Georgia Perimeter College Faculty Senate
Course Addition to Program of Study

Number:
Date Submitted:
Date approved:

Title of Proposal: **Addition of ENGR 2040 to Engineering Area F**

Initiator and Place of Origin: **Mohandas Raj, Instructor, Department of Mathematics, Computer Science, and Engineering, Clarkston Campus**

Date Approved by Curriculum Committee:

Course Curriculum Chair(s): _____
[sign if committee agrees; attach comments]

Proposal connected with other Proposal(s), #(s):

Implementation date of the Proposal: **Spring 2010**

The _____ Campus Faculty Senate has reviewed this proposal.
(Name of Campus)

Signed: _____ Date: _____
(Campus Chair)

The _____ Campus Library Director has reviewed this proposal.
(Name of Campus) (Only required for new courses, programs, or curriculum)

Signed: _____ Date: _____
(Library Director)

The _____ Academic Dean has reviewed this proposal.
(Name of Discipline)

Signed: _____ Date: _____
(Academic Dean)

This Proposal has met Senate procedural requirements and is ready for Senate review and action.

Signed: _____ Date: _____
(*Faculty Senate Chair)*

Georgia Perimeter College Faculty Senate
Course Addition to Program of Study

Course Title: Electric Circuit Analysis

Course Abbreviation and number: ENGR 2040

Credit Hours: 3

Contact Hours per Week: 2.5

Type of Course: Lecture [X] Lab [ ] Clinic [ ] Other _____
Lecture Hours: 3
Lab Hours:
Clinic Hours:
Other:

A. Rationale

As the Regents' Engineering Transfer Program (RETP) continues to expand and enjoy greater success at GPC, it becomes appropriate to investigate how the College might better prepare its Engineering students for the four-year institution in which they will be continuing their education. As Electrical Engineering is one of the major engineering disciplines, it is to be expected that a significant proportion of GPC's Engineering students will be interested in pursuing a degree in Electrical or Computer Engineering. An introductory course in the theory of Electric Circuits is considered a core part of the second-year curriculum for Electrical or Computer Engineering students. Therefore, offering this course will allow the prospective EE/CompE student to complete the first two years of education in a two-year college setting, reduce the need to take additional second-year courses at the transfer institution, and thereby make the student more attractive to the school to which he/she is transferring.

This course should be added to Area F of the Engineering Program of Study, as it is taken only by Engineering majors, and applies only toward a degree in Engineering. It should be considered as an elective, to be taken by those students with an interest in pursuing a degree in Electrical Engineering at a four-year institution.

B. Criteria (Answer each of the following questions yes, no, or not applicable. A short explanation may be included where necessary.)

1. Are the objectives of the institution met?
Yes.

2a. Have you discussed this proposal with the Library Director of at least one campus?
Yes, with Ellen Barrow, Library Director at Clarkston campus.

2b. Does that Library Director agree that library holdings are adequate to support this course? (If not, attached plan for correcting deficiencies.)
The Library currently has very few resources in this area. A list of proposed acquisitions will be provided to the Director immediately upon course approval.

3. Will suitable space for classrooms and labs be available?
Yes.

4. Can the course be scheduled in the near future?
Yes. It can be scheduled as early as Spring 2010.

5. Will the course appear in the catalog and the schedule?
Yes.

6. Is a textbook needed for the course?
Yes.

7. Is a textbook available for the course?
Yes.

8. Will this course require hiring new personnel?
No.

9. Does the course overlap with any other course/program?
No.

10. Will the course transfer to the senior colleges and universities?
Yes.

11. Has the need for the course been adequately demonstrated? (A description of the methods and results of marketing techniques to determine sufficient enrollment to justify the course may be inserted at the end of this document.)

Yes. It is estimated that 20 to 30 per cent of GPC's 700+ Engineering majors have an interest in pursuing Electrical Engineering at a four-year institution. This course is a core part of an EE student's second year curriculum; therefore, successful completion of this course will better prepare a student for completing his or her degree at the four-year school, reduce the need to take additional second-year courses after transfer, and thereby make him/her more attractive to that school.

