

2014-2015 LONG SIGNATURE SHEET



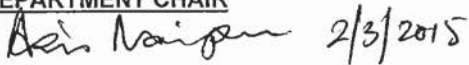
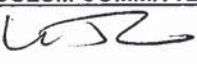

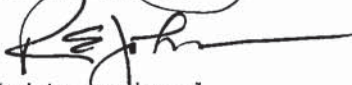
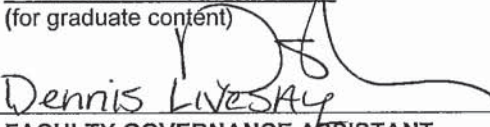
UNC CHARLOTTE

Proposal Number: ECGR 1-2-15

Proposal Title: Proposal for New Course ECGR 5171 Introduction to Energy Systems

Originating Department: Electrical and Computer Engineering

TYPE OF PROPOSAL: UNDERGRADUATE _____ GRADUATE _____ UNDERGRADUATE & GRADUATE X
 (Separate proposals sent to UCCC and Grad. Council)

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
			Approved	<u>DEPARTMENT CHAIR</u>  2/3/2015 [print name here:] ASIS NASIPURI
			Approved	<u>COLLEGE CURRICULUM COMMITTEE CHAIR</u>  [print name here:] TAO HONG
			Approved	<u>COLLEGE FACULTY CHAIR (if applicable)</u>  [print name here:] Bruce Gehrig
	9/21/15		Approved	<u>COLLEGE DEAN</u>  [print name here:]
			Approved	<u>GENERAL EDUCATION</u> (if applicable; for General Education courses) [print name here:]
			Approved	<u>HONORS COLLEGE</u> (if applicable; for Honors courses & programs) [print name here:]
			Approved	<u>UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR (for undergraduate content)</u>
9/28/15	11/3/15	2/1/16	Approved	<u>GRADUATE COUNCIL CHAIR</u> (for graduate content)  Dennis LIVESAY
				<u>FACULTY GOVERNANCE ASSISTANT</u> (Faculty Council approval on Consent Calendar)
				<u>FACULTY EXECUTIVE COMMITTEE</u> (if decision is appealed)



UNC CHARLOTTE

I. LONG FORM II. COURSE AND CURRICULUM PROPOSAL

*To: Chair of the Graduate Council

From: Badrul H. Chowdhury, ECE

Date: January 2, 2015

Re: Proposal for new course ECGR 5171 Introduction to Energy Systems

The Long Form is used for major curriculum changes. Examples of major changes can include:

Undergraduate: Major changes include new undergraduate degrees, minors, concentrations, certificates, and changes to more than 50% of an existing program (Note: changing the name of an academic department does not automatically change the name(s) of the degree(s). The requests must be approved separately by the Board of Governors.)

Graduate: Major changes include new graduate courses, major changes to an existing graduate course or major changes to an existing graduate program

Submission of this Long Form indicates review and assessment of the proposed curriculum changes at the department and collegiate level either separately or as part of ongoing assessment efforts.

*Proposals for undergraduate courses and programs should be sent to the Undergraduate Course and Curriculum Committee Chair. Proposals related to both undergraduate and graduate courses, (e.g., courses co-listed at both levels) must be sent to both the Undergraduate Course and Curriculum Committee and the Graduate Council.

I. HEADING AND PROPOSAL NUMBER

ECGR 1-2-15

University of North Carolina at Charlotte

Proposal for New Graduate Course

Course and Curriculum Proposal from: Department of Electrical and Computer Engineering

Title: *Proposal for new course ECGR 5171 Introduction to Energy Systems*

II. CONTENT OF PROPOSALS

A. PROPOSAL SUMMARY AND CATALOG COPY

1. **SUMMARY:** The Electrical and Computer Engineering Department proposes to add a new elective course to the graduate curriculum:
 - ECGR 5171: Introduction to Energy Systems

2. **PROPOSED CATALOG COPY:**

ECGR 5171. Introduction to Energy Systems. (3) Prerequisite: ~~Junior-Graduate~~ standing, or permission of the department. Overview of energy systems: energy types, generation, conversion, storage, transportation/transmission, and utilization. Principles, physical structure, processes, and utilization of fossil fuel, nuclear, and renewables for transportation, thermal, and electrical energy generation are discussed along with associated performance metrics. The course also provides an introduction to environmental impacts of energy production, life-cycle analysis, energy efficiency concepts and metrics, transmission systems, grid reliability, and the impact of smart grid technologies. All topics are presented in the context of industry standards as well as federal and state regulations. Credit will not be given for ECGR 5171 where credit has been given for ECGR 4171. (Fall).

