system.

Chapter 4

- Describe the purposes and functions of the major components in PV systems.
- Identify the common types of energy storage systems.
- Compare the functions of various power conditioning devices.
- Describe various energy sources that can be interfaced with PV systems.
- Compare the features, requirements, and applications of various system configurations.
- List various electrical and mechanical balance-of-system components.

Chapter 5

- Identify the relationships between PV cells, modules, and arrays.
- Describe the photovoltaic effect and the fundamental operation of PV devices.
- List the current-voltage (I-V) characteristics for PV devices and define the key I-V parameters.
- Discuss how the electrical load, solar radiation, and operating temperatures affect the electrical output of a PV device.
- Translate the voltage, current, and power output of a PV device from a reference condition to another operating condition.
- Determine the electrical output of similar and dissimilar PV devices connected in series and in parallel.
- Discuss the construction and features of PV modules.
- Describe the various performance rating conditions for PV modules.

Method of Instruction

Lectures, including Power Point presentations and/or video, assigned reading, class discussions either in the physical classroom or online format, individual assignments. Student questions are an important part of the learning process. Students will be expected to participate in open class discussions and assignments. Be prepared for questions on given topics.

Method of Evaluation

The student's evaluation whether in the classroom or online, will be based upon discussion and review questions, quizzes and a final exam. The following will be how the course will be weighted:

1. Discussion Questions 25%
2. Review Questions 25%
3. Quiz 25%
4. Final Exam 25%.

Grading Scale

Letter grades are assigned as follows:

90-100	A
80-89	B
70-79	C
60-69	D
Under 60	F

Course Requirements

Understanding comes from interacting and you cannot interact if you do not participate in class. Be sure to take notes on what you see in Power Point presentations, assigned reading, or during lectures. Important objectives are presented in each class meeting or in each online unit. Communicating your thoughts in the physical classroom or within the online threaded discussion is an important component of learning and participation is an important part of the course.

Assignment Policy

All assignments must be completed and handed in at the designated times assigned by the instructor. No late work will be accepted. (Usually, assignments will be requested at the beginning of class; any attempt to turn in later will be considered late and not accepted.)

Test Policy

Instructor reserves the right to schedule proctored exams.

Attendance Policy

For the physical classroom, attendance is required and roll will be taken daily. Class interaction is important, and material covered in lecture may appear on the test. For online instruction of this course, your attendance is noted by your interaction on the discussion thread and through online assessments.

Syllabus Information Disclaimer

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Accommodations for Students with Disabilities

According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union.

Equipment

Pending POR – 3/09/10

Bibliography

Dunlop, J. P., & in partnership with NJATC (2010). Photovoltaic Systems (2nd ed.). Orland Park, IL American Technical Publishers, Inc.

Useful Renewable Energy Websites

Solar

www1.eere.energy.gov
www.nrel.gov
www. solaramericacities.energy.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 279 **Year: Fall, 2010**

SOLAR PV INTERMEDIATE

Department: Applied Technologies **Credit Hours: 3**

Required Text: Photovoltaic Systems **Days/Time:**

by James P. Dunlop, American Tech. Pub. 2010

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE278**

Rationale

With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description

This course will teach the student how to layout an installation for maximum performance using standard industry tools such as a Solar Path Finder, while utilizing conduit bending, wiring and roof penetration techniques.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Historical overview of global energy crises from the 1970s into the 21st century
2. Study the elements that make up a solar cell
3. Examine basic terminology in the field
4. Review the creation of solar modules and arrays
5. Appraise the component parts that make up both a grid–tie and off-grid solar systems.

Course Learning Objectives
Student will be able to:
1. Define terms frequently used in the solar photovoltaic energy industry
2. Understand career paths in the solar energy industry
3. Understand the evolving composition of the world's energy generation and consumption
4. Understand the ways energy can be generated and distributed.
5. Student will demonstrate a working knowledge of Solar Photovoltaic.

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness and understanding of solar photovoltaic systems
2. Describe markets and applications for photovoltaic systems
3. Identify safety hazards of photovoltaic systems
4. Identify safety practices and protective equipment used during installation
5. Explain OEM, distributor, customer supply chain for photovoltaic equipment
6. Student demonstrate the ability to develop and work on equipment.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary, and a boot-camp to gain competencies.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements
Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a solar photovoltaic project from planning to installation and testing.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty
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Weather Policy
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Final Examinations
*Final examinations are required in all courses and are to be taken at the scheduled time and location. These are printed in the schedule booklet. Changes in the schedules can only be made by the Vice President of Academic Affairs (Student Handbook, p. 17).