12. Will the addition of this course affect the present balance within the department or between departments?
Yes. Since PHYS 2122 is a prerequisite for this course, offering this course will tend to increase the demand for PHYS 2122. This course will also tend to increase enrolment in MATH 2652, as it is a corequisite.

13. Have the budgetary implications of this change been assessed? (Insert a five year budget plan at the end of this document.)
Since this course will not require laboratory space, or any specialized equipment, budgetary impacts are limited to those having to do with instructors and allocation of classrooms. There are at present at least two instructors who are able to teach this course, so no hiring of new staff will be necessary for the time being.

14. Is the course compatible with the core curriculum?
Yes.

15. Has this proposal been discussed with the Academic Deans?
Yes.

16. Has a separate Senate proposal been completed to insert the new course into a program of study?
The purpose of this proposal is to add the already-approved ENGR 2040 to Area F of the Engineering major Course of Study.

C. Other Questions

1. Approval of this course would necessitate a deletion of the following course(s): **None.**

2. This course may apply toward graduation in the following programs: **Engineering.**

3. This course would be taught on the following campus(es): **Clarkston, Dunwoody.**

4. In what discipline must an instructor be SACS qualified in order to teach this course? **Any engineering discipline.**

5. To which area of the core curriculum would this course apply? **Area F.**

6. Is this course a required course or an elective course in that area? **Elective.**

7. Is this course offered at other USG institutions? **Yes. It is offered at the Georgia Institute of Technology, Albany State College, Georgia Southern University, Armstong Atlantic State University, Macon State University, and at several other institutions in the USG as well.**

8. Should the grade mode be institutional or normal/transferable? **Transferable.**

9. In which GPA calculations will the course count?

10. Can students audit the course? **Yes.**

11. Will this course satisfy a CPC deficiency? **No.**

12. Will this course follow the normal class meeting times and schedule? If not, what type of class meeting times and schedule will it follow? **Yes.**

13. Specify prerequisites, co-requisites, approval of department chair and appropriate Learning support and ESL requirements. **Prerequisite is PHYS 2212, corequisite is MATH 2652.**

D. Briefly describe how this course will help meet the objectives of the College.

- It will attract more students to GPC's Engineering program and the RETP in particular.
- It will increase the attractiveness of GPC Engineering graduates and transfer students to the institutions in which they will be continuing their education. For one thing, it reduces the number of sophomore level courses a student must take upon transfer to the four-year institution.
- It will provide an alternative to the four-year institutions for this course.

E. Common Course Outline

Georgia Perimeter College
Engineering Academic Group
Common Course Outline

Course Abbreviation	ENGR 2040
Credit Hours	3
Course Title	Electric Circuit Analysis
Prerequisite or Corequisite	PHYS 2212, MATH 2652 (corequisite)

Catalog Description

This course is an introduction to the analysis of electrical circuits and networks. Topics include resistive circuits, network topology, network analysis, capacitive and inductive circuits, AC circuits, AC power, time- and frequency-domain analysis, mutual inductance, and one- and two-port networks.

Expected Educational Results

As a result of completing this course, the student will be able to do the following:

1. Identify the elements, quantities, and constitutive relations in an electric circuit.
2. Perform analysis of circuits containing resistors, inductors, and capacitors:
    a. Series, parallel, and ladder circuits using Ohm's Law, voltage division and current division.
    b. Delta-wye transformation.
3. Perform analysis of circuits containing diodes, operational amplifiers, and bipolar junction transistors (BJTs), given their input-output behaviour.
4. Perform analysis of circuits containing dependent sources.
5. Develop network equations from a circuit diagramme using cutset and loop analysis, and node and mesh analysis.
6. Apply the linearity (superposition) principle to analyze and solve circuits with multiple independent sources.
7. Apply the Norton, Thévenin, Tellegen, and reciprocity network theorems to simplify, analyze and design large-scale networks.
8. Design a network for maximum power transfer.
9. View a circuit as a system, and describe the response of a circuit to various input signals such as impulse, step, ramp, and sinusoidal.
10. Analyze AC circuits using complex amplitude and phasors.
11. Describe the transient and steady-state response of an AC circuit.