B. JUSTIFICATION

1. Identify the need addressed by the proposal and explain how the proposed action meets the need: In recent years, there has been a tremendous interest in all forms of energy. Its past use, the conversion process, its environmental impact, and its future are all important considerations as we position ourselves for a low-carbon economy.

After taking this course, students can take more advanced courses in electric power and energy. Specific goals for the students are to:

- Have a working knowledge of the various forms of energy usage and their impact
 - Understand energy systems design from an engineering perspective
 - Understand life cycle economics of energy systems
 - Understand how systems design is changing the way we generate, convert, deliver and use energy.
2. Discuss prerequisites/corequisites for course(s) including class-standing: Prerequisite: ~~Junior~~-Graduate standing, or permission of the department.
 3. Demonstrate that course numbering is consistent with the level of academic advancement of students for whom it is intended: The course numbering ECGR 5171 is consistent with the level of academic advancement of graduate students, for whom these courses are intended.
 4. In general, how will this proposal improve the scope, quality and/or efficiency of programs and/or instruction: This course is suitable for graduate students irrespective of their area of concentration in the ECE Department at UNCC since the goal is to provide energy systems design from a basic engineering perspective. This course will also be an important component in the graduate curriculum for the Power Systems concentration in the ECE Department. This course can effectively help educate students to be cognizant of the challenges we face in energy, and also prepare them for advanced research in the field of power and energy.
 5. If course(s) has been offered previously under special topics numbers, give details of experience including number of times taught and enrollment figures.
 - ECGR 5090 Special Topics: Introduction to Energy Systems
 - Spring 2013, Enrollment: 17 (4 BS, 3 PhD, 10 M.S.)
 - Fall 2013, Enrollment: 29 (22 BS, 1 PhD, 6 MS)
 - Fall 2014, Enrollment: 11 (2 BS, 9 MS)

C. IMPACT

1. What group(s) of students will be served by this proposal? This course will serve all graduate students in electrical and computer engineering irrespective of whether they are

enrolled in the power area. This course will be especially useful though for students taking the concentration in power systems.

2. What effect will this proposal have on existing courses and curricula? The proposed course will complement the existing courses in power and energy systems in the ECE Department and effectively prepare graduate students for further studies in advanced graduate courses in the power area.
 - a. When and how often will added course(s) be taught? According to the current demand and scheduling of courses, ECGR 5171 will be taught each Fall.
 - b. How will the content and/or frequency of offering of other courses be affected? None expected.
 - c. What is the anticipated enrollment in course(s) added (for credit and auditors)? Typical enrollment is expected to be 7-15 ECE graduate students. This is consistent with current offerings of the equivalent special topics course.
 - d. How will enrollment in other courses be affected? None to minimal expected. How did you determine this? This course has been offered three times already as a special topics course and none of the other elective courses in the power area were impacted. It is clear that this course fills a niche requirement.
 - e. Identify other areas of catalog copy that would be affected, e.g., curriculum outlines, requirements for the degree, etc. Cross-listing ECGR 5171 with ECGR 4171. Also cross-listed with EMGT 5961 and SEGR 4961.

III. RESOURCES REQUIRED TO SUPPORT PROPOSAL

A. Personnel

- a. Specify requirements for new faculty, part-time teaching, student assistant and/or increased load on present faculty: None. The course sequence will be taught by one faculty member at no required increased teaching load and with no teaching assistant.
- b. List by name qualified faculty members interested in teaching the course(s): Dr. Badrul Chowdhury only has taught this course before as a special topics course, but Dr. Johan Enslin is also a qualified faculty member interested in teaching this course.