Academic Probation and Suspension
* A student registered for a minimum of seven credit hours who does not maintain a semester grade point average of 2.0 will be placed on probation the following semester of enrollment. If at the close of that semester the student has not raised the grade point average, the student may be placed on suspension, during which time the student may not be recommended for admission to any other academic institution. Failure to make satisfactory academic progress may impact financial aide recipients. (Student handbook, p. 23)

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Equipment: Current audio/visual and or digital media whether in the classroom or online, laboratory equipment, and business and industry sites.

Bibliography

Fundamental or Renewable Energy Processes
Aldo Da Rosa
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Isbn# 0120885107

Useful Renewable Energy Websites
Solar
www1.eere.energy.gov
www.nrel.gov
www. solaramericacities.energy.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 280 **Year: Fall, 2010**

SOLAR PV ADVANCED

Department: Applied Technologies **Credit Hours: 3**

Required Text: Photovoltaic Systems **Days/Time:**

by James P. Dunlop, American Tech. Pub. 2010

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE 279**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description
This advanced course will cover the proper design and installation of NEC code-compliant solar photovoltaic (PV) systems for use on residential and commercial buildings. Topics include sizing of solar electric systems; specifications of system components and sizing of DC/AC wiring. This course will prepare the student for the North American Board of Certified energy Practitioners (NABCEP) Solar Photovoltaic (PV) System Installer certification exam.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Historical overview of global energy crises from the 1970s into the 21st century
2. Study the elements that make up a solar photovoltaic system installation and maintenance
3. Examine solar photovoltaic installations through off-campus fieldtrips
4. Review the mathematics and science behind photovoltaic system sizing
5. Appraise the component parts that make up both grid–tie and off-grid solar systems.

Course Learning Objectives
Student will demonstrate the ability to:
1. Define terms frequently used in the solar photovoltaic energy industry
2. Understand career paths * and certification requirements in the solar energy industry
3. Understand the evolving composition of the world's energy generation and consumption

4. Conduct a site assessment for a solar photovoltaic system installation

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Define and demonstrate solar photovoltaic energy fundamentals
2. Explain and calculate photovoltaic module fundamentals using data sheets
3. Describe the purpose and operation of photovoltaic system components.
4. Identify safety practices and protective equipment used during installation
5. Calculate photovoltaic system sizing
6. Student will gain skills to plan, develop, and install systems.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary, and a boot-camp to demonstrate skills.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)

Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and complete planning, designing, and installing a project.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

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COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 281
SOLAR INSTALLATION

Year: Fall, 2010

Department: Applied Technologies

Credit Hours: 3

Required Text: Photovoltaic Systems
by James P. Dunlop, American Tech. Pub. 2010

Days/Time:

Instructor:
Office Hours:
Course Placement: Freshman/Sophomore

Room #:
Phone:
Pre-requisite: AE 279, AE280

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description

This advanced course will expose the student using participation in labs to dealing with understanding load and functionality, panel racking, battery storage, usage calculations leading up to physical installation of a solar photovoltaic system

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Historical overview of global energy crises from the 1970s into the 21st century
2. Study the elements that make up a solar photovoltaic system installation and maintenance
3. Examine solar photovoltaic installations through off-campus fieldtrips
4. Review the mathematics and science behind photovoltaic system sizing
5. Appraise the component parts that make up both grid–tie and off-grid solar systems.

Course Learning Objectives
Students will be able to:
1. Define terms frequently used in installation of solar photovoltaic energy industry
2. Identify personal safety and environmental hazards associated with solar photovoltaic energy systems.
3. Identify typical tools, techniques and equipment required for conducting site surveys for solar installations.
4. Describe themost common solar mounting techniques (ground, roof, and pole).
5. Demonstrate the ability to install equipment and map projects to install.