12. Describe the frequency response of an AC circuit, in terms of essential bandwidth, passbands and stopbands, Bode plots and Nyquist diagrams.
13. Determine the rms value of an AC variable.
14. Determine the resonant frequency of an AC circuit, and analyze and design resonance circuits.
15. Compute the power, apparent power, and power factor in an AC circuit.
16. Compute the power factor correction for maximum power transfer.
17. Analyze circuits containing inductive couples using the theory of mutual inductance.
18. Write the impedance matrix, admittance matrix, and transmission matrix of a two-port network.
19. Describe the relationships amongst the parameters of a two-port network.

General Education Outcomes

I. This course addresses the general education outcome relating to communication by providing additional support as follows:
   A. Students develop their listening and speaking skills by attending lectures, participating in class and in small group discussions.
   B. Students develop their reading comprehension skills by reading and discussing assigned sections of the text. Some sections are assigned for study which are not covered in class. Reading engineering text requires skills somewhat different from those used in reading materials for other courses, in that students are expected to read highly technical material and interpret complex diagrams.
   C. Unit tests, examinations, and other assignments provide opportunities for students to practice and improve technical writing skills. The Engineering field has a specialized vocabulary that students are expected to use correctly.

II. This course addresses the general education outcome of demonstrating effective individual and group problem-solving and critical-thinking skills as follows:
   A. Students must apply mathematical and engineering concepts to non-template problems and situations.
   B. In applications, students must analyze problems, often through the use of multiple representations, develop or select an appropriate mathematical model, utilize the model, and interpret results.

III. This course addresses the general education outcome of using mathematical concepts to interpret, understand, and communicate quantitative data as follows:
   A. Students must be proficient in analysis of linear electric networks containing passive elements.
   B. Students must be able to derive, solve, and analyze the differential equation describing a network.

C. Students must be proficient in the use of phasors to analyze AC circuits in steady-state operation.
D. Students must be proficient in the use of complex variables in the analysis and design of AC networks.

IV. This course addresses the general education outcome of locating, organizing, and analyzing information through appropriate computer applications (including hand-held graphing calculators). As a result of taking this course, the student should be able to use technology to:
A. Solve a system of linear equations.
B. Graph the response of a circuit to common inputs.
C. Draw the Bode and Nyquist plots of a network.
D. Place the poles and zeros of a transfer function to design a network that meets given specifications.

Course Content

1. Elements of an electric network and their equations
2. Circuit analysis and design
3. Input-output analysis
4. Frequency domain analysis
5. Power and energy
6. Mutual inductance
7. Two-port networks

Entry Level Competencies

Upon entering this course the student should be able to do the following:

1. Write a system of linear equations in matrix form.
2. Solve a system of linear equations using the methods of Gaussian elimination and Cramer's rule.
3. Effectively use trigonometric identities such as the sum of angles and double angle formulas.
4. Use trigonometry to solve a triangle.
5. Draw accurate graphs of elementary functions such as power and root functions, polynomial functions, trigonometric and inverse trigonometric functions, and exponential and logarithmic functions.
6. Express numbers as logarithms, and work effectively with logarithmic quantities.
7. Perform complex arithmetic.
8. Differentiate and integrate elementary functions such as would be studied in the calculus.

Assessment of Expected Educational Results

I. Course Grade

The course grade will be determined by the student's performance on homework, exams, and a final exam.

II. Departmental Assessment

This course will be assessed every three years. The assessment will consist of a set of questions agreed upon by the Engineering committee.

III. Use of Assessment Findings

The Engineering Committee, or a special assessment committee appointed by the Engineering Committee, will analyze the results of the assessment and determine implications for curriculum changes.

Effective Date: August 2009 Approved Date:

Reviewed by Committee: