ABET
Self-Study Report

for the

Electrical and Computer Engineering Technology

Program

at

Western Carolina University

Cullowhee, NC

July 1, 2008

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Self-Study Report

Electrical and Computer Engineering Technology
Bachelor of Science

Western Carolina University

BACKGROUND INFORMATION

- **Contact information**

Dr. Ken Burbank
Professor and Department Head
Department of Engineering and Technology
Western Carolina University
Belk Building 220
Cullowhee, NC 28723
Office phone: 828-227-2181
Fax: 828-227-7838
Email: kburbank@email.wcu.edu

- **Program History**

An Electronics Engineering Technology (EET) program was initiated in 1988 and produced its first graduates in 1991. The program included standard courses in circuit analysis, analog and digital circuits, microprocessors, control systems, computer systems and communication systems. Graduates work in electronics-related industries such as communications, computers, medicine, entertainment, military, education, automated manufacturing, process control, defense and aerospace, and the automotive and consumers industries in a variety of engineering and engineering technology related areas.

The EET program received initial TAC of ABET accreditation in 1993. In the mid-1990s, the EET program initiated concentrations in automation and telecommunications. At this time, EET students were required to choose one of the concentrations. In 2002, the program was accredited, in which both the automation and telecommunication concentrations were evaluated. In Fall 2003, the automation concentration became the Electrical and Computer Engineering Technology (ECET) program and the

telecommunications concentration became the Telecommunications Engineering Technology (TEL) program. The purpose of these changes was to better reflect the mission of these programs and to accommodate student interest. The TEL degree was phased out effective Spring 2006, but a TEL minor is still offered.

The ECET program received TAC of ABET accreditation in 2006. Since this visit there have been no changes to the program. Several changes have been submitted for administrative approval and if approved will be implemented in Fall 2009. It is proposed that the course ECET 211 Electronic Drafting and Fabrication, 3 credit hours, be added as a required course. The reason for this change is that learning how to layout a circuit board in a software application and fabricate the board are very important skills that will benefit the ECET student in team-oriented electronic projects as well as in a career in engineering and technology. To offset the additional 3 hours of course credit required for ECET 211, the required number of technical electives would be reduced from 7 to 4 credit hours. Currently all 300-400 level ECET, MET, TEL, and CS courses that are not required courses in the ECET program are allowed as technical electives. Since the Manufacturing Engineering Technology program is not longer offered, references to MET courses as electives in the ECET program will be deleted.

- **Options**

The ECET program offers one track. There are no concentrations within the ECET program. ECET students are eligible to seek a minor in Telecommunications.

- **Organizational Structure**

The academic organization of Western Carolina University is divided into eight colleges. (Figure 1) These colleges include the Colleges Arts and Sciences, Business, Education and Allied Professionals, Fine and Performing Arts, College of Health the Human Sciences, and Kimmel School of Construction Management and Technology, Honors College and Graduate School. Graduate programs are offered directly through each college and the Kimmel School, and the Graduate School coordinates the admission process, funding support, and awarding of degrees to graduate students. In addition, the Honors College coordinates courses and events in every area of study.

The Kimmel School is divided into two constituent departments: Construction Management and Engineering and Technology.

There are three undergraduate programs in the Engineering and Technology Department:

1. Electrical and Computer Engineering Technology
2. Engineering Technology
    - Applied Systems Technology Concentration
    - Engineering and Technical Operations Concentration
3. Electrical Engineering

Electrical Engineering (EE) program began in 2002. The EE program is a joint degree program with the University of North Carolina in Charlotte. A request for accreditation of this program will be made in January of 2009 for a review in the fall semester of that year. Only the ET and ECET programs are under review this year.