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Define and demonstrate solar photovoltaic energy fundamentals
2. Calculate photovoltaic system sizing
3. Exhibit knowledge of photovoltaic system electrical design
4. Exhibit knowledge of photovoltaic system mechanical design
5. Describe photovoltaic system performance analysis and troubleshooting
6. Explain proper installation procedures
7. Demonstrate the ability to install equipment and map projects to install.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary, laboratory, and on site.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

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Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and complete a feasibility study to bring a renewable energy system to the area.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

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Equipment: Current audio/visual and or digital media whether in the classroom or online, laboratory, and onsite.

Bibliography
Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press
Isbn# 0120885107

Useful Renewable Energy Websites

Solar

www1.eere.energy.gov
www.nrel.gov
www. solaramericacities.energy.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 282 **Year: Fall, 2011**

SOLAR THERMAL BASICS

Department: Applied Technologies **Credit Hours: 3**

Required Text: Photovoltaic Systems **Days/Time:**

by James P. Dunlop, American Tech. Pub. 2010

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: none**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, alternative solar energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will teach the student basic terminology and identification of the basic system components for solar thermal systems in both passive and active systems. The student will determine system layout, location and configuration of solar thermal installations.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Historical overview of global energy crises from the 1970s into the 21st century
2. Historical overview of usage of solar thermal in the United States since the 1970s
3. Study the elements that make up both active and passive solar thermal systems.
3. Examine solar thermal installations through off-campus fieldtrips
4. Review the mathematics and science behind solar thermal technology
5. Appraise the component parts for both grid–tie and off-grid solar thermal systems.

Course Learning Objectives
1. Define terms frequently used in the solar thermal energy industry
2. Understand basic solar thermal fundamentals
3. Understand career paths * and certification requirements in the solar thermal energy industry
3. Understanding site determination and selection
4. Choosing a system type and system sizing options

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Define and demonstrate solar thermal energy fundamentals
2. Describe the purpose and operation of solar thermal components
3. Explain solar thermal energy production using data sheets
4. Identify safety practices and protective equipment used during installation
5. Calculate solar thermal system sizing

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)

Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and complete a feasibility study to bring a renewable energy system to the area.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

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Attendance Policy

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to drop the course, it is your responsibility to withdraw officially before the last day to drop. If you fail to do so, you may receive a failing grade in the course instead of a "W". **You are expected to attend class.**

Weather Policy
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Final Examinations
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Academic Probation and Suspension
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Equipment: Current audio/visual and or digital media whether in the classroom or online, and laboratory equipment.

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Aldo Da Rosa
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Isbn# 0120885107

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COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 283 **Year: Fall, 2011**

SOLAR THERMAL INTERMEDIATE

Department: Applied Technologies **Credit Hours: 3**

Required Text: Photovoltaic Systems **Days/Time:**

by James P. Dunlop, American Tech. Pub. 2010

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE 282**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, alternative solar energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will elevate student awareness of solar thermal systems through determination of steps for appropriate site assessment and installation. The student will be able to identify manufacturer specifications, mounting and materials for intended installation. This course includes component demonstration, fieldtrips off-campus where necessary.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Reviewing the types of solar thermal systems in usage throughout the U.S. and the world
2. Reviewing solar system types and system sizing options
3. Reviewing basic solar thermal system components
4. Location and site considerations of solar thermal systems
5. Structural considerations
6. Safety guidelines in the workplace

Course Learning Objectives

1. Define terms frequently used in the solar thermal energy industry
2. Understand basic solar thermal fundamentals

3. Understand career paths * and certification requirements in the solar thermal energy industry
3. Understanding site determination and selection
4. Choosing a system type and system sizing options

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Define and demonstrate solar thermal energy fundamentals
2. Describe the purpose and operation of solar thermal components
3. Create solar thermal system troubleshooting steps
4. Identify safety practices and protective equipment used during installation
5. Calculate solar thermal system sizing
6. The ability to plan, develop and implement systems.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary.

Method of Evaluation		**Grading Scale**	
Homework and quizzes	10%	90 – 100	A
Midterm Exam	25%	80 - 89	B
*Semester Project/Final Exam	50%	70 - 79	C
**Class Attendance	15%	60 - 69	D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and plan, complete, and present a solar thermal system.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

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Final Examinations
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Bibliography

Fundamental or Renewable Energy Processes
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www. solaramericacities.energy.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 284 **Year: Fall, 2011**

SOLAR THERMAL ADVANCED

Department: Applied Technologies **Credit Hours: 3**

Required Text: Photovoltaic Systems **Days/Time:**

by James P. Dunlop, American Tech. Pub. 2010

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE 282, AE283**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, alternative solar energy sources are more attractive for the twenty-first century and beyond.

