

# Program Review Year 2010– 2011

## Engineering Science

### Program Review Team Members

<u>Name</u>	<u>Title</u>
Liliana Brand	Assistant Professor of Mathematics
Paul Chanley	Engineering & Electronic Technology Program Coordinator
Michael Cross	Instructor, Department of Natural Sciences
Thomas Greene	Assistant Professor, Department of English
Lori Heymans	Associate Professor Developmental Math
Habib Maagoul	Assistant Professor of Mathematics
Michael Pelletier	STEP UP Project Leader

DATE: \_\_\_\_\_ 3-4-2011 \_\_\_\_\_



**B. Does the program have external (specialized) programmatic approval or certification?**

Yes \_\_\_\_\_

No   X  

**IF NO, skip to I (C).**

**IF YES, please complete items 1 through 8 below.**

1. What is the name of the programmatic approval or certification agency?
  
2. What is the current approval or certification status of the program?
  
3. What date was the last approval or certification status awarded?
  
4. What is the anticipated date of the next approval or certification action?
  
5. How often does the program file an official report with the approving or certifying agency?
  
6. Where is the program currently in the review schedule (e.g., year 3 of a 7 year cycle)?
  
7. What were the strengths and weaknesses of the program, as identified by the approval or certification agency during the last approval or certification activity? (*Base your response in this area to the citation of Standards.*)
  
8. How has the program been revised to address the citations or recommendations?

**C. Is there an external accrediting, certifying, or approval organization relevant to your program from which you are not currently receiving accreditation, approval or certification?**

Yes \_\_\_\_\_

No   X  

**IF NO, skip to question II.**

**IF YES, please complete items 1 through 3 below.**

1. What is the name of this external organization?

2. What status can your program receive from this organization?

Accreditation \_\_\_\_\_ Certification \_\_\_\_\_ Approval \_\_\_\_\_

3. Are you intending to apply for accreditation, certification, or approval from this organization?

Yes \_\_\_\_\_

No \_\_\_\_\_

**IF NO, please explain, then go to question II.**

**IF YES, please complete items 4 through 7 below, then go to question II**

4. Why are you intending to apply for accreditation, certification, or approval?

5. When are you intending to apply and why?

6. Are there any specific resources you will need when you go through the accreditation, certification, or approval process that you do not currently have? If yes, please describe.

7. Please provide information about any additional questions, concerns, etc. you may have with respect to your intention to apply for accreditation, certification, or approval.

## **II. MISSION**

### **A . The program's mission statement is as follows:**

The primary mission of the Associate in Science Degree in Engineering Science at NECC is to prepare students to effectively transfer to a four-year college or university. The Engineering Science program also offers the opportunity to obtain certificates in Electronic Equipment Technology and CAD. Both of these certificates allow students to develop additional skill sets that are very attractive in the marketplace, giving students a competitive edge when entering a four-year institution or when applying for a job position.

To achieve this mission, a core curriculum has been developed in cooperation with the engineering divisions of several four-year institutions. Students have the opportunity to explore various engineering fields in order to choose the specialization best suited to their interests and abilities. The program's mainstay is to enthusiastically engage and educate students in science, technology, engineering and mathematics, which provides them with solid fundamentals that help them succeed in pursuing the bachelor's degree in engineering.

In addition, the program encompasses a course of study to help students become effective, compelling communicators, work in a team environment, and be cognizant of the social, cultural and economic condition of the region. This holistic approach to the degree enables students to address future changes in technology and society as it occurs.

### **B. Describe the process through which faculty developed the program mission.**

The Associate in Science Degree in Engineering Science program mission statement was developed by the program's faculty members. The faculty's knowledge of the engineering industry was a key element of the mission statement. In addition, engineering programs of several four-year institutions were reviewed during the development process. Finally, the mission statement was reviewed and edited by other faculty members on the program review team.

### **C. Describe how the program's mission statement is consistent with, or aligns with, the mission of the College.**

The Associate in Science Degree in Engineering Science program mission aligns with Northern Essex Community College's mission by providing an affordable course of study, which enhances the economic and social life of the people in the Greater Merrimack Valley. The program's graduates are provided a strong basis toward continuation of study at four-year institutions.

### **D. Describe how this program facilitates the accomplishment of the College's mission and core values.**

The Associate in Science Degree in Engineering Science Program supports all of the college's Core Values. For example:

**Student Engagement:** Activities which support student engagement include Whiteboard analyses, software simulations, and hands-on lab work.

**Collaboration:** The classrooms have been designed to give students a place to collaborate on ideas, work on homework assignments and conduct research on the computers. Program faculty also actively collaborates with faculty in area four-year colleges, for example Merrimack College, Northeastern University, and the University of Massachusetts – Lowell.

**Excellence:** The Program provides an educational environment that supports active learning and a technical pathway that provides a competitive, solid foundation to further their education with a Baccalaureate degree at four-year institutions like UMASS Lowell and Merrimack College, and a career encompassing life-long learning. The program is committed to student success by providing dedicated, highly professional and experienced faculty and staff to deliver quality classroom instructions, lab work and proper assessment of student proficiency. Just as important, students work with current industry equipment, computers and software. Faculty members also continually inform students about specialized services at the College that support student success, including the Math Center, Academic Tutoring Center, Advisory, and Workforce Development.

### III. INSTITUTIONAL STRATEGIC PLAN

#### A. Describe how this program satisfies or is consistent with one or more of the College's institutional goals as defined in the Institutional Strategic Plan.

The Engineering Science program supports all of the College's institutional goals as articulated in the Strategic Plan in a number of ways. For example, the program strives for **educational excellence** by actively supporting and preparing students from the courses of study through graduation. Such a supportive, hands-on environment helps students achieve a successful transition from the community college to a four year institution of higher education.

The Engineering Science program has also created a set of Student Learning Outcomes. These learning outcomes demonstrate that graduates of the program have developed the required competencies. See Appendix 3 for the curriculum map which provides all outcomes for the Engineering Science program.

Second, the Engineering Science program supports the institutional goal of **engaging students as active learners** by providing the technology, the learning environments and the academic courses of study to prepare engineering students for their future. The Engineering Science students participate in current contemporary class discussions using modern lab equipment, computers, and software application/simulation. They also have the opportunity to participate in cooperative learning assignments. The Engineering Science program includes full-time faculty as well as adjuncts that help students achieve their goals by being available for tutoring, advising, coaching while also expanding the availability of online and evening classes.

**B. Describe how significant modification of this program would impact other programs at NECC.**

Significant modification to the Engineering Science program would impact other programs at NECC, particularly the Electronic Technology, Electronic Technology Computer Systems Option and Computer Aided Drafting (CAD) certificate programs because the programs share several courses. Any significant changes to the Engineering Science program would need to be integrated between the programs.

Additionally, an engineering student's career paths could be altered because the Electronic Technology & CAD course work offers additional "hands-on" experience and lab work in technology and application. This experience gives NECC engineering students a solid technical skill set which allows them to compete at four-year institutions and in the work force.

Finally, there would be an impact on several other courses and departments at NECC if significant modifications would be made to the program. For example, higher level math courses would be affected as Engineering Science students are required to take Calculus I, II & III and Differential Equations. College Algebra & Trigonometry as well as Advanced Algebra and Trigonometry could also be impacted since these two courses are prerequisites to the Calculus sequences.

Also, the Physics and Chemistry courses would be impacted since all Engineering Science students are required to take them.

#### **IV. PROGRAM POLICIES AND PROCEDURES**

**A. List any specific program policies and procedures, and comment on the rationale for any differences from institutional policies and procedures.**

*(Programs may need to develop specific policies and procedures related to the day-to-day operation of the specific program [e.g., to meet accreditation standards, to establish the parameters for clinical education experiences]. When there are specific program policies and procedures, these policies and procedures should be consistent with those of the institution. Differences between program-specific policies and institutional policies should be described within the context of the program.)*

The Engineering Science Program follows the institutional policies and procedures; including proficiencies and prerequisites, established by the college

**B. Describe the mechanism used to assure that all students in the program receive copies of current program-specific policies and procedures, relevant information about the program, and information about the institutional policies and procedures.**

Faculty clearly communicates policies and procedures in a user-friendly manner at the beginning of every semester through syllabi and relevant student material. Each student is expected to read the policies and procedures of the program within these materials. The college institutional policies and procedures, student advising handbook, student code of conduct, and college catalogs are available to students from the NECC website. Engineering

Science students receive emails and newsletters throughout the semesters covering relevant program information, current events, and job opportunities.

**C. Describe how the program defines “student success.”** *(For example, if the program facilitates student transfer, and students do indeed transfer, does this meet the program’s definition of success?)*

**Describe the program’s policies, procedures and practices related to student success.**

Student success in the Engineering Science program is defined by student learning program outcomes and by continuing education in a baccalaureate degree program through transfer credit. (The curriculum map in Appendix 3 provides all outcomes for the Engineering Science program and the College.)

There are several policies, procedures, and practices in place to provide for student success. First, the Engineering Science program ensures quality and relevancy of the program curriculum to meet the needs of our diverse student population, community and four year schools. Second, the faculty and staff support students through accessible, reliable, and user-focused support services, including the Math Center, Academic Tutoring Center, Advising Center and Work Force Development. Third, the faculty and staff create an environment that attracts, retains and supports students through an “open-door” policy for office hours as well as scheduled appointments.



## SECTION TWO: STUDENTS

### I. PROGRAM DEMAND, COMPLETION, AND RETENTION

**A. Discuss how the program obtains data concerning student demand for the program. (See completed Chart 1 in Appendix 1.) Discuss how the data in Chart 1 was analyzed and interpreted.**

Data obtained for the Engineering Science Program was provided by Dean of Institutional Research and Planning. Total unduplicated enrollment for the Engineering Science over a three year period averaged 153 students per year. For AY 2007–2008, AY 2008 –2009 and AY 2009-2010, total enrollment was 124, 145 and 190 respectively. There has been approximately a 50% increase in enrollment during this time frame.

**B. Discuss student program completion and transfer. (See completed Chart 2 in Appendix 1.)**

*(If there are two or more consecutive years in which there are five (5) or fewer graduates from the program, describe the analysis conducted by faculty to determine the reason for this number of graduates. Include the action plan the faculty developed and implemented. Comment on the effectiveness of the action plan.)*

- For the years (2007 – 2008), (2008 -2009) and (2009 – 2010), the total unduplicated enrollment (new plus continuing) is 124, 145 and 190 students, respectively. The three-year average for enrollment is 153 students per year.
- For the same years, the number of program graduates is 2, 7 and 5 students, respectively. The three-year average for graduates is 5 students per year. It appears students are transferring to four year schools prior to graduating at NECC. The data from Chart 4 supports this claim. There have been several changes to the Engineering Science curriculum to help support students to graduate prior to transferring because, in many ways, actually having a degree can provide an advantage to transfer students.
- From the years 2007-2010, 9 students graduating from the Engineering Science program transferred to 4-year institutions. However, during the same time frame, 94 students transferred to four year institutions prior to graduating.

In order to help increase the graduation rate it is essential to have NECCUM training for all Engineering Science faculty advisors. This would provide students with the maximum flexibility to align courses for graduation.

Allow Engineering Science students to declare the engineering concentration they are interested in when enrolling in the program. Currently, all Engineering Science students are in one big group even though there are four distinct concentrations with different course requirements. This will make it easier to track students and optimize scheduling.

Also, mandate any Engineering Science student testing into BA II and/or MAT115 be required to take the EET certificate and/or CAD certificate depending on student's engineering concentration. The certificate program would permit students to get involved in

courses relating to their field early in their education instead of waiting to complete the Calculus sequence. This would give them an opportunity to determine early on and before investment in extensive coursework, whether engineering is the major they want to pursue. In addition, obtaining a certificate provides students with an employable skill set, and an advantage if they decide to transfer to a four year program. Also, this exposure in a certificate program may keep students interested in engineering and increase retention.

The development of *Engineering Essentials & Design, EST104* course hopefully will help the retention and graduation rate. The purpose is to enroll Engineering Science students in hands on, problem solving course early on in the education cycle. The intent is to keep students interest and provide insight to the career path they have chosen.

**C. Describe the demographic characteristics of students enrolled in program. (See completed Chart 3 in Appendix 1.)**

The following is a summary of the demographic characteristics of students enrolled in the Engineering Science program for the last three academic years. In terms of gender, the majority of the students are male. For AY 2007 - 2008, AY 2008 – 2009 and AY 2009 – 2010, the female enrollment was 12%, 14% and 16%, respectively. The trend of female enrollment in Engineering Science program at NECC is slightly lower to the national trend (19%) of women enrolling in major engineering universities throughout the United States (reference ASEE).

For AY 2007 - 2008, AY 2008 - 2009 and AY 2009 – 2010, the minority student enrollment was 29%, 32% and 35%, respectively, which is slightly higher than the overall NECC minority enrollment percentages. The majority of minority students are Hispanic representing 86%, 83% and 72%, respectively.

**D. Discuss student retention and positive college outcomes by student demographics. (See completed Chart 4 in Appendix 1.)**

1. Describe the program policies, procedures, and practices that are in place related to student retention. Discuss how are they implemented? Comment on their effectiveness.

Policies, procedures and practices for student retention are determined by the academic policies of NECC. There are no specific Engineering Science program policies for the retention of students.

The Engineering Science program student retention rates for the last two years were consistent at about 40%, increasing from 23% in AY2007-2008. The data for AY 2007-2008, AY 2008-2009 and AY 2009-2010 was 23%, 41% and 40% respectively. The positive college outcomes for the last three academic years have been greater than 70%. The data for AY 2007-2008, AY 2008-2009 and AY 2009-2010 was 72%, 77% and 72% respectively.