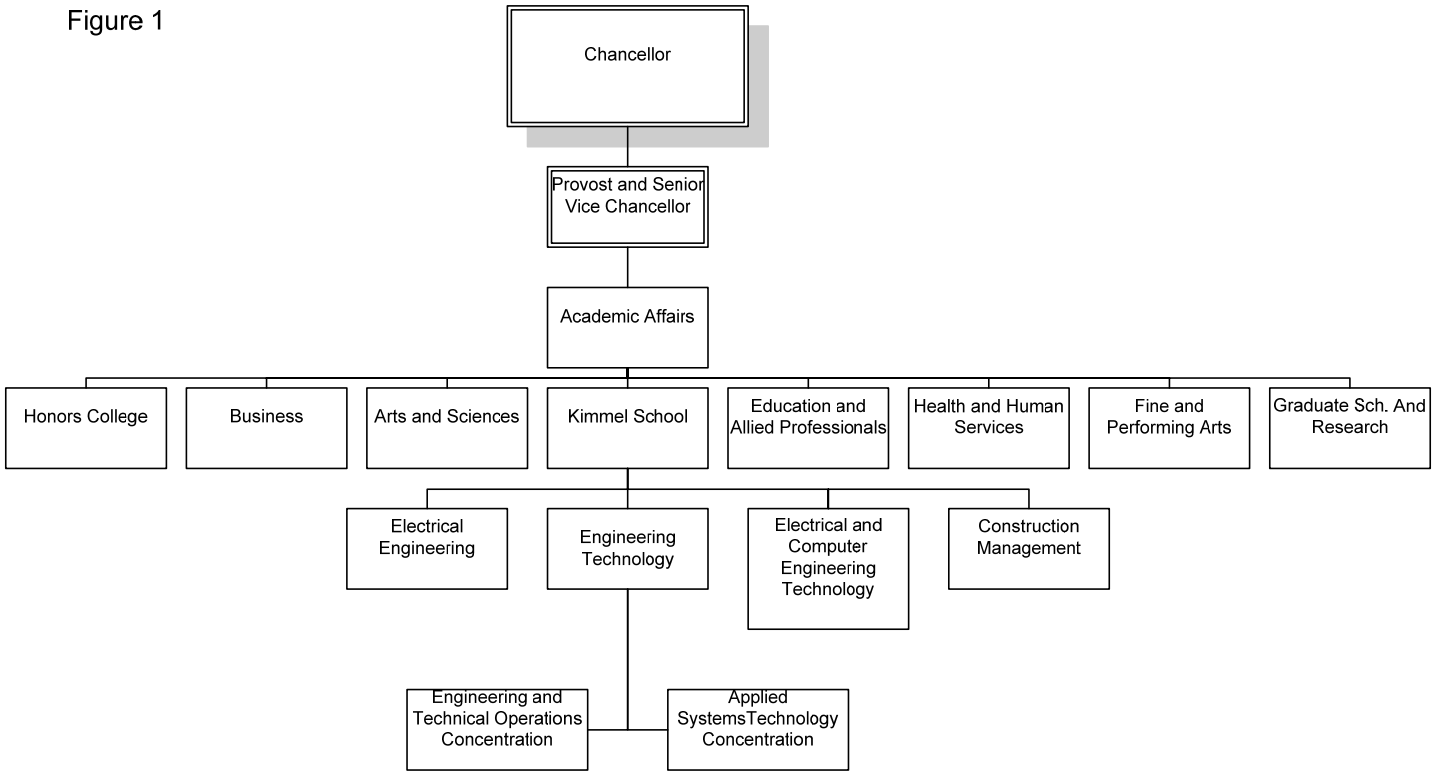
- **Program Delivery Modes**

The only mode of instruction in which the ECET program is offered is a full-time day program, on-campus. Eight of the fifteen ECET/TEL courses required for the ECET major are administered in a lecture/lab format; four are administered as a lecture/lab/recitation combination; two are student team-oriented project courses; and one is a lecture-only course. The lecture/lab/recitation courses require six contact hours per week and are targeted for the sophomore and first semester junior students. In the two hour per week recitation section, the instructor typically requires students to work on assignments in class. This effort helps students develop study skills and encourages teamwork.

Course credit is offered for students who choose to participate in cooperative education. Most of the ECET students who choose to earn course credit through a co-op experience are sophomores and juniors.

Western Carolina University
Colleges and Schools
Organizational Chart

Figure 1



- **Deficiencies, Weaknesses or Concerns Documented in the Final Report from the Previous Evaluation and the Actions taken to Address them**

The final report of the 2006 ABET review of the ECET program included the following:

a. Institutional Strengths

Facilities especially classrooms and laboratories, have excellent equipment and are well maintained. They indicate institutional commitment to the program. Faculty and students enjoy the good working environment and modern laboratory equipment and reflective of industrial practice. The Center for Integrated Technologies, within the Kimmel School, enhances educational opportunities for students with state-of-the-art equipment and an economic engagement approach. Electrical and Computer Engineering Technology students utilize this resource in senior project work, and additional collaboration is anticipated.

b. Institutional Weaknesses

1. ABET Policy II.B.2.b states, "… All engineering technology programs must include the word "technology" as the final noun in the title. Preferred program titles would include the words 'engineering technology'." Several transcripts inspected showed inconsistent use of the appropriate terminology in program titles. An accurate program title is needed in transcripts to avoid it being confused with the engineering program. Transcripts must be corrected to reflect the program title "Electrical and Computer Engineering Technology".

   14-Day Response: The institution provided documentation that the university registrar made the necessary changes to the title of the degree program that appears in student transcripts.

   Status: This finding has been resolved.

2. ABET Policy II.L.6 states, "Accredited programs should be specifically identified as accredited by the Technology Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone (410)

347-7700." Several University publications provided outdated references to ABET and must be corrected to the above.