Course Description
The focus of this course is to show how a solar thermal system can be integrated into a building and cooperate with the building main energy system. Important aspects of this course are to instruct the student how to use simulation programs for investigating the performance of the solar thermal systems as well as ensuring structural integrity and on-site penetrations meet all appropriate codes.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Study the elements that make up both active and passive solar thermal systems.
2. Examine solar thermal installations through off-campus fieldtrips
3. Review the mathematics and science behind active and passive solar thermal technology
4. Appraise the component parts for both active and passive solar thermal systems.
5. Address troubleshooting steps for both active and passive solar thermal systems
6. Solar pool heating
7. System monitoring

Course Learning Objectives
1. Demonstrate knowledge of terminology used in the solar thermal energy industry
2. Understand basic solar thermal fundamentals for both active and passive systems
3. Understand career paths * and certification requirements in the solar thermal energy industry

4. Understanding site determination, selection and troubleshooting steps
5. Choosing a system type and system sizing options
6. Attaining working knowledge of Solar Pool heating systems with system monitoring

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Demonstrate solar thermal energy fundamentals for both active and passive systems
2. Describe purpose and operation of solar thermal components for passive and active systems.
3. Explain solar thermal energy production using data sheets
4. Identify safety practices and protective equipment used during installation
5. Exhibit awareness of guidelines for Collector and system certification (FSEC and SRCC)
6. Demonstrate a working knowledge of systems.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary, and a boot-camp to demonstrate skills.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a plan, develop a project and demonstrate implementation.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty

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Equipment: Current audio/visual and or digital media whether in the classroom or online, laboratory equipment, and industry demonstrations.

Useful Renewable Energy Websites
Solar
www1.eere.energy.gov
www.nrel.gov
www. solaramericacities.energy.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 285 **Year: Fall, 2011**

SOLAR THERMAL INSTALLATION

Department: Applied Technologies **Credit Hours: 3**

Required Text: Photovoltaic Systems **Days/Time:**

by James P. Dunlop, American Tech. Pub. 2010

Instructor: **Room #:**
Office Hours: **Phone:**

Course Placement: Freshman/Sophomore **Pre-requisite: AE 284**

Rationale
With the world turning away from fossil fuels because of environmental and terror concerns, alternative solar energy sources are more attractive for the twenty-first century and beyond.

Course Description
This course will be a "hands-on" practical application by the student of solar technology utilizing various installation techniques for both active and passive solar thermal systems. The student will apply the principles of site analysis, coast vs. payback, energy audit and solar system design into a student or class project.

Assessment
The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline
1. Study the elements that make up both active and passive solar thermal systems.
2. Examine solar thermal installations through off-campus fieldtrips
3. Use calculation for estimating the solar irradiance toward surfaces in different geometries
4. Appraise the component parts for both active and passive solar thermal systems.
5. Address troubleshooting steps for both active and passive solar thermal systems
6. Design a solar thermal system in a class project or apply it to a given building
7. Fieldtrips involving on-site monitoring of student or class projects

Course Learning Objectives
1. Demonstrate knowledge of terminology used in the solar thermal energy industry
2. Understand basic solar thermal fundamentals for both active and passive systems

3. Understand career paths * and certification requirements in the solar thermal energy industry
4. Understanding site determination, selection and troubleshooting steps
5. Choosing a system type and system sizing options
6. Attaining working knowledge of Solar Pool heating systems with system monitoring

Course Competencies: *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Demonstrate knowledge of a solar collector by measuring an efficiency curve
2. Demonstrate knowledge of how building design effects energy usage of buildings
3. Exhibit the ability to perform a critical analysis of use and value of delivered solar energy
4. Convey knowledge of how a solar thermal system interacts with other energy systems like electrical heating, heat pumps and district heating.
5. Identify safety practices and protective equipment used during installation
6. Exhibit awareness of installation guidelines (FSEC and SRCC)
7. Demonstrate a working knowledge of the systems and installation