2. Is there evidence that any segment of the student population has a higher attrition rate from this program? If so, what action has the program taken to address this phenomenon?

There is no overwhelming evidence of data that suggests any particular student population has a higher attrition rate than another. However, for AY2009-2010, the minority population had a slightly higher program retention rate (46%) with respect to the total student population in the program. Also, the female population during the same time frame had a 10% greater retention rate (50%) than the total population.

## **SECTION THREE: CURRICULUM**

### **I. CONTENT, ORGANIZATION, AND DEVELOPMENT PROCESSES**

#### **A. Describe the curriculum.** *(You may use the same format used in the NECC Academic Catalog.)*

During the course of this program review, the curriculum was thoroughly scrutinized in terms of its adequacy in preparing students for transfer to four-year colleges, especially considering the many different concentrations in which students elect to be prepared. This work included NECC program faculty and administrators as well as representatives from the University of Massachusetts – Lowell in the form of chairs of several engineering departments, Northeastern University, and an outside consultant. Based on this work, the curriculum was revised, presented for approval to the college's Academic Affairs Committee, and approved in February 2011. It is expected to be fully implemented by the spring of 2012.

Both the former and the new program descriptions are presented below in a side-by-side comparison. Included with these descriptions is the recommended course sequence for the new curriculum, and suggested text for the NECC Advising Handbook.

## Engineering Science

Former Program Description				New Program Description			
The associate in science degree program in Engineering Science is designed to prepare an engineering student for transfer to a four-year college or university. A core curriculum has been developed in cooperation with the American Society for Engineering Education and engineering divisions of several four-year institutions. The core curriculum allows the student an opportunity to explore various engineering fields equipping him/her to choose the field of specialization best suited to his/her interests and abilities. The fields of engineering include computer/electrical, mechanical, civil, chemical and environmental. A strong background in mathematics is required. A minimum of 64 credit hours are required for graduation.				The associate in science degree program in Engineering Science is designed to prepare an engineering student for transfer to a four-year college or university. <b>Curriculum</b> has been developed in cooperation with the American Society for Engineering Education and engineering divisions of several four-year institutions. The core <b>and focus</b> curriculum allows the student an opportunity to explore various engineering fields equipping him/her to choose the field of specialization best suited to his/her interests and abilities. The <b>concentration areas</b> of engineering include computer/electrical, mechanical, civil/environmental and chemical. A strong background in mathematics is required. A minimum of <b>66</b> credit hours are required for graduation.			
Requirements	Courses	Credits	Comments	Requirements	Courses	Credits	Comments
					<b>Core Requirements</b>		
ENG101	English Composition I	3		ECO201	Micro Economics	3	
ENG102	English Composition II	3	Prerequisite	ECO202	Macro Economics	3	
EST110	Engineering Design Graphics	3		ENG101	English Composition I	3	
MAT251	Calculus I	4	Prerequisite	ENG102	English Composition II	3	Prerequisite
MAT252	Calculus II	4	Prerequisite	ENG103	Technical Writing	3	Prerequisite
MAT253	Calculus III	4	Prerequisite	EST110	Engineering Design Graphics	3	
MAT254	Differential Equations	4	Prerequisite	EST104	Engineering Essentials & Design	3	Co-requisite
PHS131	Engineering Physics I	4	Prerequisite	CHM121	General Chemistry I	4	Prerequisite
	<b>Chemical / Environmental Engineering Focus</b>			MAT251	Calculus I	4	Prerequisite
CHM121	General Chemistry I	4	Prerequisite	MAT252	Calculus II	4	Prerequisite
CHM122	General Chemistry II	4	Prerequisite	MAT253	Calculus III	4	Prerequisite
PHS132	Engineering Physics II	4	Prerequisite	MAT254	Differential Equations	4	Prerequisite
	Liberal Arts Elective	3/4		PHS131	Engineering Physics I	4	Prerequisite

	<b>Civil / Mechanical Engineering Focus</b>			PHS132	Engineering Physics II	4	Prerequisite
EST111	Computer Aided Drafting I	3	Prerequisite		<b>Chemical Engineering Concentration</b>		
EST112	Computer Aided Drafting II	3	Prerequisite	CHM122	General Chemistry II	4	Prerequisite
CHM121	General Chemistry I	4	Prerequisite		Chem. Eng. Elective	3/4	EST213 or higher, or MAT125, <b>MUST see advisor</b> , Prerequisite
CHM122	General Chemistry II	4	Prerequisite	PHI110	Ethics	3	
PHS132	Engineering Physics II	4	Prerequisite		<b>Civil/ Environmental Engineering Concentration</b>		
	<b>Computer / Electrical Engineering Focus</b>			EST111	Computer Aided Drafting I	3	Prerequisite
CTE101	Fundamentals of Digital Logic	3	Co-requisite	EST112	Computer Aided Drafting II	3	Prerequisite
CTE103	Digital Design Lab	2	Co-requisite	CHM122	General Chemistry II	4	Prerequisite
CTE210	Microcomputers	4	Prerequisite		Civil/Env Eng Elective	3	EST211 or higher, <b>MUST see advisor</b> , Prerequisite
EST231	Engineering Circuit Analysis I	5	Prerequisite		Civil/Env Eng Elective	3	EST212 or higher, <b>MUST see advisor</b> , Prerequisite
EST232	Engineering Circuit Analysis II	5	Prerequisite		<b>Electrical/Computer Engineering Concentration</b>		
PHS132	Engineering Physics II	4	Prerequisite	CTE101	Fundamentals of Digital Logic	3	Co-requisite
				CTE103	Digital Design Lab	2	Co-requisite
					Elect/Comp Eng Elective	5	EST231 or higher, <b>MUST see advisor</b> , Prerequisite
					Elect/Comp Eng Elective	5	EST232 or higher, <b>MUST see advisor</b> , Prerequisite

					<b>Mechanical Engineering Concentration</b>		
				EST111	Computer Aided Drafting I	3	Prerequisite
				EST112	Computer Aided Drafting II	3	Prerequisite
					Mech Eng Elective	3	EST211 or higher, <b>MUST see advisor,</b> Prerequisite
					Mech Eng Elective	3	EST212 or higher, , <b>MUST see advisor,</b> Prerequisite
				PHI110	Ethics	3	
<b>Program Electives</b>				<b>Program Electives</b>			
<b>Requirements</b>	<b>Courses</b>	<b>Credits</b>	<b>Comments</b>	<b>Requirements</b>	<b>Courses</b>	<b>Credits</b>	<b>Comments</b>
	Computer Elective	8	CIS240 recommended		Computer Program Elective	4	CIS140, CIS200 or higher, not CIS141
	Humanities Elective	6	Not GRA, COM recommended, Lit required for UMASS Lowell		Humanities Elective	3	COM111 <b>Strongly</b> recommended
	Social Science Elective	6	ECO201 and ECO202 recommended				

## **Recommended Course Sequence- Engineering Science Program**

### **Chemical Engineering Concentration**

<b>1<sup>st</sup> Semester</b>	EST104	EST110	MAT251	CHM121	ENG101	
<b>2<sup>nd</sup> Semester</b>	MAT252	ENG102	ECO201	Computer Elect	CHM122	
<b>3<sup>rd</sup> Semester</b>	MAT253	ECO202	PHS131	PHI110	ENG103	
<b>4<sup>th</sup> Semester</b>	MAT254	PHS132	Hum Elect	CHEM Elect		

### **Civil/Environmental Engineering Concentration**

<b>1<sup>st</sup> Semester</b>	EST110	EST104	MAT251	PHS 131	ENG101	
<b>2<sup>nd</sup> Semester</b>	EST111	ENG102	MAT252	PHS 132	Comp Elect	
<b>3<sup>rd</sup> Semester</b>	EST112	MAT253	ECO201	CHM121	Civil/Env Eng Elect	
<b>4<sup>th</sup> Semester</b>	MAT254	CHM122	Civil/Env Eng Elect	ENG103	ECO202	Hum Elect

### **Electrical/Computer Engineering Concentration**

<b>1<sup>st</sup> Semester</b>	EST110	EST104	MAT251	CTE101	CTE103	
<b>2<sup>nd</sup> Semester</b>	MAT252	ENG101	CHM121	Comp Elect	ECE201	
<b>3<sup>rd</sup> Semester</b>	MAT253	ENG102	Elect/Comp Eng Elect	ECO202	PHS131	
<b>4<sup>th</sup> Semester</b>	MAT254	ENG103	Elect/Comp Eng Elect	PHS132	Hum Elect	

### **Mechanical Engineering Concentration**

<b>1<sup>st</sup> Semester</b>	EST110	EST104	MAT251	PHS131	ENG101	
<b>2<sup>nd</sup> Semester</b>	EST111	ENG102	MAT252	Comp Elect	PHS132	
<b>3<sup>rd</sup> Semester</b>	EST112	MAT253	ECO201	Mech Eng Elect	CHM121	
<b>4<sup>th</sup> Semester</b>	MAT254	ECO202	Mech Eng Elect	ENG103	Hum Elect	PHI110



## **Proposed NECC Advising Handbook**

The associate in science degree program in Engineering Science is designed to prepare an engineering student for transfer to a four-year college or university. **Curriculum** has been developed in cooperation with the American Society for Engineering Education and engineering divisions of several four-year institutions. The core **and focus** curriculum allows the student an opportunity to explore various engineering fields equipping him/her to choose the field of specialization best suited to his/her interests and abilities. The **concentration areas** of engineering include computer/electrical, mechanical, civil/environmental and chemical. A strong background in mathematics is required. A minimum of **66** credit hours are required for graduation.

Requirements		Credits	Comments
<b>Core Requirements</b>			
ECO201	Micro Economics	3	
ECO202	Macro Economics	3	
ENG101	English Composition I	3	
ENG102	English Composition II	3	Prerequisite
ENG103	Technical Writing	3	Prerequisite
EST110	Engineering Design Graphics	3	
EST104	Engineering Essentials & Design	3	Co-requisite
CHM121	General Chemistry I	4	Prerequisite
MAT251	Calculus I	4	Prerequisite
MAT252	Calculus II	4	Prerequisite
MAT253	Calculus III	4	Prerequisite
MAT254	Differential Equations	4	Prerequisite
PHS131	Engineering Physics I	4	Prerequisite
PHS132	Engineering Physics II	4	Prerequisite
<b>Chemical Engineering Concentration</b>			
CHM122	General Chemistry II	4	Prerequisite
	Chem. Eng. Elective	3/4	EST213 or higher, or MAT125, <b>MUST see advisor</b> , Prerequisite
PHI110	Ethics	3	
<b>Civil/ Environmental Engineering Concentration</b>			
EST111	Computer Aided Drafting I	3	Prerequisite
EST112	Computer Aided Drafting II	3	Prerequisite
CHM122	General Chemistry II	4	Prerequisite
	Civil/Env Eng Elective	3	EST211 or higher, <b>MUST see advisor</b> , Prerequisite
	Civil/Env Eng Elective	3	EST212 or higher, <b>MUST see advisor</b> , Prerequisite

	<b>Electrical/Computer Engineering Concentration</b>		
CTE101	Fundamentals of Digital Logic	3	Co-requisite
CTE103	Digital Design Lab	2	Co-requisite
	Elect/Comp Eng Elective	5	EST231 or higher, <b>MUST see advisor</b> , Prerequisite
	Elect/Comp Eng Elective	5	EST232 or higher, <b>MUST see advisor</b> , Prerequisite
	<b>Mechanical Engineering Concentration</b>		
EST111	Computer Aided Drafting I	3	Prerequisite
EST112	Computer Aided Drafting II	3	Prerequisite
	Mech Eng Elective	3	EST211 or higher, <b>MUST see advisor</b> , Prerequisite
	Mech Eng Elective	3	EST212 or higher, <b>MUST see advisor</b> , Prerequisite
PHI110	Ethics	3	
	<b>Program Electives</b>		
	Computer Program Elective	4	CIS140, CIS200 or higher, not CIS141
	Humanities Elective	3	<b>COM111 Strongly recommended</b>

**B. Discuss how the curriculum is an organized, sequential series of courses that progress from simple to complex learning.**

The new Engineering Science Program at NECC was developed after comparing the old program with other similar programs. The new NECC program is consistent with those other programs. The new program is sequential and logical in its order and progresses from simple to complex. The program is rigorous in mathematics and science. The math and science course sequences provide a solid foundation for engineering courses to build on.

**C. Describe the curriculum development, review and revision processes used by the program to assure that the curriculum meets the needs of students and graduates. Include discussion of the mechanisms that allow input into these processes from (1) employers of program graduates and (2) schools to which students transfer (if applicable).**

Because of the very nature of the Engineering industry, it is essential for the Engineering Science program to be current with new technologies. As a result, faculty needs to investigate and evaluate new technical ideas and implement concepts into the classroom in order to provide a quality program. This is currently accomplished by focusing on contacts with four-year institutions, academic conferences and industry workshops. When appropriate, the program makes modifications to the curriculum based on the requirements of academia and business. For example, after review of the NECC Engineering Science program in connection with this review, modifications to the curriculum were recently made.

The revisions to the program, made as noted above after detailed discussions with faculty at area four-year colleges, were made with the goal of more closely aligning the Engineering Science Program with the first two years of requirements with UMASS Lowell's Engineering Program. The alignment is necessary, as the majority of our graduates transfer to UMASS Lowell. This will also provide students the opportunity to transfer to other institutions within the state system, insuring maximum efficiency upon transfer. Additionally, the changes will simplify the advising process via concise program audit/transfer course sequencing. These revisions should maximize the efficiency of transferring to the four year institution. All Engineering Chairs at UMASS Lowell have had input to the curriculum changes.