B. Physical Facility: None

C. Equipment and Supplies: None

D. Computer: None

E. Audio-Visual: None

F. Other Resources: None

G. Source of Funding. Indicate source(s) of funding for new/additional resources required to support this proposal: None required

IV. CONSULTATION WITH THE LIBRARY AND OTHER DEPARTMENTS OR UNITS

A. Library Consultation

Indicate written consultation with the Library Reference Staff at the departmental level to insure that library holdings are adequate to support the proposal prior to its leaving the department. (Attach copy of *Consultation on Library Holdings*).

B. Consultation with other departments or units

The Systems Engineering and Engineering Management Department already has two course numbers for this course. They are EMGT 5961 and SEGR 4961.

C. Honors Council Consultation. In the case of Honors courses or Honors programs indicate written consultation with the Honors Council (if applicable).

V. INITIATION AND CONSIDERATION OF THE PROPOSAL

A. Originating Unit

Approved per attached signatures

B. Other Considering Units

SEEM

C. CREDIT HOUR. (Mandatory if new and/or revised course in proposal): 3

Review statement and check box once completed:

- The appropriate faculty committee has reviewed the course outline/syllabus and has determined that the assignments are sufficient to meet the University definition of a [credit hour](#).

D. ATTACHMENTS.

1. CONSULTATION: Attach relevant documentation of consultations with other units.
2. COURSE OUTLINE/SYLLABUS: For undergraduate courses attach course outline(s) including basic topics to be covered and suggested textbooks and reference materials with dates of publication. For Graduate Courses attach a course syllabus. Please see [Boiler Plate for Syllabi for New/Revised Graduate Courses](#).
3. PROPOSED CATALOG COPY: Copy should be provided for all courses in the proposal. Include current subject prefixes and course numbers, full titles, credit hours, prerequisites and/or corequisites, concise descriptions, and an indication of when the courses are to be offered as to semesters and day/evening/weekend. Copy and paste the [current catalog copy](#) and use the Microsoft Word "track changes" feature (or use red text with "~~strike~~" formatting for text to be deleted, and adding blue text with "underline" formatting for text to be added).

a. For a new course or revisions to an existing course, check all the statements that apply:

- This course will be cross listed with another course.
- There are prerequisites for this course.
- There are corequisites for this course.
- This course is repeatable for credit.
- This course will increase/decrease the number of credits hours currently offered by its program.
- This proposal results in the deletion of an existing course(s) from the degree program and/or catalog.

For all items checked above, applicable statements and content must be reflected in the proposed catalog copy.

b. If overall proposal is for a new degree program that requires approval from General Administration, please contact the facultygovernance@uncc.edu for consultation on catalog copy.

4. ACADEMIC PLAN OF STUDY (UNDERGRADUATE ONLY): Does the proposed change impact an [existing Academic Plan of Study](#)?
 Yes. If yes, please provide updated Academic Plan of Study in template format.
 No.

5. **STUDENT LEARNING OUTCOMES (UNDERGRADUATE & GRADUATE):**

Does this course or curricular change require a change in Student Learning Outcomes (SLOs) or assessment for the degree program?

- Yes. If yes, please provide updated SLOs in template format.
 No.

6. **TEXTBOOK COSTS:** It is the policy of the Board of Governors to reduce textbook costs for students whenever possible. Have electronic textbooks, textbook rentals, or the buyback program been considered and adopted?

- Yes. Briefly explain below.
 No. Briefly explain below.

Electronic version of the textbook was not available at the time it was adopted. However, the cost of the textbook is well below average and rentals and buybacks are available at the bookstore.

IMPORTANT NOTE: A Microsoft Word version of the final course and curriculum proposal should be sent to facultygovernance@uncc.edu upon approval by the Undergraduate Course and Curriculum Committee and/or Graduate Council chair.

The University of North Carolina at Charlotte
The William States Lee College of Engineering

**~~ECGR 4090/ECGR 5090/SEGR 4961/EMGT 5961~~ ECGR 4171/ECGR 5171 Introduction to
Energy Systems**

Course Description:

Overview of energy systems: energy types, generation, conversion, storage, transportation/transmission, and utilization. Principles, physical structure, processes, and utilization of fossil fuel, nuclear, and renewables for transportation, thermal, and electrical energy generation are discussed along with associated performance metrics. The course also provides an introduction to environmental impacts of energy production, life-cycle analysis, energy efficiency concepts and metrics, transmission systems, grid reliability, and the impact of smart grid technologies. All topics are presented in the context of industry standards as well as federal and state regulations. Credit will not be given for ECGR 5171 where credit has been given for ECGR 4171.