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary, and a boot-camp to demonstrate skills.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)
Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a feasibility study and plan and present the installation plan.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty
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www. solaramericacities.energy.gov

COLBY COMMUNITY COLLEGE

Syllabus

Course Number/Title: AE 276 Intro to Energy Technologies **Year: Fall, 2010**

Department: Business & Technology **Credit Hours: 3**

Required Text: Renewable Energy **Days/Time: 8/23 – 9/3, 2010**

by Godfrey Boyle, Oxford Univ. Press, 2004

Instructor: Tom Moorhous **Room #:Bedker 710**
Office Hours: before 9am cst M-F **Phone:785.460.5534**

Course Placement: Freshman/Sophomore **Pre-requisite: none**

Rationale

With the world turning away from fossil fuels because of environmental and terror concerns, renewable, alternative energy sources are more attractive for the twenty-first century and beyond.

Course Description

This course covers the basic concept of the interconnection and integration of non-wind and electrical systems and exposes the student to the many facets of the renewable energy sources. It covers the history and development of the solar, geothermal, biofuel industries, terminology used in these industries, and applications within society. It also covers environmental and economic issues of each of these renewable energy sources and the future of each industry.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline

1. Historical overview of global energy crises from the 1970s into the 21st century
2. Historical overview of the creation of the Department of Energy and NREL in 1977
3. Solar Photovoltaic
4. Solar Thermal and available resources
5. Bioenergy using alternative biofuel/biomass sources
6. Geothermal energy processes and systems

7. Tidal/Hydroelectriity and Hydrogen systems

Course Learning Objectives

1. Historical overview of renewable energy sources since the 1970s
2. Current global energy usage from carbon-based fossil fuels
3. Recent movement to alternative renewable energy
4. Solar Photovoltaic theory and construction
5. Solar thermal systems with residential and/or commercial application
6. BioEnergy/Biomass defined
7. Biofuel production for commercial application
8. Geothermal dynamics
9. Geothermal processes for residential and/or commercial application
10. Tidal/Hydroelectricity processes
11. Magnetism alternative energy systems
12. The future of renewable energy in the U.S. and Globally

Course Competencies *A set of measurable performance criteria upon which students are evaluated. Vocational Programs must include the Career Development Skills as well as the course competencies. The Skills list is attached to this document for reference.*

1. Elevate student awareness and understanding of renewable energy systems
2. Engage student learners in hands-on experimentation with alternative energy processes
3. Engage the student in energy resource management
3. Examine the application of alternative energy systems in residential and commercial settings
4. Explain the installation techniques for transitioning to alternative energy systems
5. Explore the future of embracing renewable energy technologies globally.

Method of Instruction Lecture on-site and/or online utilizing fieldtrips where necessary.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
Midterm Exam	25%	80 - 89 B
*Semester Project/Final Exam	50%	70 - 79 C
**Class Attendance	15%	60 - 69 D

Course Requirements

Homework and quizzes (10% of final grade)

Homework will consist of all practice problems assigned during a given week with quizzes over the problems administered periodically. Late homework due to class time lost as a result of possible fieldtrip(s) can be accepted at later dates set down by the instructor

Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)

Students will form teams and complete a feasibility study to bring a renewable energy system to the area.

Attendance (See Attendance Policy on next page) 15% of final grade

ACADEMIC HONESTY

* In accordance with the mission of Colby Community College to provide for the development of better futures for it's students-it is essential that the principles of academic honesty and professional ethics be stressed throughout the educational process. The college, faculty, and student share responsibilities in addressing this issue. Student responsibilities are twofold: 1. Complete class assignments to the best of their ability without plagiarizing, cheating or in any way misrepresenting their work. 2. Refrain from participating in any form of academic dishonesty as an individual or in combination with other individuals. (Student Handbook p.22)* If you must miss a writing assignment/test, please make prior arrangements with me, as soon as possible, during my posted office hours only. **Makeup writing assignment/tests will not be accepted later than one week after the missed writing assignment is due. Failure to complete the writing assignments in this time period will result in a grade of F for that assignment. *No exceptions.***