Also, during the review process, it was observed that the Engineering Science program lacked a solid Introduction to Engineering Course. NECC acted upon and developed and implemented an Engineering Essentials & Design, (EST104) course into the Engineering Science Program.

**D. How does the curriculum contribute to the student accomplishing the institutional outcomes?**

The major goal of the Engineering Science Program is to prepare students for transferring to a four year engineering program. The program prepares students for further technical education through STEM (Science, Technology, Engineering & Math) coursework and effective advising strategies. Students are well prepared for transfer through their coursework and other program related experiences. The Engineering Science courses align with area four-year colleges.

The program's Outcomes and Curriculum Map clearly shows how the courses in the program support the institutional learning outcomes.

**E. How does the curriculum contribute to the student accomplishing the program specific outcomes?**

The program's curriculum is embedded in the Outcomes and Curriculum Map, which shows how the curriculum contributes to the student accomplishing the program outcomes.

## SECTION FOUR: PROGRAM RESOURCES

### I. FACULTY

**A. Discuss the number of faculty assigned to the program with respect to its adequacy to complete all activities associated with maintaining a high-quality educational program. (See completed Chart 5(A), Chart 5(B), and Chart 5(C) in Appendix 1.)**

*If the program holds specialized accreditation or approval, state the number of full-time faculty (or full-time equivalent faculty) required by the outside agency (\_\_\_\_\_). Write "NA" if not applicable.*

The charts included in Appendix 1 refer to the old program, which has since been revised.

The percentage of credit hours taught by full time faculty for the **core** set of courses was just over 50% for the last academic terms. The percentage of credit hours taught by full time faculty for the **focus** set of courses has dropped to 26% for spring 2010. Hopefully, with curriculum modification these numbers should increase. Based upon these numbers the program could support additional full time faculty to decrease the dependence upon non full-time faculty, especially in the sequence of physics courses.

**B. Indicate the percentage of faculty that are full-time, as well as the percentage of credit hours taught by full-time faculty. (See Chart 5 (D) in Appendix 1.)**

The most recent percentage of credit hours taught by full time faculty was mentioned in part A. The percentage of full-time faculty, for **core** and **focus** courses, who taught in the spring 2010 term is about 33%.

**C. Discuss how the percentage of full-time faculty, both in terms of numbers and credit hours taught, impacts the program.**

It is more likely that full time faculty, who maintain office hours, attend college meetings and functions and participate at higher levels of program related activities, tend to provide a better overall quality of program delivery to students. This is important to monitor, especially now that enrollment is increasing.

**D. For each faculty member, document their credentials and professional activities. (See the copies of Chart 6 in Appendix 1 completed for each faculty member [full, part-time, or DCE]). (Note: Each individual faculty member should complete his/her own chart and submit it to the Program Coordinator or designee.)**

**Describe and summarize the credentials and the activities of program faculty with respect to maintaining their status as content experts and remaining current in their field of expertise.**

The credentials are more than adequate in delivering this program at a high quality. In reviewing the Faculty Credentials (Chart 6) Evaluations, it is apparent that the faculty members have consistently engaged in activities that keep them abreast of new developments in their discipline which enhance the existing program curriculum.

Minority members and females are well represented in the faculty members who teach in the program, providing good role models for the students.

## II. CLASSROOMS AND LABORATORIES

**Discuss whether the program has classrooms and laboratories of sufficient quality and quantity to provide an environment conducive to effective teaching and learning.** *(How did the program coordinator/faculty make this decision?)*

The majority of the technical courses required for the Engineering Science program are taught in the new Technology Center building. The quality and quantity of the classrooms is sufficient, and offer the latest technology to provide an environment conducive to effective teaching and learning. However, this technology needs to remain current with the latest in technology and software. For example, the CAD courses are an integral part of the program and needs continuous update to AutoCAD. Currently, there are plans to incorporate a plotter to the CAD courses. This action needs to be completed and supported.

A new course has been developed for the program, “Engineering Essentials & Design” and needs to be supported with hardware, MATLAB and C++. Also, a review of the Physics I & II lab material needs to be performed in order to remain current with technology.

With respect to the Math, English, Humanities and Social Science electives, there is a sufficient quantity of classrooms.

## III. INSTRUCTIONAL TECHNOLOGY

**Describe the instructional technology required to support the program’s curriculum plan. Discuss whether the current instructional technology is of sufficient quality and quantity to provide an environment conducive to effective teaching and learning.** *(How did the program coordinator/faculty make this decision?)*

The Engineering Science program relies heavily on technology. For example, courses require use of the internet for project research as well as Blackboard, electronic laboratory equipment, components and application software. The majority of instructor support materials from the text book publisher is CD and/or internet-based. It is essential for the instructional technology to be continuously updated to ensure the ongoing quality of the program. The latest revisions of application and simulation software need to be installed in the student’s classroom/lab computers, instruction stations. Also, faculty needs to be able to review current technologies and implement them into classroom instructions. NECC needs to continue supporting the classroom and instructional technological updates required by the program on an annual basis.

## IV. LIBRARY AND RELATED LEARNING RESOURCES

**Discuss whether the program has access to library and related learning resources adequate to support the curriculum plan and to provide an environment conducive to effective teaching and learning.** *(How does the program use the library and related learning resources in the implementation of the curriculum plan? Describe the process used by the program to determine the adequacy of library and related learning resources.)*

- **Library Resources**

- The Northern Essex Community College Libraries serve the varied informational needs of the students, faculty and staff of the college. The libraries support the College's academic programs and provide for the research needs of students as well as the professional development of the faculty. Materials in Electronic Technology and related technologies are available in both book and journal format at the NECC library and at other local and regional libraries.
- The NECC library subscribes to many electronic periodical databases which include the full-text of articles from thousands of journals and newspapers. These databases are available on campus as well as off-campus through the library's web page. Computers with World Wide Web access are available to students at the library. The library staff provides reference and inter-library loan service. In addition, librarians provide instruction to groups and individuals on the research process and on strategies for locating library and electronic resources. Students and faculty are able to use other Massachusetts public college and university libraries, as well as area public libraries. Additional educational resources are available through the library's involvement in consortia that include most of the public and academic libraries in Eastern Massachusetts.
- The NECC libraries are members of the North of Boston Library Exchange (NOBLE) consortium. The consortium members include 27 public and academic libraries with a combined collection of more than 6 million books. Daily delivery of books and other materials is available through the Northeast Regional Library System. Professional staff is on duty during the hours the library is open.

- *Academic Computing Labs*

- Our Computer Labs feature the latest Dell p/c workstations, laser printers, scanners, ergonomic seating, and study area. Specialty support staff and faculty are available to assist students with computer and course-related problems. Peer tutoring is also available in the computer labs to assist students with computer-related classes and questions.

## **V. FINANCIAL RESOURCES**

**Discuss whether the program's financial resources are adequate for the program to achieve its stated mission.**

*(How does the program coordinator/faculty participate in developing the program/department budget?*

*How does the program coordinator/faculty participate in evaluating the adequacy of the budget to support effective teaching and learning?)*

The Engineering Science & Electronic Technology programs share a budget. The shared budget is adequate to support fundamental office expenses such as Mail/Office/Graphics (MOG), basic electronic parts/devices for lab work, in state travel. However, if the program is to grow, attract more students, and stay on the cutting edge of its curriculum, more financial resources must be provided.



For example, it is critical for faculty associated with this program to keep current with every-changing technology. Additional funding for workshops and conferences that focus on what's new and improved in technology is needed. For example, in order to implement MATLAB across the Engineering Science curriculum, faculty would need to be trained. Also, there should be financial resources for yearly renewals of AutoCAD, MATLAB, C++ and Multisim software.

## **VI. CONTENT EXPERTS**

### **A. Does the program have an Advisory Committee?**

Yes \_\_\_\_\_ No   X  

**IF NO, skip to VI (B).**

**IF YES, please complete items 1 through 5 below.**

1. Insert the roster of Advisory Committee members.
2. Report the schedule of meetings for the past three years, or as many as available if the Advisory Committee has been meeting for less than three years.
3. Insert copies of the Advisory Committee minutes for the past three years.
4. Describe the input of the Advisory Committee experts on program outcomes.
5. Describe the usefulness of the Advisory Committee relative to anticipating changes and challenges that need to be met by the program.

**NOW GO TO QUESTION VI (C).**

### **B. Does the program have any plans to develop an Advisory Committee?**

Yes \_\_\_\_\_ No   X  

**IF NO, what is the program's rationale for this decision?**

Engineering Science program is a transfer program.

**IF YES, please detail below.**

**NOW GO TO SECTION VI (C).**

### **C. Does the program use content experts other than those represented in an Advisory Committee?**

Yes   X   No \_\_\_\_\_

**IF NO, skip to Section Five.**

**IF YES, please discuss below and then go to Section Five.**

The program frequently consults with faculty at four year colleges regarding the program's offerings, in order to ensure that the program stays current and aligns well with the various four year college curricula.

In addition, faculty regularly attend and workshop to stay current in the field. For more detailed information on the faculty activities, please see Section Four (D) and Appendix 1.

## **SECTION FIVE: PROGRAM OUTCOMES**

### **I. PROGRAM OUTCOME ASSESSMENT PLAN**

#### **A. Insert the Program Outcome Assessment Plan for the previous three years. (See Plan in Appendix 3.)**

*(If the program has participated in Program Outcomes Assessment for fewer than three years, please comment on the reason and insert the number of Program Outcome Assessment plans the program has completed.)*

See the newly developed plan included in Appendix 3.

#### **B. How has the Program Review contributed to, supported, or confirmed the findings of the Program Outcome Assessment Plan activities?**

The development of the Engineering Science mission statement has proven beneficial and provided clarity to the program. Program objectives and student learning outcomes support the mission statement and are the mainstay of the program outcomes assessment plan.

During the program review process, current engineering curriculum was researched and reviewed. The review confirmed that the outcomes for the program are current with the required skill set for engineering students. The data also indicated that Engineering Science program needs to stay at the cutting-edge of technology and invest in the future by providing students with new training equipment, software, and tools to compete and succeed in the job force. Also, as the job market skill set changes with technology, so must the outcomes of the Engineering Science program. Therefore, the program outcomes must be reviewed annually.

## SECTION SIX: SUMMARY

### I. CONCLUSIONS: PROGRAM STRENGTHS AND WEAKNESSES

A. List and describe the program's major strengths, based on information obtained in the Program Review. Cite evidence for each identified strength.

AREA OF STRENGTH	EVIDENCE
Engaging students as active learners.	SECTIONS ONE (II) (D) and II (A)
Striving for educational excellence.	SECTIONS ONE (II) (D) and II (A)
Increase in student demand.	SECTION TWO (I) (A)
Non-graduating students as well as graduating students transferring at a high rate to four year colleges to continue their education.	SECTION TWO (I) (B)
Solid minority representation in program.	SECTION TWO (I) (C)
Minority and female representation among the faculty.	SECTION FOUR (I) (D)
Recent program retention rates and positive college outcomes rates for both minorities and females are slightly higher than for the college overall.	SECTION TWO (I) (D)

The newly revised and approved curriculum, including a revised core, revised concentrations, and the development of a new course.	SECTION THREE
Well qualified faculty	SECTION FOUR (I) (D)
The program's outcomes and assessment plan	SECTION FIVE

**B. List and describe the program's weaknesses or areas in which improvement is desirable, based on information obtained in the Program Review. Cite evidence for each identified weakness or area for improvement.**

<b>CHALLENGES</b>	<b>EVIDENCE</b>
Low program graduation rate.	SECTION TWO (I) (B)
Low female enrollment in program.	SECTION TWO (I) (C)
Having a full-time faculty member for the physics courses sequence.	SECTION FOUR(I) (A)
Making sure funds are available each year to update the AutoCAD. Without this regular updating, both this program and the CAD certificate program would be significantly negatively impacted. The same need for regular updating applies to MATLAB.	SECTION FOUR (II) SECTION FOUR (V)
Need to continuously update the instructional technology to ensure the ongoing quality of the program.	SECTION FOUR (III) SECTION FOUR (V)
Need for faculty to stay current with respect to technology and instructional methods, through workshops, publications, and conferences.	SECTION FOUR (III) SECTION FOUR (V)
Need to implement MATLAB in the Calculus, Engineering Physics, Engineering Circuit Analysis course sequences	SECTION FOUR (II) SECTION FOUR (IV)

## II. ACTION PLAN

**For each identified weakness or area in which improvement is desirable, submit an Action Plan.**

*(When designing the Action Plan, a suggested plan would include the elements of Process Management using a Plan-Do-Study-Act (PDSA) cycle.) (Note: Add as many of the following tables as necessary.)*

Problem	Improvement Activity	Person Responsible	Date of Activity	Findings
Low program graduation rate.	(1) New curriculum which has improved sequencing, making progress more apparent to students and advisors.	(1) Already completed	(1) Spring 2011	
	(2) NECCUM training for all Engineering Science faculty advisors.	(2) Dean of Advising		
	(3) Allow Engineering Science students to declare the engineering concentration they are interested in when enrolling in the program.	(3) Unknown		
	(4) Mandate Engineering Science student testing into BA II and/or MAT115 be required to take the EET certificate	(4) Unknown		
	(5) Engineering Essentials & Design, <i>EST104</i> course will help retention and graduation rate.	(5) Already completed	(5) Fall 2010	(5) The purpose is to enroll Engineering Science students in hands on, problem solving course early on in the education cycle. The intent is to keep students interest and provide insight to the career path they
	(6) Maximize number of advisors by assigning only Engineering Science students to the faculty that have engineering degrees.	(6) Unknown		
	(7) To avoid confusion between Technologies (Alg & Trig based) Circuit Analysis I (CTE111) & Circuit Analysis II (CTE112) with Engineering Science. Circuit Analysis (calculus based); change the Technologies course name	(7) Program Coordinator		

	to Applied DC Circuit Analysis and Applied AC Circuit Analysis. This eliminates the “I and II” designation. Therefore, the “I and II” can be reserved for the Engineering Science program.			have chosen.
Analysis:				