Instructor: Prof. Badrul H Chowdhury

Phone: (704) 687-1960 **Fax:** (704) 687-5588 **E-mail:** b.chowdhury@uncc.edu

Office: EPIC 1162 **Office Hours:** M and Tu: 11 am – noon

Prerequisite: ~~Junior~~ Graduate standing, or permission of the department.

Required Textbook

Energy Systems Engineering: Evaluation and Implementation, 2nd Edition, by Francis Vanek, Louis, D. Albright, Largus Angenent, McGraw-Hill, 2012.

Reference Textbooks

1. Energy and the Environment, 2nd Edition, by Robert A. Ristinen, Jack P. Kraushaar, December 2005, Wiley & Sons.
2. Alternative Energy Resources: The Quest for Sustainable Energy, by Paul Kruger, March 2006, Wiley & Sons.
3. Sustainable Energy: Choosing Among Options, by J. W. Tester, E. M. Drake, M. W. Golay, M. J. Driscoll, and W. A. Peters, 2005, MIT Press, Cambridge, MA.

Supplementary Materials: Lecture notes will be provided through Moodle.

Learning Objectives:

After completing the course, the students will be able to

1. Have a working knowledge of the various forms of energy usage and their impact
2. Understand energy systems design from an engineering perspective
3. Understand life cycle economics of energy systems
4. Understand how systems design is changing the way we generate, convert, deliver and use energy.

5. Understand how policies can impact the use of energy.
6. Make a presentation of a technical report on a current issue related to energy systems.

Course Contents & Tentative Schedule

	Topic	Lectures
1	Introduction to Energy Systems; sustainability; power vs. energy; units of energy; performance metrics;	1.5
2	Historical development of energy sources; energy resources summary	0.5
3	Energy utilization (electricity, transportation, heat, etc.); statistics	0.5
4	Physics refresher: thermal cycles; electrical equations, basic circuits, AC & DC power, generators and loads	1.5
5	Conventional/fossil-based energy sources and turbines – principles, structures, processes, and emissions/waste	1
6	Alternative energy sources (fuel cell technologies, advanced engines, dish/Stirling engines, etc.) – principles, structures, processes, and emissions/waste	2
7	Renewable energy sources (solar photovoltaics, solar thermal, CSP, wind, biomass, geothermal, ocean, tide, etc.) – principles, structures, and processes	2
8	Electrical transmission systems and how they work: power flows, balancing, reliability and quality, ancillary services	2
9	Energy storage technologies: principles, performance, applications, and hurdles	1
10	Energy use in transportation; propulsion systems; well-to-wheel analysis	1
11	Nuclear energy and its future	0.5
13	Environmental impact of energy production, transportation, and utilization; climate change; solutions for decarbonization	1

Course Policies, Requirements and Assessment:

1. **Exams:** There will be two exams during the semester. There will be no final exam. In lieu of the exam, you will have to turn in a term paper and present your findings in front of the class. Exams will most likely be take home exams unless otherwise announced. You may bring a calculator to tests.
2. **Absences:** Regular, on-time attendance is a requirement for on-campus students. Students are allowed one absence without penalty. All other absences, including missed absences for work and minor illnesses, will result in a lower attendance score. A student whose religion requires that (s)he miss class for a religious observance must fill out a "Request for Religious Observances" form and submit it prior to the census date for that semester to receive an excused absence for that event. The University's inclement weather number is 704-786-2877.
3. **Excused absence:** A medical certificate will be required to make up a test because of absence from a test due to illness. For absences from tests or quizzes because of plant trips, you will need to provide some documentation or proof, 24 hours in advance, that you will be going on a plant trip. Usually a travel itinerary from the company or a copy of the ticket is sufficient.
4. **Homework** is due in class on the second class period after the assigned date unless otherwise announced. For some assignments, students will be working in groups, but Individual Assignments should be completed independently. Students who plagiarize from other sources or hand in assignments identical to or copied from others (except for assignments submitted as a group) will be violating scholastic honesty regulations and will not receive credit and will be subject to university's procedures and policies! You must submit all work in class before class begins on the date the homework is due. If you wish to submit your work early, you may certainly do so in person. On occasion, you will be allowed to upload your homework to Moodle. In those cases, you must name you file '**HW#_Lastname_Firstname**' where # is replaced by the assignment number, Lastname and Firstname are your last and first names. You must also scan into a pdf document before uploading the assignment.
5. **Term project:** Students will work individually, or in teams on an applied or theoretical project topic related to energy systems. Each team will write a proposal and a final report and present their work. Specific interests of students related to their job or research work will also be taken into account.
6. Graduate section (ECGR 5171) and undergraduate sections (ECGR 4171) will be taught jointly, but obtaining graduates credit in the graduate section will require additional assignments on the homework, project, and exams. In general, graduate students will be responsible for 25% more points in their homework and exams; besides, some of the additional questions for graduate students will have a higher difficulty level and will be of the essay type.
7. I will try my best to return all graded homework/quizzes/tests in a timely manner.
8. If you wish to discuss the grade received on homework/tests, you will have 4 weeks from the date of the homework submission or the date of the test to do so. After that, no change will be made on the grade. You will have a full semester after the date of the final exam to ask to see the final. However, the review must be done in person.

9. You are encouraged to visit with me during office hours. If you have a conflict with my posted hours, please call for an appointment. Email exchanges are always encouraged.

Moodle Environment

This course includes a significant and required use of the Moodle on-line environment. You must be able to access course materials and announcements on-line. You can login to Moodle here: <https://moodle2.uncc.edu/login/index.php>

Email

You *must* be reachable via your UNC Charlotte email account. All course communication will be directed to you at your UNC Charlotte email address. If you primarily use a different email account, then you should forward your email to your primary account.

Diversity

The William Lee States College of Engineering strive to create an inclusive academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socio-economic status.

Academic Honesty

You are required to complete 100% of your own work in this class (including making a full contribution to the team project). Cheating violates the UNC Charlotte Code of Academic Integrity and may result in course failure, suspension, and/or expulsion. For more information see the following: <http://integrity.uncc.edu/>

Disability and Impairment Accommodation

If you require course adaptations or accommodations because of a disability, or if you have emergency medical information about which we should be informed, please speak with us as soon as possible. Students who require such accommodations must work with the Office of Disability Services (704-687-4355).

Special Instructions for On-line Students

- (1) This class is offered as both an on-campus face-to-face delivery and an online version. Online students don't have to be present in class to take this course if they sign up for the online section. Each lecture will be recorded using Panopto software. The software is maintained by Classroom Support. All students (both on-campus and on-line) will be able to watch the recording on Moodle shortly after the lecture ends.
- (2) For *online students*, it is expected that they will watch the lecture on the day the lecture is recorded. However, if that's not possible, they should finish watching the lecture by the specific deadline provided on the Moodle course link. They are expected to answer short quiz-

type questions based on each lecture every week. The link for these questions will remain active only for a limited time. This activity will count as attendance.

- (3) Online students will not be required to do a presentation; however, a project report will be required.
- (4) For on-line students, the exams and homework submission are handled via Moodle. The exams are emailed to all distance students at a pre-set of the exam day. Moodle will not accept submissions past a specific time. Homework submissions work in a similar fashion - students have to upload their scanned homework to Moodle by the submission deadline. You must name your file as '**HW#_Lastname_Firstname**' or '**Exam#_Lastname_Firstname**' where # is replaced by the assignment number, Lastname and Firstname are your last and first names. You must also scan into a pdf document before uploading the assignment.

~~(5) Graduate and undergraduate sections will be taught jointly, but obtaining graduate credit will require additional assignments on the homework, project, and exams.~~

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Grading Policy:

Exam I	20%
Exam II	20%
Term Project and Presentation	25%
Homework	20%
Attendance and Participation	15%

The grading scale is as follows:

A = 90 -100 B = 80 - 89.99 C = 70 - 79.99 U = < 70