Attendance Policy

*Colby Community College views class attendance as a mandatory activity. Students are expected to attend courses in which they are enrolled. If you are sick, you are encouraged to visit the Health Center. It is your responsibility to notify your instructors of any absence due to illness or any other reason. (Student handbook p. 17). Class attendance will be taken each day. If you must be absent, or miss a session, please consult with me in advance. Regular attendance is essential to earning a passing grade in this class and is required. If you plan to drop the course, it is your responsibility to withdraw officially before the last day to drop. If you fail to do so, you may receive a failing grade in the course instead of a "W". **You are expected to attend class.**

Weather Policy

> Due to state requirements mandating the number of instruction hours, Colby Community College rarely cancels regularly scheduled classes due to inclement weather. The decision to attend class during hazardous weather conditions rests with each individual student. Commuters should check with civil authorities for weather and road conditions (Student Handbook, p. 17). ***In the event of foul weather or cancellation of school, the student can participate through the college online website.***

Final Examinations

*Final examinations are required in all courses and are to be taken at the scheduled time and location. These are printed in the schedule booklet. Changes in the schedules can only be made by the Vice President of Academic Affairs (Student Handbook, p. 17).

Academic Probation and Suspension

* A student registered for a minimum of seven credit hours who does not maintain a semester grade point average of 2.0 will be placed on probation the following semester of enrollment. If at the close of that semester the student has not raised the grade point average, the student may be placed on suspension, during which time

the student may not be recommended for admission to any other academic institution. Failure to make satisfactory academic progress may impact financial aide recipients. (Student handbook, p. 23)

Syllabus Information Disclaimer *"I reserve the right to change any information contained in this document, when necessary, with adequate notice given to the student. Notice shall be given in the classroom during class. No other notice is required. It is the students' responsibility to keep up with any changes, modifications, adjustments or amendments that are made to this document."*

Accommodations for Students With Disabilities *Use the following statement: "According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union."*

Equipment Current audio/visual and or digital media whether in the classroom or online.

Bibliography

Fundamental or Renewable Energy Processes
Aldo Da Rosa
Elsevier Academic Press
Isbn# 0120885107

Useful Renewable Energy Websites

Wind Basics	www.nrel.gov/learning/re_wind.html
Wind energy tutorial	www.awea.org/faq/
Wind resource maps	www.nrel.gov/wind/resource_assessment.html
Wind energy technology	www.world-wind-energy.info/
Wind energy manual	www.energy.iastate.edu/renewable/wind/wem-wem-02_toc.htmal
Small wind	www.awea.org/smallwind/
Wind energy for kids	www.alliantenergykids.com

COLBY COMMUNITY CO

Syllabus

Course Number/Title:EG200 ENGINEERING | **Year: Fall, 2010**

Department: Applied Technologies | **Credit Hours: 3**

Required Text: Supplied Materials | **Days/Time:**

Instructor: | **Room #:**

Office Hours: | **Phone:**

Course Placement: Freshman/Sophomore | **Pre-requisite: Math**

Course Description

Students will learn what it means to engineer projects. This will explore how engineers examine topics, how they learn and communicate. The traditional projects will be examined but an emphasis will be placed on energy projects. At the end of the course, the student will have a beginning understanding of the field and its relationship to other fields.

Assessment

The CCC assessment plan meets the general education requirements by continually assessing its effectiveness through student outcomes. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Through your cooperation we are working to improve teaching and learning at Colby Community College.

Course Outline and Competencies

Students will be able to:

1. Define basic terminology in engineering
2. Analyze and understand the engineering profession
3. Communicate effectively problems and solution integration
4. Understand the science behind the problems examined.

Course Learning Objectives

1. The student will have a solid understanding of the basic principles of Engineering
2. The student will be able to define basic terms, analyze and understand the profession
3. The student will acquire practical skills in designing, analyzing, building and trouble shooting Engineering projects.

Method of Instruction: Lecture on-site and/or online utilizing fieldtrips where necessary.

Method of Evaluation		**Grading Scale**
Homework and quizzes	10%	90 – 100 A
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Revised & Approved May 2003

Course Requirements
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Testing (25% of final grade) There will be a midterm and final over the material covered in class.

Semester Project (50% of final grade)
Students will form teams and complete a project illustrating understanding of engineering principles in relationship to field of study.

Attendance (See Attendance Policy on next page) 15% of final grade

Academic Honesty:
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Equipment: Current audio/visual and or digital media whether in the classroom or online.

Revised & Approved May 2003