Problem	Improvement Activity	Person Responsible	Date of Activity	Findings
Low female enrollment in program.	Recruit female students	Unknown		
Analysis:				



Problem	Improvement Activity	Person Responsible	Date of Activity	Findings
Having a full-time faculty member for the physics courses sequence. Also, Review PHS131 and PHS132 Engineering Physics I & II for proper lab equipment.	Hire full time physics teacher	Division Dean		
Analysis:				

Problem	Improvement Activity	Person Responsible	Date of Activity	Findings
Making sure funds are available each year to update the AutoCAD. Without this regular updating, both this program and the CAD certificate program would be significantly negatively impacted. The same need for regular updating applies to MATLAB.	Secure funds	Division Dean		
Analysis:				

Problem	Improvement Activity	Person Responsible	Date of Activity	Findings
Need to continuously update the instructional technology to ensure the ongoing quality of the program.	Attend workshops and conferences	Program Coordinator		
Analysis:				

Problem	Improvement Activity	Person Responsible	Date of Activity	Findings
Need for faculty to stay current with respect to technology and instructional methods, through workshops, publications, and conferences.	Attend conferences and workshops	Program Coordinator		
Analysis:				

Problem	Improvement Activity	Person Responsible	Date of Activity	Findings
Implement MATLAB in the Calculus, Engineering Physics, Engineering Circuit Analysis course sequences,	Faculty professional development	Division Dean		
Analysis:				

### III. RESOURCES REQUESTED

**Complete the following chart, including quotes from vendors, diagrams for requested space, and draft postings as appropriate.** *(Note: Add rows, increase row height, etc., as needed.)*

1. EQUIPMENT				
Item	Justification	Vendor (include contact information)	Cost	Date Needed
MATLAB	EST104, Northeastern University will provide the funds for first year use. NECC will need to support the course	Math Works	\$2,500	Aug. 2012
AutoCad	EST110, EST111 and EST112 needs the software	Autodesk	\$8,200	Aug 2011
Multisym	EST231, EST232, CTE103 and CTE101 require this software. Will also be used by the EET program	National Instruments	\$1,000	Aug 2011

Faculty Development to implement MATLAB in the Calculus, Engineering Physics, Engineering Circuit Analysis course sequences,	MATLAB programming is used in four year colleges and in the workplace	Unknown	\$5,000	Spring 2012
Function Generators with "Burst" mode	Required to expand the new EST104 course. Currently, working with Northeastern University and Simple Machine company for a cheaper solution.	Agilent Technology.	\$5,000 \$500 each, 10 needed	Spring 2012
<b>2. PERSONNEL</b>				
Position (identify as faculty, staff, etc.)	Justification	Credentials/area of content expertise related to curriculum	Salary	Date Needed
Website developer	Essential to develop a website for the program Also, the website would need continuous updates.	Certificate, NECC work study student	Unknown	Aug 2011

**3. SPACE**

Type of space requested	Justification	Description (include square feet, construction requirements, e.g., plumbing, electricity, data ports)	Cost	Date Needed
Storage room to hold engineering lab equipment	Important to have a storage area to hold the equipment used in the Engineering Science courses.	Room already exists, TC132, The room is shared with Networking and Electronic Technology programs.	None	Already in place

## **APPENDICES**

**APPENDIX 1**  
**CHARTS 1-6**

**Chart 1. Student Demand**

	AY 2007-2008	AY 2008-2009	AY 2009-2010	3 Year Average
Total Applications	69	70	101	80
First Time Freshmen who registered	41	33	54	43
External Transfers who registered	7	10	15	11
Internal Transfers who registered	0	0	0	0
Readmitted Students who registered	7	4	11	7
Total Students new to program	55	47	80	61
Total Unduplicated Enrollment	124	145	190	153

**Chart 2. Program Completion/Student Transfer**

	AY 2007-2008	AY 2008-2009	AY 2009-2010	3 Year Average
Program Graduates	2	7	5	5
Students who transfer prior to graduation from program (multiple years out)	38	NA	NA	NA

**Chart 3. Student Demographics**

		Asian	Black	Cape Verdean	Hawaiian/Pacific Islander	Hispanic	Native American/ Native Alaskan	White	Non-Resident Alien	Multi-Racial	Unknown	Total	Minority Percentage (unprorated)
AY 2007-2008	Male	1	3	-	-	29	1	62	1	-	11	108	31%
	Female	0	0	-	-	2	0	12	0	-	1	15	13%
	Unknown	0	0	-	-	0	0	1	0	-	0	1	0%
	Total	1	3	-	-	31	1	75	1	-	12	124	29%
AY 2008-2009	Male	2	4	-	-	33	1	71	2	-	11	124	32%
	Female	0	0	-	-	6	1	11	0	-	3	21	33%
	Total	2	4	-	-	39	2	82	2	-	14	145	32%
AY 2009-2010	Male	4	7	0	3	40	1	95	3	0	6	159	35%
	Female	2	0	0	1	8	1	17	0	0	2	31	39%
	Total	6	7	0	4	48	2	112	3	0	8	190	35%



#### Chart 4. Fall to Fall Retention

\* Program Retention = (Graduated from This Program + Still Enrolled in This Program)/Fall Cohort

\*\* Positive College Outcome = (Total Graduates + Total Active)/Fall Cohort

ALL						
	Fall 2007-Fall 2008		Fall 2008-Fall 2009		Fall 2009-Fall 2010	
	#	%	#	%	#	%
<b>FALL COHORT</b>	<b>101</b>	-	<b>115</b>	-	<b>163</b>	-
<u>GRADUATES</u>						
Graduated from This Program *	2	2%	5	4%	2	1%
Graduated from Any Other Program	2	2%	1	1%	10	6%
<b>TOTAL Graduates **</b>	<b>4</b>	<b>4%</b>	<b>6</b>	<b>5%</b>	<b>12</b>	<b>7%</b>
Graduated from This Program and then Transferred to 4-Year	2	2%	5	4%	2	1%
Graduated from Any Other Program and then Transferred to 4-Year	0	0%	1	1%	4	2%
<b>Total Graduates who Transferred to 4-Year</b>	<b>2</b>	<b>2%</b>	<b>6</b>	<b>5%</b>	<b>6</b>	<b>4%</b>
Graduated from this Program and Enrolled in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program and Enrolled in Another NECC Program	0	0%	0	0%	2	1%
<b>Total Graduates who Enrolled in Another NECC Program</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>2</b>	<b>1%</b>
Graduated from this Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	2	2%	0	0%	4	2%
<b>Total Graduates who did not Transfer to 4-year or Enroll in Another NECC Program</b>	<b>2</b>	<b>2%</b>	<b>0</b>	<b>0%</b>	<b>4</b>	<b>2%</b>
<u>NON-GRADUATES - ACTIVE</u>						
Transferred to 4-Year	43	43%	30	26%	21	13%
Still Enrolled in This Program *	21	21%	42	37%	63	39%
Still Enrolled, but in Another NECC Program	5	5%	10	9%	21	13%
<b>TOTAL Active **</b>	<b>69</b>	<b>68%</b>	<b>82</b>	<b>71%</b>	<b>105</b>	<b>64%</b>
<u>Inactive - Did not graduate or transfer and they are not enrolled at NECC</u>						
<b>TOTAL Inactive</b>	<b>28</b>	<b>28%</b>	<b>27</b>	<b>23%</b>	<b>46</b>	<b>28%</b>
<b>Program Retention</b>	<b>23</b>	<b>23%</b>	<b>47</b>	<b>41%</b>	<b>65</b>	<b>40%</b>
<b>Positive College Outcome</b>	<b>73</b>	<b>72%</b>	<b>88</b>	<b>77%</b>	<b>117</b>	<b>72%</b>

**MINORITY (H, I, A, B)**

	Fall 2007-Fall 2008		Fall 2008-Fall 2009		Fall 2009-Fall 2010	
	#	%	#	%	#	%
<b>FALL COHORT</b>	<b>33</b>	-	<b>35</b>	-	<b>57</b>	-
<u>GRADUATES</u>						
Graduated from This Program *	0	0%	0	0%	1	1%
Graduated from Any Other Program	1	1%	1	1%	5	3%
<b>TOTAL Graduates **</b>	<b>1</b>	<b>1%</b>	<b>1</b>	<b>1%</b>	<b>6</b>	<b>4%</b>
Graduated from This Program and then Transferred to 4-Year	0	0%	0	0%	1	1%
Graduated from Any Other Program and then Transferred to 4-Year	0	0%	1	1%	1	1%
<b>Total Graduates who Transferred to 4-Year</b>	<b>0</b>	<b>0%</b>	<b>1</b>	<b>1%</b>	<b>2</b>	<b>1%</b>
Graduated from this Program and Enrolled in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program and Enrolled in Another NECC Program	0	0%	0	0%	1	1%
<b>Total Graduates who Enrolled in Another NECC Program</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>1</b>	<b>1%</b>
Graduated from this Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	1	1%	0	0%	3	2%
<b>Total Graduates who did not Transfer to 4-year or Enroll in Another NECC Program</b>	<b>1</b>	<b>1%</b>	<b>0</b>	<b>0%</b>	<b>3</b>	<b>2%</b>
<u>NON-GRADUATES - ACTIVE</u>						
Transferred to 4-Year	11	11%	9	8%	3	2%
Still Enrolled in This Program *	11	11%	13	11%	25	15%
Still Enrolled, but in Another NECC Program	2	2%	2	2%	8	5%
<b>TOTAL Active **</b>	<b>24</b>	<b>24%</b>	<b>24</b>	<b>21%</b>	<b>36</b>	<b>22%</b>
<u>Inactive - Did not graduate or transfer and they are not enrolled at NECC</u>						
<b>TOTAL Inactive</b>	<b>8</b>	<b>8%</b>	<b>10</b>	<b>9%</b>	<b>15</b>	<b>9%</b>
<b>Program Retention</b>	<b>11</b>	<b>33%</b>	<b>13</b>	<b>37%</b>	<b>26</b>	<b>46%</b>
<b>Positive College Outcome</b>	<b>25</b>	<b>76%</b>	<b>25</b>	<b>71%</b>	<b>42</b>	<b>74%</b>

**MAJORITY (W)**

	Fall 2007-Fall 2008		Fall 2008-Fall 2009		Fall 2009-Fall 2010	
	#	%	#	%	#	%
<b>FALL COHORT</b>	<b>57</b>	<b>-</b>	<b>67</b>	<b>-</b>	<b>89</b>	<b>-</b>
<u>GRADUATES</u>						
Graduated from This Program *	2	2%	4	3%	0	0%
Graduated from Any Other Program	0	0%	0	0%	4	2%
<b>TOTAL Graduates **</b>	<b>2</b>	<b>2%</b>	<b>4</b>	<b>3%</b>	<b>4</b>	<b>2%</b>
Graduated from This Program and then Transferred to 4-Year	2	2%	4	3%	0	0%
Graduated from Any Other Program and then Transferred to 4-Year	0	0%	0	0%	2	1%
<b>Total Graduates who Transferred to 4-Year</b>	<b>2</b>	<b>2%</b>	<b>4</b>	<b>3%</b>	<b>2</b>	<b>1%</b>
Graduated from this Program and Enrolled in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program and Enrolled in Another NECC Program	0	0%	0	0%	1	1%
<b>Total Graduates who Enrolled in Another NECC Program</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>1</b>	<b>1%</b>
Graduated from this Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	0	0%	0	0%	1	1%
<b>Total Graduates who did not Transfer to 4-year or Enroll in Another NECC Program</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>1</b>	<b>1%</b>
<u>NON-GRADUATES - ACTIVE</u>						
Transferred to 4-Year	26	26%	15	13%	13	8%
Still Enrolled in This Program *	9	9%	25	22%	31	19%
Still Enrolled, but in Another NECC Program	2	2%	8	7%	13	8%
<b>TOTAL Active **</b>	<b>37</b>	<b>37%</b>	<b>48</b>	<b>42%</b>	<b>57</b>	<b>35%</b>
<u>Inactive - Did not graduate or transfer and they are not enrolled at NECC</u>						
<b>TOTAL Inactive</b>	<b>18</b>	<b>18%</b>	<b>15</b>	<b>13%</b>	<b>28</b>	<b>17%</b>
<b>Program Retention</b>	<b>11</b>	<b>19%</b>	<b>29</b>	<b>43%</b>	<b>31</b>	<b>35%</b>
<b>Positive College Outcome</b>	<b>39</b>	<b>68%</b>	<b>52</b>	<b>78%</b>	<b>61</b>	<b>69%</b>

**FEMALE**

	Fall 2007-Fall 2008		Fall 2008-Fall 2009		Fall 2009-Fall 2010	
	#	%	#	%	#	%
<b>FALL COHORT</b>	<b>9</b>	<b>-</b>	<b>19</b>	<b>-</b>	<b>28</b>	<b>-</b>
<u>GRADUATES</u>						
Graduated from This Program *	0	0%	0	0%	1	1%
Graduated from Any Other Program	0	0%	0	0%	1	1%
<b>TOTAL Graduates **</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>2</b>	<b>1%</b>
Graduated from This Program and then Transferred to 4-Year	0	0%	0	0%	1	1%
Graduated from Any Other Program and then Transferred to 4-Year	0	0%	0	0%	1	1%
<b>Total Graduates who Transferred to 4-Year</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>2</b>	<b>1%</b>
Graduated from this Program and Enrolled in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program and Enrolled in Another NECC Program	0	0%	0	0%	0	0%
<b>Total Graduates who Enrolled in Another NECC Program</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>
Graduated from this Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	0	0%	0	0%	0	0%
<b>Total Graduates who did not Transfer to 4-year or Enroll in Another NECC Program</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>
<u>NON-GRADUATES - ACTIVE</u>						
Transferred to 4-Year	4	4%	4	3%	4	2%
Still Enrolled in This Program *	3	3%	6	5%	13	8%
Still Enrolled, but in Another NECC Program	0	0%	2	2%	2	1%
<b>TOTAL Active **</b>	<b>7</b>	<b>7%</b>	<b>12</b>	<b>10%</b>	<b>19</b>	<b>12%</b>
<u>Inactive - Did not graduate or transfer and they are not enrolled at NECC</u>						
<b>TOTAL Inactive</b>	<b>2</b>	<b>2%</b>	<b>7</b>	<b>6%</b>	<b>7</b>	<b>4%</b>
<b>Program Retention</b>	<b>3</b>	<b>33%</b>	<b>6</b>	<b>32%</b>	<b>14</b>	<b>50%</b>
<b>Positive College Outcome</b>	<b>7</b>	<b>78%</b>	<b>12</b>	<b>63%</b>	<b>21</b>	<b>75%</b>

**MALE**

	Fall 2007-Fall 2008		Fall 2008-Fall 2009		Fall 2009-Fall 2010	
	#	%	#	%	#	%
<b>FALL COHORT</b>	<b>92</b>	<b>-</b>	<b>96</b>	<b>-</b>	<b>135</b>	<b>-</b>
<u>GRADUATES</u>						
Graduated from This Program *	2	2%	5	4%	1	1%
Graduated from Any Other Program	2	2%	1	1%	9	6%
<b>TOTAL Graduates **</b>	<b>4</b>	<b>4%</b>	<b>6</b>	<b>5%</b>	<b>10</b>	<b>6%</b>
Graduated from This Program and then Transferred to 4-Year	2	2%	5	4%	1	1%
Graduated from Any Other Program and then Transferred to 4-Year	0	0%	1	1%	3	2%
<b>Total Graduates who Transferred to 4-Year</b>	<b>2</b>	<b>2%</b>	<b>6</b>	<b>5%</b>	<b>4</b>	<b>2%</b>
Graduated from this Program and Enrolled in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program and Enrolled in Another NECC Program	0	0%	0	0%	2	1%
<b>Total Graduates who Enrolled in Another NECC Program</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>2</b>	<b>1%</b>
Graduated from this Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	0	0%	0	0%	0	0%
Graduated from Any Other Program, but did not Transfer to 4-Year or Enroll in Another NECC Program	2	2%	0	0%	4	2%
<b>Total Graduates who did not Transfer to 4-year or Enroll in Another NECC Program</b>	<b>2</b>	<b>2%</b>	<b>0</b>	<b>0%</b>	<b>4</b>	<b>2%</b>
<u>NON-GRADUATES - ACTIVE</u>						
Transferred to 4-Year	39	39%	26	23%	17	10%
Still Enrolled in This Program *	18	18%	36	31%	50	31%
Still Enrolled, but in Another NECC Program	5	5%	8	7%	19	12%
<b>TOTAL Active **</b>	<b>62</b>	<b>61%</b>	<b>70</b>	<b>61%</b>	<b>86</b>	<b>53%</b>
<u>Inactive - Did not graduate or transfer and they are not enrolled at NECC</u>						
<b>TOTAL Inactive</b>	<b>26</b>	<b>26%</b>	<b>20</b>	<b>17%</b>	<b>39</b>	<b>24%</b>
<b>Program Retention</b>	<b>20</b>	<b>22%</b>	<b>41</b>	<b>43%</b>	<b>51</b>	<b>38%</b>
<b>Positive College Outcome</b>	<b>66</b>	<b>72%</b>	<b>76</b>	<b>79%</b>	<b>96</b>	<b>71%</b>

## ACADEMIC PROGRAM REVIEW: Engineering Science (Core Requirements)

### CHART 5 (A), (B), (C), (D): FACULTY RESOURCES

Fall (2010)

**5(A). FULL-TIME**

## FACULTY

[illegible]

## ACADEMIC PROGRAM REVIEW

**CHART 5 (A), (B), (C), (D) : FACULTY RESOURCES**

**5(B). PART-TIME FACULTY**  
**– Engineering Science – N/A**

[illegible]

## ACADEMIC PROGRAM REVIEW

### CHART 5 (A), (B), (C), (D): FACULTY RESOURCES

### 5(C). DCE FACULTY Engineering Science (Core Requirements)

[illegible]



ACADEMIC PROGRAM REVIEW

**CHART 5 (A), (B), (C), (D): FACULTY RESOURCES**

**CHART 5 (D): COMPARISONS BETWEEN FULL-TIME AND NON-FULL-TIME FACULTY (PART-TIME AND DCE):  
OVERALL NUMBERS AND CREDIT HOURS TAUGHT**

**Core Course  
Requirements**

TERM	# FULL-TIME FACULTY (FTF)	# CREDIT HOURS TAUGHT BY FULL-TIME FACULTY (FTCH)	# OF NON-FULL-TIME FACULTY (NFTF)	# CREDIT HOURS TAUGHT BY NON-FULL-TIME FACULTY (NFTCH)	TOTAL # OF FACULTY (FTF + NFTF) (TF)	TOTAL # CREDIT HOURS TAUGHT by FTF + NFTF (TCH)		PERCENTAGE OF FACULTY THAT ARE FULL-TIME (FTF / TF)	PERCENTAGE OF CREDIT HOURS TAUGHT BY FULL-TIME FACULTY (FTCH / TCH)
SPRING (2010)	2	25	3	18	5	43		40%	58%
FALL (2009)	2	27	4	25	6	52		33%	51%
SPRING (2009)	3	41	3	14	6	55		50%	75%

**Program Review - Engineering Science -- Focus Courses**  
**FullTime Faculty**

Name	Courses	Spring 2010		Fall 2009		Spring 2009		Chemical Environmental	Civil Mechanical	Computer Electrical
		Taught	Adjustment	Taught	Adjustment	Taught	Adjustment			
White, M	CHM121 & 122	8	3	8	3	12	0	X	X	
Schuster, E	CTE210					12	0			X
Chanley, P	CTE101, 102			9	3					X

**Program Review - Engineering Science -- Focus Courses**  
**DCE Faculty**

Name	Courses	Spring 2010	Fall 2009	Spring 2009	Chemical Environmental	Civil Mechanical	Computer Electrical
Cleary, S	CHM122, PHS132, PHS133			12	X	X	X
White, M	CHM121	4			X	X	
Marshall, S	PHS132	4			X	X	
Chanley, P.	CTE101, 102			5			X
Kouklamis, P	CTE101, 102	5	5				X
Nigh, F	CTE210	4					X
Robertston, S.	EST111, 112	6	6	6		X	
<b>Total Credits</b>		23	11	23			

ACADEMIC PROGRAM REVIEW:

**Engineering Science: Focus  
Courses**

**CHART 5 (A), (B), (C), (D): FACULTY RESOURCES**

**CHART 5 (D): COMPARISONS BETWEEN FULL-TIME AND NON-FULL-TIME FACULTY (PART-TIME AND DCE):  
OVERALL NUMBERS AND CREDIT HOURS TAUGHT**

**Focus  
Courses**

TERM	# FULL-TIME FACULTY (FTF)	# CREDIT HOURS TAUGHT BY FULL-TIME FACULTY (FTCH)	# OF NON-FULL-TIME FACULTY (NFTF)	# CREDIT HOURS TAUGHT BY NON-FULL-TIME FACULTY (NFTCH)	TOTAL # OF FACULTY (FTF + NFTF) (TF)	TOTAL # CREDIT HOURS TAUGHT by FTF + NFTF (TCH)		PERCENTAGE OF FACULTY THAT ARE FULL-TIME (FTF / TF)	PERCENTAGE OF CREDIT HOURS TAUGHT BY FULL-TIME FACULTY (FTCH / TCH)
SPRING (2010)	1	8	5	23	6	31		17%	26%
FALL (2009)	2	17	2	11	4	28		50%	60%
SPRING (2009)	2	24	3	23	5	47		40%	51%

**CHART 6: FACULTY CREDENTIALS**  
**Complete one chart for each member of the faculty**

DATE 10/12/2010

(Note: Each individual faculty member should complete this form and return it to the Program Coordinator, or designee.)

<b>NAME: Paul Chanley</b>						
Current Academic Rank:		Associate Professor		Tenure Status		Tenured [ <b>x</b> ] Not Tenured [ ]
<b>Academic Degrees:</b>						
Bachelor Degree BA [ ] BS [ <b>x</b> ]		Concentration: BSEE				
Institution Granting Degree:		Northeastern University				
Masters Degree:	MA [ ]	MS [ <b>x</b> ]	MEd [ ]	MBA [ ]	MPH [ ]	Other :
Concentration:						
Institution Granting Degree		UMASS Lowell				
Doctorate:		PhD [ ]	EdD [ ]	JD [ ]	Other:	
Concentration:						
Institution Granting Degree						
<b>Certifications</b>						
<b>Type</b>		<b>Issuing Agency</b>				<b>Date</b>
<b>Membership in Professional Organizations</b>				<b>Awards</b>		
ASEE						
<b>Publications (relevant to teaching responsibilities)</b>				<b>Presentations (relevant to teaching responsibilities)</b>		

**CHART 6 (CONTINUED)**

<b>NAME:</b>		
<b>Continuing Education Activities/Professional Development (For past 3 years, or of major significance prior to this time and related to area of teaching responsibility)</b>		
Type	Sponsoring Agency	Date
RET UMASS Lowell Nano Manufacturing Lab	Northeastern University-NSF	July-Aug 2006
RET Boston University HTT&L	Northeastern University - NSF	July-Aug 2009
High Tech Tools and Toys Lab	Northeastern University - ALERT	June 2010
<b>Other information which you believe demonstrates your academic and experiential qualifications, and maintenance of expertise in your area of educational responsibility.</b>		

## **PAUL J. CHANLEY**

16 Friend Street, Wakefield, MA 01880

Telephone: 781-246-1718 e-mail: pchanley@comcast.net

### **Summary of Qualifications**

An experienced instructor in electrical engineering, technology and mathematics with a strong business and technical background as well as the ability to establish rapport with students to assist them in incorporating classroom theory into practical work experience. An effective manager who has trained and supervised a number of work teams in business and government.

### **Work Experience**

**Northern Essex Community College (NECC), Haverhill MA**

2/99 -present

#### ***Faculty***

Responsible for instructing a variety of courses for NECC's Electronic Technology and Engineering curriculum. Develop and deliver course lectures, labs, design projects and examinations.

- *Electronics I and Electronics II*
- *DC Circuit Analysis and AC Circuit Analysis*
- *Medical Electronics, Clinical Safety and Medical Equipment Troubleshooting*
- *Fundamentals of Digital Logic and Digital Design Lab*
- *Applied Technical Math and College Algebra & Trigonometry*
- *Microcomputers*
- *Electronic Communication Systems*
- *Green Technology*

Developed new curriculum and training courses:

- *Introduction to Engineering*, a first course for students in Engineering Science or Technology covering the essential topics needed for success in engineering.(2010)
- *Raytheon Electronic Technology Certificate* is an on-site training program at the manufacturing plant in Andover, MA that prepares employees for technical advancement in the company. (2009 – present)
- *Supplemental Instruction (SI)* section of NECC's College Algebra and Trigonometry course is the first of its kind at the college. (2009)
- *Green Technology* explores lifestyle changes that empower students to reduce their personal and community "Carbon Footprint", resulting in a greener society. (2008)
- *Oscilloscope Course* (2002) details oscilloscope operations, functionality and lab work.
- *Photonics Module* (2001) includes theory, problems and lab work on the nature of light and basic principles such as the refraction and reflection of light as well as light propagation in fiber optic cable.

Co-authored the following papers which were published by the American Society for Engineering Education (ASEE):

- *Digital Design in Community College Courses, 2005*
- *Embedded Computer Systems & Photonics, 2006*
- *Building Math Skills in Context: Integrating Mathematics with Engineering & Technology, 2007*
- *Professional Development Institutes on Alternative Energy, 2008*
- *Green Technology Course at a Community College, 2010*

***Co-Chair, NECC's Environmental Impact & Sustainability Committee***

9/07 – 9/09

***Member, NECC's Finance Committee***

3/04 – 9/07

## **Paul Chanley**

### ***Engineering Electronic Technology & Program Coordinator***

9/04 – present

Responsible for enhancing the Electronics Technology and Engineering Programs at NECC by finding ways to improve the quality of the learning experience, curriculum, technical standards and resources, including:

- Working with Admissions and others at NECC to recruit students with outreach to local high school students and teachers.
- Coordinating curriculum review with local colleges and universities to support students pursuing higher education at four-year institutions.
- Verifying that NECC curriculum reflects current industry and university technical standards.

### ***NECC Grant Instructor and Team Member***

3/04 – present

Responsible for teaching engineering and technology material, acting as a resource, and performing outreach activities based on various grant opportunities. Such grants include:

- Massachusetts Department of Education: Perkins Career and Technical Education Summer Transition Program for Vocational High School Students.
- Massachusetts Board of Higher Education: STEM Pipeline; New and Improved Programs/Embedded Computer Systems for Middle and High School Teachers.
- Massachusetts Department of Education: Merrimack Valley Occupational, Technical, and Educational Collaborative (MVOTEC)
- National Science Foundation: Museum of Science PowerUp! Program
- National Science Foundation: Northeastern University RET Program – Nanotechnology, 2006 and High Tech Tools and Toys Lab, 2009
- National Science Foundation: Advanced Technological Education (ATE) Program Reviewer, Washington, DC, 11/07
- Massachusetts Department of Education: STEM pipeline-“STEM-ROCKS”, 2008
- National Science Foundation: Northeastern University “STEP-UP”, 2008
- “STEP-UP”: Summer Bridge Program for Engineering Students, 2008,

### ***Curriculum Content Consultant, The Ohio Board of Regents***

2008 - 2009

- Reviewed curriculum and provided recommendations for improvement:
- ITT Educational Services, Inc.: AAS in Computer and Electronics Engineering Technology.
- Also conducted a site visit
- ETI Technical College: AAS in Computer Electronic Engineering Technology (CEET) and AAS in CEET with the IT & Network.
- Ohio Valley College of Technology: AAB in Computer Technology.

### ***U.S. Bureau of the Census (Census 2000), Lowell, MA***

2/99- 9/00

#### ***Supervisor***

Handled the listing and enumeration of hospitals, military bases, colleges, prisons, social service shelters, and soup kitchens for Middlesex County.

- Performed facility questionnaires, trained and supervised crew leaders. Evaluated progress of various operations reflected in daily progress reports and summaries.
- Trained and supervised enumerators for field work during the block canvassing preparation stage of Census 2000, including problem solving and monitoring progress of team to ensure timeliness.

## **Paul Chanley**

**OMNIREL, Leominster, MA**

1/98-5/98

### ***Manufacturing Manager***

Overall production responsibility for a new power electronic hybrid product line. Managed customer order backlog, assured on-time delivery, and supervised production personnel.

**RAYTHEON, Quincy, MA**

9/92-12/97

### ***Program Manager***

Overall responsibility for the performance of several electronic hybrid missile component product lines relative to delivery, cost, and quality.

- Developed the manufacturing plan to ensure customer requirements were achieved within established product line objectives and budget. Led engineering support teams to identify technical production issues and coordinated solutions.
- Successfully coordinated engineering and manufacturing teams to transition hybrids from design prototype phase to production.
- Interfaced with customers to identify immediate and long-term production needs and technical issues relating to product performance. Coordinated bid proposals for both new and existing customers.

**RAYTHEON, Lowell, MA**

8/86-9/92

### ***Project Engineer***

Managed the production of three new developmental missile prototypes. Advanced prototype missile piece part systems through manufacturing into missile configuration for flight test.

### ***Manufacturing Support Engineer***

Served as lead electrical engineer in both the pre-production and production phases of an air-to-air missile antenna/seeker servo system. Identified and resolved manufacturing and quality control problems.

## **Education and Training**

### **Raytheon**

Developmental Management Program, 1994

**Lowell University, Lowell, MA (University of Massachusetts – Lowell)**

Master of Science in Electrical Engineering, 1991

**Northeastern University, Boston, MA**

Bachelor of Science in Electrical Engineering, 1986

## **Affiliations**

Partner and Treasurer, KClub Investments

5/98 - present

Partner and CFO, Crystal Communications Group

6/02 - present

Student of Eastern Small Circle Jujitsu, Defensive Edge Martial Arts Academy

9/05 - present

Youth instructor for Defensive Edge Martial Arts Academy

7/07 - present



**CHART 6: FACULTY CREDENTIALS**  
**Complete one chart for each member of the faculty**

DATE October 14, 2010

(Note: Each individual faculty member should complete this form and return it to the Program Coordinator, or designee.)

<b>NAME: Ethel Schuster</b>						
Current Academic Rank:			Tenure Status		Tenured [X ]	Not Tenured [ ]
<b>Academic Degrees:</b>						
Bachelor Degree BA [ ] BS [ X ]		Concentration:		Computer Science		
Institution Granting Degree:		Brandeis University				
Masters Degree:	MA [ ]	MS [ X ]	MEd [ ]	MBA [ ]	MPH [ ]	Other :
Concentration:						
Institution Granting Degree		University of Pennsylvania				
Doctorate:		PhD [ X ]	EdD [ ]	JD [ ]	Other:	
Concentration:						
Institution Granting Degree		University of Pennsylvania				
<b>Certifications</b>						
<b>Type</b>		<b>Issuing Agency</b>				<b>Date</b>
ServSafe						Oct 2008
<b>Membership in Professional Organizations</b>			<b>Awards</b>			
			CITI Grant to “Adapt a Course on Operating Systems as an On-line”, 2002			
<b>Publications (relevant to teaching responsibilities)</b>			<b>Presentations (relevant to teaching responsibilities)</b>			
See attached CV						

# Publications

## Refereed Journals

- Schuster, E. 1988. Establishing the Relationship between Discourse Models and User Models. *Computational Linguistics*, 14(3):82-85.
- Schuster, E. 1986. The Role of Native Grammars in Correcting Errors in Second Language Learning. *Computational Intelligence*, 2(2): 93-98.
- Schuster, E. 1986. VP2: The Role of the User Modeling in Correcting Errors in Second Language Learning. *Journal of Structural Learning*, 9(2): 175-190.

## Book Chapters

- Schuster, E. and T. Finin. 1986. VP2: The Role of User Modeling in Correcting Errors in Second Language Learning. In Cohn, A. G. and Thomas, J. R., editors, *Artificial Intelligence and its Applications*, 197-209, John Wiley and Sons Ltd., Reading, UK.

## Conference Proceedings and Presentations

- Genoves, L., Lizotte, R., Schuster, E., Dayrell, C., Aluisio, S. M., A two-tiered approach to detecting English article usage: an application in scientific paper writing tool. *RANLP-2007*, Borovets, Bulgaria.
- Schuster, E., Aluisio, S. M., Feltrim, V., Pessoa, A. Jr., Oliveira, O. Jr., Enhancing the Writing of Scientific Abstracts: A Two-phased Process Using Software Tools and Human Evaluation. *ENIA-2005*, Sao Leopoldo, Brazil
- Aluisio, S. M., Schuster, E., Feltrim, V., Pessoa, A. Jr., Oliveira, O. Jr., Evaluating Scientific Abstracts with a Genre-specific Rubric. Poster presented at the *12th International Conference on Artificial Intelligence in Education (AIED 2005)*, Amsterdam.
- Schuster, E. 2004. Innovative Approaches to Teaching Operating Systems online. Presented at *Massachusetts Colleges Online*, Braintree, MA.
- Schuster, E. 1996. An Exciting Approach to Problem Solving: An Introductory Course in Computer Science. Poster presented at the *Twenty-seven Symposium on Computer Science Education*, Philadelphia, PA.
- Schuster, E. and J. Burckett-Picker. 1996. Interlanguage Errors Becoming the Target Language through Student Modeling. *Fifth International Conference on User Modeling*, Hawaii.
- Schuster, E. 1995. An Introductory Course in Computer Science using HyperCard. Presentation to parents of prospective students at Simmons College, Boston, MA.
- Schuster, E. 1995. From Ada to Gwen: Women in Computer Science. Presentation to Mathematics and Computer Science Alumnae at Simmons College, Boston, MA.
- Schuster, E. 1995. A Jazzy Approach to Computer Science: An Introductory Course using HyperCard. Presented at *Teaching the Three-Fold Introduction to Computer Science Workshop*, Geneseo, NY.

- Schuster, E. and J. Burckett-Picker. 1995. More Errors Please: Certain Interlanguage Errors as a Positive Sign of Learning. Poster presented at the *Seventh World Conference on Artificial Intelligence in Education*, Washington, D. C.
- Burckett-Picker, J. and E. Schuster. 1995. Computer System Student Modeling Using Interlanguage. *MATSOL Spring Conference*, Boston, MA.
- Schuster, E. 1994. A Jazzy Approach to Problem Solving: An Introductory Course in Computer Science. Conference on *Problem Solving Across the Curriculum*, Geneva, NY.
- Schuster, E. 1991. Events and their Pronominal Reference in Discourse. Poster presented at *AAAI Fall Symposium Series: Discourse Structure in Natural Language Understanding and Generation*, Asilomar, CA.
- Schuster, E. 1990. Structuring Events for their Pronominal Reference. *Proceedings of the Seventh Israeli Symposium on Artificial Intelligence and Computer Vision*, Kfar Maccabiah, Israel.
- Schuster, E. 1988. Anaphoric Reference to Events and Actions: A Representation and its Advantages. *Proceedings of the International Conference on Computational Linguistics*, COLING-88, Budapest, Hungary.
- Schuster, E. 1987. An Approach for Generating Reference to Events in Discourse. Presented at Penn Linguistic Colloquium, Philadelphia, PA.
- Schuster, E. 1986. Establishing the Relationship between Discourse Models and User Models. Presented at the International Workshop on User Modeling, Maria Laach, W. Germany.
- Schuster, E. 1985. Grammars as User Models. *Proceedings of the 1985 International Joint Conference on Artificial Intelligence*, Los Angeles, CA.
- Schuster, E. 1984. Modelling Prior Knowledge to Facilitate Learning a New Skill. Presented at the Meeting of the Association for Computing Machinery, Philadelphia, PA.
- Schuster, E. 1984. Modelling Prior Knowledge to Facilitate Learning a New Language: Two-Word Verbs in English. Presented at the Computer Assisted Language Learning and Instruction Consortium Symposium, Baltimore, MD., and at Penn Linguistic Colloquium, Philadelphia, PA.  
*Proceedings of Penn Linguistic Colloquium*, Philadelphia, PA.
- Schuster, E. and T. Finin. 1983. Understanding Misunderstandings. *Proceedings of Penn Linguistic Colloquium*, Philadelphia, PA.

## Technical Reports

- Schuster, E. 1988. *Pronominal Reference to Events and Actions: Evidence from Naturally-Occuring Data*. Technical Report MS-CIS-88-13, University of Pennsylvania, Philadelphia, PA.
- Schuster, E. 1986. *Towards a Computational Model of Anaphora in Discourse: Reference to Events and Actions*. Ph.D. Dissertation Proposal, Technical Report MS-CIS-86-34, University of Pennsylvania, Philadelphia, PA.

- Schuster, E. 1984. *VP2: The Role of User Modelling in Correcting Errors in Second Language Learning*. Master Thesis, Technical Report MS-CIS-84-66, University of Pennsylvania, Philadelphia, PA.
- Schuster, E. 1984. *Code-Switching in Spanish and Yiddish: Evidence for the Translation Model*. Technical Report MS-CIS-84-32, University of Pennsylvania, Philadelphia, PA.
- Schuster, E. 1983. *Custom-Made Responses: Maintaining and Updating the User Model*. Technical Report MS-CIS-83-13, University of Pennsylvania, Philadelphia, PA.
- Schuster, E. and T. Finin. 1983. *Understanding Misunderstandings*. Technical Report MS-CIS-83-12, University of Pennsylvania, Philadelphia Pa.
- Schuster, E. 1982. *Explaining and Expounding*. Technical Report MS-CIS-82-49, University of Pennsylvania, Philadelphia, PA.

**CHART 6 (CONTINUED)**

<b>NAME: Ethel Schuster</b>		
<b>Continuing Education Activities/Professional Development (For past 3 years, or of major significance prior to this time and related to area of teaching responsibility)</b>		
Type	Sponsoring Agency	Date
RIAO-2007	Necc	May-June 2007
ETS	ETS	May 2006
Necc Professional Day	Necc	2010, 2009, 2008, 2007, 2006, 2005
Grace Hopper	NECC	Sept 2010, 2009
CCSCNE	NECC	May 2010
<b>Other information which you believe demonstrates your academic and experiential qualifications, and maintenance of expertise in your area of educational responsibility.</b>		

Since the 2004-2005 academic year, I have been collaborating with colleagues from the University of Sao Paulo (USP) in Sao Carlos, Brazil on a project for improving students' writing of scientific abstracts and taught 3 courses on enhancing the English-writing of scientific papers, written by Brazilian-Portuguese speakers. I have continued to collaborate with these Brazilian researchers and returned to teach again in the summer of 2006. Since then, we have continued this collaboration, along with professor Richard Lizotte, focusing on errors made by non-native English speakers. We have published several papers (see attached list of publications)

NECC was a recipient of a federal grant to support and encourage Latino students (Title V). As part of this grant, I have been involved in summer courses since 2004. In 2004 and 2006, I co-taught the courses with an English professor. Our goal was to engage Latino students in reading, encourage them to write, and help them enhance their writing abilities. We also worked on their critical thinking skills. We chose books by Latina authors ("The House of the Spirits" by Isabel Allende and "Like Water for Chocolate" by Laura Esquivel). The students learned about history, geography, art and music in addition to their writing and reading. The success of the courses has been measured by the students' eager response and their requests to have the courses offered again, as well as by their success in improving their grades in their English Composition courses. As part of this grant, we have also provided tutoring for Latino students by Latino tutors and have organized a series of speakers on topics such as health, business, and art as they affect or interest the Latino population. In the summer of 2007, I co-taught a similar style of course in the Business area with professor Bill Zannini. This course, entitled "The Entrepreneur in Me", was designed to introduce the students to methods and tools for developing a personal business proposal. The goal was to identify a business idea that the students could develop and focus on their strengths and weaknesses as entrepreneurs.

Also, as part of this grant, I helped organized a series of lectures for Latino students by Latino professionals during the 2006-2007 academic year. I also led a program to provide tutoring for students in computer science courses in our Lawrence campus. I was involved in this grant and as part of that, attend the HACU conference in Chicago, October 20-22, 2007.

In the summer of 2007, I co-taught a summer course sponsored by BATEC for middle and high-school teachers. I have since been involved in the BATEC initiative and attend the ATE conference in Washington, DC, October 17-19, 2007.

### **"Viva Computing", September 2008-May 2010**

Viva Computing is an after-school program that has been conducted at the LBGC for the past two years, since September of 2008. The LBGC serves a large Latino population of over 4,000 youth members in Lawrence, MA. The club is open during the academic year for after-school programs as well as vacations, and it hosts a large variety of programs ranging from homework support, to sports, reading, playing, dancing and special programs. The goal of Viva Computing was to engage young Latina girls (ages 9 to 14) in technological and computational inquiry, specific uses of computers, their tools and applications. We planned to acquaint the girls with technology by encouraging them to be active participants in activities that would engage them. We designed hands-on activities in computer engineering and technology. At the end is a list of the programs we organized in 2009 and their topics and the count of participants. Our activities encouraged them to explore mathematics, technology, science and problem solving. We exposed them to various devices and methods that handle information. We challenged the girls to "invent" applications, to experiment and to have fun by working individually as well as in groups. We used strategies that have been proven to be successful with a variety of learners. These included (1) focusing on specific themes; (2) mixing art and technology; (3) encouraging storytelling and exploration. The sessions were held after the academic day and, to our surprise the girls were all very eager and excited to join, stay on and participate. So much so that at the end when parents arrived the girls did not want to leave. To us, this created a contagious sense of challenge, success and commitment.

**CHART 6: FACULTY CREDENTIALS**  
**Complete one chart for each member of the faculty**

DATE \_\_\_\_\_

(Note: Each individual faculty member should complete this form and return it to the Program Coordinator, or designee.)

<b>NAME: Habib M. Maagoul</b>						
Current Academic Rank:		Assistant Professor		Tenure Status		Tenured [ <input type="checkbox"/> ] Not Tenured [ <input checked="" type="checkbox"/> ]
<b>Academic Degrees:</b>						
Bachelor Degree BA [ <input type="checkbox"/> ] BS [ <input checked="" type="checkbox"/> ]		Concentration: Engineering emphasized in Mthematics				
Institution Granting Degree:						
Masters Degree:	MA [ <input checked="" type="checkbox"/> ]	MS [ <input type="checkbox"/> ]	MEd [ <input type="checkbox"/> ]	MBA [ <input type="checkbox"/> ]	MPH [ <input type="checkbox"/> ]	Other :
Concentration:	Mathematics					
Institution Granting Degree						
Doctorate:		PhD [ <input type="checkbox"/> ]	EdD [ <input type="checkbox"/> ]	JD [ <input type="checkbox"/> ]	Other:	
Concentration:						
Institution Granting Degree						
<b>Certifications</b>						
<b>Type</b>		<b>Issuing Agency</b>			<b>Date</b>	
University		University of Arizona, Tucson Az			2004	
<b>Membership in Professional Organizations</b>				<b>Awards</b>		
Amattyc				Employee of the year “HS”		
NTCM				Teacher of the year”HS”		
MAA						
<b>Publications (relevant to teaching responsibilities)</b>				<b>Presentations (relevant to teaching responsibilities)</b>		

**CHART 6 (CONTINUED)**

<b>NAME:</b>		
<b>Continuing Education Activities/Professional Development (For past 3 years, or of major significance prior to this time and related to area of teaching responsibility)</b>		
Type	Sponsoring Agency	Date
Doctorate classes Toward Ph.d	Georgia State University	2006-2008
<b>Other information which you believe demonstrates your academic and experiential qualifications, and maintenance of expertise in your area of educational responsibility.</b>		
<p><b>EDUCATION</b></p> <p><b>2007 to Present</b> Enrolled in PhD program “Teaching and Learning with Major in Mathematics,” Georgia State University, Atlanta, GA</p> <p><b>2001 to 2004</b> University of Arizona, Graduate College of Mathematics, Tucson, Arizona</p> <p><b>Masters of Mathematics degree;</b> Thesis Topic: The Importance of Mathematics Pedagogy and Its Necessary Incorporation into the Modern Classroom</p> <p><b>1999 - 2000</b> Delaware Technical and Community College, Georgetown, Delaware</p> <p>Completed 18 credit hours toward Micro-Computer Services</p> <p><b>1996 - 1997</b> Royal Moroccan Naval Center for Detection Casablanca, Morocco</p> <p>Completed Electronic Science program (Digital electronic/analog, various types of radar, And electronic warfare)</p> <p><b>1994 - 1995</b> Defense Language Institute, Lockland Air Force Base, San Antonio, Texas: Completed comprehensive English studies program</p> <p>Coronado Amphibious Training School, San Diego, California: surface warfare, damage control, and Firefighting School</p> <p><b>1988 - 1992</b> Royal Moroccan Naval Academy, Casablanca, Morocco: General navigational studies with a concentration in mathematics, physics, and electronics (<b>BA in Engineering with emphasize in math</b>)</p> <p><b>1986 - 1988</b> Marrakech Engineering Preparatory School, Marrakech, Morocco: Math and Physics</p> <p><b>1982 - 1986</b> Abu Al Abass Sebty High School, Marrakech, Morocco: Math and Physics</p>		



**CHART 6: FACULTY CREDENTIALS**  
**Complete one chart for each member of the faculty**

DATE Oct 25, 2010

(Note: Each individual faculty member should complete this form and return it to the Program Coordinator, or designee.)

<b>NAME: Liliana Brand</b>						
Current Academic Rank:		Tenure Status		Tenured [x]	Not Tenured [ ]	
<b>Academic Degrees:</b>						
Bachelor Degree BA [ ] BS [ x ]		Concentration: Electrical Engineering				
Institution Granting Degree:		Universidad del Valle, Cali/Colombia/South America				
Masters Degree:	MA [ ]	MS [ x ]	MEd [ ]	MBA [ ]	MPH [ ]	Other :
Concentration:						
Institution Granting Degree		University of Massachusetts, Lowell				
Doctorate:		PhD [ ]	EdD [ ]	JD [ ]	Other:	
Concentration:						
Institution Granting Degree						
<b>Certifications</b>						
<b>Type</b>		<b>Issuing Agency</b>			<b>Date</b>	
<b>Membership in Professional Organizations</b>			<b>Awards</b>			
Amatyc						
<b>Publications (relevant to teaching responsibilities)</b>			<b>Presentations (relevant to teaching responsibilities)</b>			
Spanish Study Guide:Algebra Series by Lial, Hornsb & McGinnis						

**CHART 6 (CONTINUED)**

<b>NAME: Liliana Brand</b>		
<b>Continuing Education Activities/Professional Development (For past 3 years, or of major significance prior to this time and related to area of teaching responsibility)</b>		
Type	Sponsoring Agency	Date
Viva Computing: afterschool program at the Boys & Girls Club of Lawrence	STEM	2008-2010
<b>Other information which you believe demonstrates your academic and experiential qualifications, and maintenance of expertise in your area of educational responsibility.</b>		

**CHART 6: FACULTY CREDENTIALS**  
**Complete one chart for each member of the faculty**

DATE 10/17/2010

(Note: Each individual faculty member should complete this form and return it to the Program Coordinator, or designee.)

<b>NAME: PETER KOUKLAMANIS</b>						
<b>42 Highland Meadows / Danvers, MA 01923</b>						
Current Academic Rank:		Adjunct		Tenure Status		Tenured [ ] Not Tenured [ ]
<b>Academic Degrees:</b>						
Bachelor Degree BA [ ] BS [ + ]		Concentration: Electrical Engineering (EE)				
Institution Granting Degree:		Lowell University, Lowell MA,				
Masters Degree:	MA [ ]	MS [ + ]	MEd [ ]	MBA [ ]	MPH [ ]	Other
Concentration:		Computer Eng				:
Institution Granting Degree		Lowell University, Lowell MA,				
Doctorate:		PhD [ ]	EdD [ ]	JD [ ]	Other:	
Concentration:						
Institution Granting Degree						
<b>Certifications</b>						
<b>Type</b>		<b>Issuing Agency</b>				<b>Date</b>
MCSE, MS Networks&OS, Exchange Server, etc		Clark University				2003
Lasar Simulation		Teradyne				1994
Many more certificates to list here		Various Agencies				1981-2002
<b>Membership in Professional Organizations</b>			<b>Awards</b>			
IEEE Computer Society (in the past)			Multiple Honors for Contributions in Test, Software and Simulation - Digital Equipment Corporation.			
<b>Publications (relevant to teaching responsibilities)</b>			<b>Presentations (relevant to teaching responsibilities)</b>			
Publications during the years in the industry, in the fields of automated probing systems, and In-circuit, but none relating to teaching responsibilities.			Same and more as in Publications.			

**CHART 6 (CONTINUED)**

<b>NAME: Peter Kouklamanis.</b>		
<b>Continuing Education Activities/Professional Development (For past 3 years, or of major significance prior to this time and related to area of teaching responsibility)</b>		
Type	Sponsoring Agency	Date
Angel	NSCC	2010
Blackboard	NSCC	2008
<b>Other information which you believe demonstrates your academic and experiential qualifications, and maintenance of expertise in your area of educational responsibility.</b>		
<p>Teaching for a few years the Hardware, Operating Systems, and Java courses at NSCC, I am always reading and keeping up with new developments in the areas of hardware, microprocessors, OS, and programming. Other areas of interest are Databases and Mathematics. I often discuss teaching techniques with my peers (mostly at NSCC), and I have been keeping up with various publications relating to teaching Techniques and effectiveness of various styles.</p>		

## **Engineering Science Program Outcomes Assessment Plan**

### **Introduction**

Through a combination of rigorous coursework as well as practical laboratory experiences, the Engineering Science Associate in Science Degree program prepares students to pursue further study at four-year institutions. Graduates gain highly marketable skills, encompassing the use of state-of-the-art technologies including computers and laboratory equipment.

### **Formation of the Outcomes Assessment Team**

The process outlined in the outcomes assessment guide was followed to develop the outcomes assessment team. The Engineering Science program members include representatives from Engineering, Math, Science and English departments.

Our team met at the college to create a timeline and develop a plan to deliver the Engineering Science Program Review. It was decided that the work would be done via electronic mail and media with meetings as needed.

### **Development of Program Mission Statement**

The Engineering Science program mission statement was developed by the program's faculty members. The faculty's first-hand experience working in the engineering industry is a key element of the mission statement. The mission statement was reviewed by the program review team. Comments and edits were incorporated. In addition, engineering programs of several two- and four-year institutions were reviewed during the development process. Finally, the mission statement was reviewed and edited by other faculty members inside and outside the department as well as professional administrators with NECC.

The mission statement of the Engineering Science program reflects the program objectives and is aligned to NECC's mission statement, strategic goals, and core values. We reviewed our mission statement with the Director of Program Review and Assessment, Ellen Wentland.

### **Development of Program Objectives and Learning Outcomes**

To develop and articulate the program's objectives and learning outcomes, we reviewed the college-wide core values. The Engineering Science program objectives incorporate communication skills, quantitative reasoning and science & technology.

The process of developing the program objective and outcomes was a major focus of the program review for Engineering Science. First, identified were several outcomes students should master upon completion of the program. Second, under each outcome, action verb statements were generated that are demonstrable and reflect the knowledge and skills students have learned as a direct result of their intellectual and personal experiences in the program's classrooms and laboratory.

Participants, including Ellen Wentland, reviewed and critiqued objectives and learning outcomes of the program that fit with the spirit of the Strategic Plan and goals for NECC. The outcomes are accomplished through the program's curriculum as demonstrated in the Outcomes and Curriculum Map. (See Appendix 3)

### **Report of Current Assessments**

Assessments already in place are listed in the Outcomes and Assessment Map. (See Appendix 3)

### **Outcomes Assessment Schedule and Strategy for Plan Implementation**

The Engineering Science program has developed learning outcomes (LO). Information from the *Guide* provided the team with foresight to implement an attainable number of learning outcomes per year. .

### **Strategy for Plan Implementation**

Assessment is the first step in a continual learning cycle which includes measurement, feedback, reflection, and change. The team members responsible for the implementation of assessment would involve the Program Coordinator, assisted by other full-time, part-time, and DCE faculty.

Faculty participate in the assessment activities by conducting bi-annual reviews of program goals and assessment plans, assisting with the collection and interpretation assessment data as required by the assessment plan, participating in annual reviews of assessment results, and contributing in the resulting decision-making process. Also, faculty are encouraged to implement supplemental assessment strategies in their own classes as a means of improving teaching and learning. It is important to adapt assistance and feedback to the program's own research styles and skills. Faculty in some areas are very experienced in designing surveys and using survey data and developing rubrics, for example.

**KEY**

I = Introduce; R = Reinforce;

**Outcomes and Curriculum Map - Engineering Science**

E = Emphasize

X = Extent to which outcome is addressed is not specified

**PROGRAM MISSION STATEMENT:** The primary mission of the Associate in Science Degree in Engineering Science at NECC is to prepare students to effectively transfer to a four-year college or university. The Engineering Science program also offers the opportunity to obtain certificates in Electronic Equipment Technology and CAD. Both of these certificates allow students to develop additional skill sets that are very attractive in the marketplace, giving students a competitive edge when entering a four-year institution or when applying for a job position.

OBJECTIVES		ASSOCIATED LEARNING OUTCOMES	PROGRAM CURRICULUM: SPECIFIC COURSES AND RELATIONSHIP TO OUTCOME																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
			Core Courses												Chemical Engineering Concentration		Civil/Environmental Engineering Concentration		Electrical/Computer Engineering Concentration		Mechanical Engineering Concentration			Program Electives																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
			English Composition I (ENG101)	English Composition II (ENG102)	Technical Writing (ENG103)	Engineering Design Graphics (EST110)	Calculus I (Mat251)	Calculus II (Mat 252)	Calculus III (MAT253)	Differential Equations (MAT254)	Engineering Physics I (PHS131)	Engineering Physics II (PHS132)	Engineering Essentials and Design (EST104)	General Chemistry I (CHM121)	Micro Economics (ECO201)	Macro Economics (ECO202)	General Chemistry II (CHM122)	Chem. Eng. Elective	Ethics (PHI110)	Computer Aided Drafting I (EST111)	Computer Aided Drafting II (EST112)	General Chemistry II (CHM 122)	Civil/Env Eng Elective	Civil/Env Eng Elective	Fundamentals of Digital Logic (CTE101)	Digital Design Lab (CTE103)	Elect/Comp Eng Elective	Elect/Comp Eng Elective	Computer Aided Drafting I (EST111)	Computer Aided Drafting II (EST112)	Mech Eng Elective	Mech Eng Elective	Ethics (PHI110)	Computer Porgram Elective	Humanities Elective																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
1	The ability to identify, formulate and solve technical problems.	1 Analyze problems, that is, isolate and describe the important components of a problem: what is given (design specification, performance requirements, testing standards, etc); what is known from previous experiences relevant to the problem; and what the unknowns are.						X	X	X	X	X	X	X	X	X	X																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

OBJECTIVES	ASSOCIATED LEARNING OUTCOMES	PROGRAM CURRICULUM: SPECIFIC COURSES AND RELATIONSHIP TO OUTCOME																																	
The objectives of the Engineering Science Associate Degree Program include to assist students in the development of:	The graduating student will be able to:	Core Courses												Chemical Engineering Concentration			Civil/Environmental Engineering Concentration			Electrical/Computer Engineering Concentration			Mechanical Engineering Concentration			Program Electives									
		English Composition I (ENG101)	English Composition II (ENG102)	Technical Writing (ENG103)	Engineering Design Graphics (EST110)	Calculus I (Mat251)	Calculus II (Mat 252)	Calculus III (MAT253)	Differential Equations (MAT254)	Engineering Physics I (PHS131)	Engineering Physics II (PHS132)	Engineering Essentials and Design (EST104)	General Chemistry I (CHM121)	Micro Economics (ECO201)	Macro Economics (ECO202)	General Chemistry II (CHM122)	Chem. Eng. Elective	Ethics (PHI110)	Computer Aided Drafting I (EST111)	Computer Aided Drafting II (EST112)	General Chemistry II (CHM 122)	Civil/Env Eng Elective	Civil/Env Eng Elective	Fundamentals of Digital Logic (CTE101)	Digital Design Lab (CTE103)	Elect/Comp Eng Elective	Elect/Comp Eng Elective	Computer Aided Drafting I (EST 111)	Computer Aided Drafting II (EST 112)	Mech Eng Elective	Mech Eng Elective	Ethics (PHI110)	Computer Porgram Elective	Humanities Elective	
	2	Represent the problem in a visual form such as a schematic, flow chart, diagram or data table. This visualization will represent the components of the problem in a way that leads to the construction of a solution.				X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X		
	3	Demonstrate strong fundamentals in the ability to formulate and solve problems by applying principles of mathematics, science and engineering.					X	X	X	X	X	X			X	X					X	X	X	X	X	X	X				X	X		X	



OBJECTIVES		ASSOCIATED LEARNING OUTCOMES		PROGRAM CURRICULUM: SPECIFIC COURSES AND RELATIONSHIP TO OUTCOME																																
The objectives of the Engineering Science Associate Degree Program include to assist students in the development of:		The graduating student will be able to:		Core Courses												Chemical Engineering Concentration			Civil/Environmental Engineering Concentration			Electrical/Computer Engineering Concentration			Mechanical Engineering Concentration			Program Electives								
				English Composition I (ENG101)	English Composition II (ENG102)	Technical Writing (ENG103)	Engineering Design Graphics (EST110)	Calculus I (Mat251)	Calculus II (Mat 252)	Calculus III (MAT253)	Differential Equations (MAT254)	Engineering Physics I (PHS131)	Engineering Physics II (PHS132)	Engineering Essentials and Design (EST104)	General Chemistry I (CHM121)	Micro Economics (ECO201)	Macro Economics (ECO202)	General Chemistry II (CHM122)	Chem. Eng. Elective	Ethics (PHI110)	Computer Aided Drafting I (EST111)	Computer Aided Drafting II (EST112)	General Chemistry II (CHM 122)	Civil/Env Eng Elective	Civil/Env Eng Elective	Fundamentals of Digital Logic (CTE101)	Digital Design Lab (CTE103)	Elect/Comp Eng Elective	Elect/Comp Eng Elective	Computer Aided Drafting I (EST111)	Computer Aided Drafting II (EST112)	Mech Eng Elective	Mech Eng Elective	Ethics (PHI110)	Computer Porgram Elective	Humanities Elective
2	The ability to create and conduct technical experiments, analyze and interpret data.	1	Develop a hypothesis: define the pertinent dependent and independent variables.							X	X	X	X	X	X	X	X					X	X	X	X	X	X				X	X		X		
		2	Establish a sound experiment method that will allow for measuring the variables and testing the hypothesis.														X	X			X	X	X	X	X	X	X				X	X		X		
		3	Demonstrate the ability to conduct an experimental procedure, use laboratory materials properly and safely, collect data, carefully note observations and describe procedures.														X	X			X	X	X	X	X	X	X				X	X				
		4	Analyze and interpret data.								X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	

OBJECTIVES		ASSOCIATED LEARNING OUTCOMES		PROGRAM CURRICULUM: SPECIFIC COURSES AND RELATIONSHIP TO OUTCOME																																
The objectives of the Engineering Science Associate Degree Program include to assist students in the development of:		The graduating student will be able to:		Core Courses														Chemical Engineering Concentration			Civil/Environmental Engineering Concentration			Electrical/Computer Engineering Concentration			Mechanical Engineering Concentration			Program Electives						
				English Composition I (ENG101)	English Composition II (ENG102)	Technical Writing (ENG103)	Engineering Design Graphics (EST110)	Calculus I (Mat251)	Calculus II (Mat 252)	Calculus III (MAT253)	Differential Equations (MAT254)	Engineering Physics I (PHS131)	Engineering Physics II (PHS132)	Engineering Essentials and Design (EST104)	General Chemistry I (CHM121)	Micro Economics (ECO201)	Macro Economics (ECO202)	General Chemistry II (CHM122)	Chem. Eng. Elective	Ethics (PHI110)	Computer Aided Drafting I (EST111)	Computer Aided Drafting II (EST112)	General Chemistry II (CHM 122)	Civil/Env Eng Elective	Civil/Env Eng Elective	Fundamentals of Digital Logic (CTE101)	Digital Design Lab (CTE103)	Elect/Comp Eng Elective	Elect/Comp Eng Elective	Computer Aided Drafting I (EST 111)	Computer Aided Drafting II (EST 112)	Mech Eng Elective	Mech Eng Elective	Ethics (PHI110)	Computer Program Elective	Humanities Elective
3	The ability and skills required to adapt and adjust to rapidly emerging technologies .	1	Demonstrate the ability to effectively use information acquisition tools.				x	x	x	x	x	x				x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x			
		2	Demonstrate the ability to incorporate new tools and methods from the field of math, science, engineering and technology.				x	x	x	x		x							x	x		x	x	x	x	x	x	x	x	x	x		x			
4	The ability to work independent ly and contribute to the project’s goal in team based activities.	1	Demonstrate the ability to effectively work independently within a team project based activity.								x	x	x	x			x	x				x	x	x	x	x	x	x				x	x			
		2	Articulate the team’s project and describe the role of each team member.								x	x	x	x			x	x				x	x	x	x	x	x	x				x	x			

OBJECTIVES		ASSOCIATED LEARNING OUTCOMES		PROGRAM CURRICULUM: SPECIFIC COURSES AND RELATIONSHIP TO OUTCOME																																
The objectives of the Engineering Science Associate Degree Program include to assist students in the development of:		The graduating student will be able to:		Core Courses												Chemical Engineering Concentration			Civil/Environmental Engineering Concentration			Electrical/Computer Engineering Concentration			Mechanical Engineering Concentration			Program Electives								
				English Composition I (ENG101)	English Composition II (ENG102)	Technical Writing (ENG103)	Engineering Design Graphics (EST110)	Calculus I (Mat251)	Calculus II (Mat 252)	Calculus III (MAT253)	Differential Equations (MAT254)	Engineering Physics I (PHS131)	Engineering Physics II (PHS132)	Engineering Essentials and Design (EST104)	General Chemistry I (CHM121)	Micro Economics (ECO201)	Macro Economics (ECO202)	General Chemistry II (CHM122)	Chem. Eng. Elective	Ethics (PHI110)	Computer Aided Drafting I (EST111)	Computer Aided Drafting II (EST112)	General Chemistry II (CHM 122)	Civil/Env Eng Elective	Civil/Env Eng Elective	Fundamentals of Digital Logic (CTE101)	Digital Design Lab (CTE103)	Elect/Comp Eng Elective	Elect/Comp Eng Elective	Computer Aided Drafting I (EST111)	Computer Aided Drafting II (EST112)	Mech Eng Elective	Mech Eng Elective	Ethics (PHI110)	Computer Program Elective	Humanities Elective
5	Communication skills.	1	Demonstrate skills in general writing, including related to memoranda and reports.	x	x	x					x	x	x	x			x	x	x				x	x		x	x	x				x	x	x		x
		2	Demonstrate skills in technical writing.			x					x	x	x	x			x	x			x	x	x		x	x	x				x	x				
		3	Demonstrate good oral communication skills.				x	x	x	x			x						x	x														x		x
6	Quantitative Reasoning	1	Interpret and manipulate quantitative information and applied mathematical concepts to solve real world problems.				x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x		x		
7	Science and Technology	1	Explain how science and technology are interrelated in the design of certain systems and/or devices.			x	x	x	x	x	x	x					x		x	x		x	x	x	x	x	x	x	x	x	x					

**Outcomes and Assessments Map –Engineering Science**

<b>OBJECTIVES</b>		<b>ASSOCIATED LEARNING OUTCOMES</b>		<b>ASSESSMENT METHOD(S) ALREADY IN PLACE AND WHERE (e.g., in which courses or other curricular experiences such as practicums, internships, etc.)</b>
<b>The objectives of the Engineering Science Program include to assist students in the development of:</b>		<b>The graduating student will be able to:</b>		
1	The ability to identify, formulate and solve technical problems.	1	Analyze problems, that is, isolate and describe the important components of a problem: what is given (design specification, performance requirements, testing standards, etc); what is known from previous experiences relevant to the problem; and what the unknowns are.	EST104 labs and projects
		2	Represent the problem in a visual form such as a schematic, flow chart, diagram or data table. This visualization will represent the components of the problem in a way that leads to the construction of a solution.	EST104 labs and projects, CTE103 labs
		3	Demonstrate strong fundamentals in the ability to formulate and solve problems by applying principles of mathematics, science and engineering.	EST104 labs and projects, PHS131 & PHS132 labs and projects
2	The ability to create and conduct technical experiments, analyze and interpret data.	1	Develop a hypothesis: define the pertinent dependent and independent variables.	EST104 labs and projects, PHS131 & PHS132 labs and projects
		2	Establish a sound experiment method that will allow for measuring the variables and testing the hypothesis.	EST104 labs and projects, PHS131 & PHS132 labs and projects
		3	Demonstrate the ability to conduct an experimental procedure, use laboratory materials properly and safely, collect data, carefully note observations and describe procedures.	EST104 labs and projects, PHS131 & PHS132 labs and projects, CHM121 labs
		4	Analyze and interpret data.	EST104 labs and projects, PHS131 & PHS132 labs and projects, CHM121 labs

3	The ability and skills required to adapt and adjust to rapidly emerging technologies.	1	Demonstrate the ability to effectively use information acquisition tools.	MAT251, 252 &253 exams and class projects, EST104 labs and projects
		2	Demonstrate the ability to incorporate new tools and methods from the field of math, science, engineering and technology.	MAT251, 252 &253 exams and class projects, EST104 labs and projects
4	The ability to work independently and contribute to the project's goal in team based activities.	1	Demonstrate the ability to effectively work independently within a team project based activity.	EST104 labs and projects, PHS131 & PHS132 labs and projects, CHM121 labs
		2	Articulate the team's project and describe the role of each team member.	EST104 labs and projects, PHS131 & PHS132 labs and projects, CHM121 labs
5	Communication skills.	1	Demonstrate skills in general writing, including related to memoranda and reports.	ENG101, 102 &103
		2	Demonstrate skills in technical writing.	ENG103
		3	Demonstrate good oral communication skills.	EST104, MAT251,252 &253
6	Quantitative Reasoning	1	Interpret and manipulate quantitative information and applied mathematical concepts to solve real world problems.	Incorporated in all Technical, Math and Science courses
7	Science and Technology	1	Explain how science and technology are interrelated in the design of certain systems and/or devices.	EST104,

# LEARNING OUTCOMES ASSESSMENT SCHEDULE

PROGRAM:   Engineering Science

DATE:           March 2011

Objectives	Learning Outcomes	Assessment Dates			
		2011-12	2012-13	2013-14	2014-15
1	L01				
	L02				
	L03				
2	L01				
	L02				
	L03				
	L04				
3	L01				
	L02				
4	L01				
	L02				
5	L01				
	L02				
	L03				
6	L01				
7	L01				