14-Day Response: The institution provided documentation that the Provost office has made the appropriate correction in the catalog.

Status: This finding has been resolved.

c. Program Strengths

1. The electronics laboratories are equipped with state-of-the-art equipment typical of that encountered in industry. The quantity of equipment is such that laboratory classes are small enough for the students to receive individual attention from the faculty member teaching the laboratory course. In addition, students and faculty have access to the Center for Integrated Technologies to use such equipment as a light measurement system, a wide bandwidth oscillator, and a high resolution spectrometer. Students are well-prepared when they graduate to utilize modern industrial equipment in their work.
2. There is a very effective capstone design course sequence (ECET 478/479-Senior Design Proposal and Senior Design Project) with a good number of computer-based senior design projects including wireless sensor network, networked sensors for Autonomous Underwater Vehicle navigation, PIC computer-controlled autonomous manipulator, MATLAB Simulation for a Smart Sensing Node, Computer-Based Water Turbidity Monitoring System.

d. Program Weaknesses

1. Criteria: Criterion 1. Program Educational Objectives. The criterion states, "…*program educational objectives* are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve during the first few years following graduation. Each engineering technology program must have in place: a. published educational objectives that are consistent with the mission of the institution and applicable ABET criteria, b. a documented process by which the objectives are determined and

periodically evaluated based on the needs of constituencies served by the program." There was no evidence that input from program constituencies was used to determine or assess the educational objectives of the program. The program educational objectives as stated by the institution do not adequately describe what the graduate is expected to accomplish during the first few years of employment; they appear to describe knowledge that the student will have upon graduation from this program which would be program outcomes rather than objectives. There appears to be some confusion on the part of the program between program educational objectives and program outcomes. Since the program educational objectives are not adequately defined, the institution is unable to demonstrate that the educational program supports them. Therefore, it is required that the program demonstrate that it has in place (1) published educational objectives that are consistent with the mission of the institution and applicable ABET criteria, and (2) a documented process by which the objectives are determined and periodically evaluated based on the needs of constituencies served.

2. Criteria: Criterion 2. Program Outcomes states, "…*program educational objectives*… are typically demonstrated by the student and measured by the program at the time of graduation. An engineering technology program must demonstrate that graduates have: (the skills and knowledge defined in items (a) through (k)." Criterion 3. Assessment and Evaluation states, "Each program must utilize multiple assessment measures in a process that provides documented results to demonstrate that the program objectives and outcomes are being met." There was no evidence that program outcomes were being assessed at or near to the time of graduation. The program provided course-level assessment materials including textbooks, syllabi, and examples of graded coursework. However, assessment at the course level does not demonstrate attainment of specific program outcomes at the time of graduation. Therefore, it is required that the program (1) demonstrate that its graduates have achieved outcomes (a) through (k) of Criterion 2, and (2) demonstrate that it is using multiple assessment measures in a process that provides documented results to demonstrate that the program outcomes are being met.

Due Process Response: The institution provided documentation of a 2007 through 2013 time line for program outcome assessments and multiple assessment planning matrices for 2007-2008.

Status after Due Process: This finding remains a Weakness until the program demonstrates that graduates have attained competency in the program outcomes that align to outcomes (a) through (k) as defined in Criterion 2, via multiple assessment measures.

3. Criteria: Criterion 7. Institutional and External Support states: "An advisory committee representing the organizations that employ graduates must be utilized to advise the program in establishing, achieving, and assessing its goals". The membership of the industry advisory committee is not representative of employers or potential employers of the graduates, and no evidence was provided that the committee was actively involved in curricular change for this program. The lack of a strong industry advisory committee input in curricular decision-making may result in a curriculum that is not responsive to the needs of local and regional industry. Therefore, it is required that the program demonstrate that it is utilizing an advisory committee representing the organizations that employ graduates to provide advise in establishing, achieving, and assessing program goals.

   Due Process Response: The institution stated that future advisory committee meetings will continue to review the ECET curriculum and program assessments and results, and that it will be expanded to include additional representatives from graduate employers.

   Status after Due Process: This finding remains a Weakness until documentation is provided that the advisory committee fully meets program criteria.

e. **Program Concerns**

1. Criteria: Criterion I. Program Criteria for Computer Engineering Technology states, "Graduates ….must demonstrate knowledge and hands-on competence appropriate to the goals of the program in: a. the application of …operating systems… and the ability to analyze, design, and implement hardware and software computer systems". Various types of computer systems including

microcontroller-, microprocessor-, and PC-based computer systems, and C-based software programs are used throughout the program for courses and discussion topics in real-time computer controlled sensing/instrumentation and control applications. However, the required knowledge and hands-on competence needed in the areas of operating systems and hardware and software computer systems were not included in program outcomes for the Electrical and Computer Engineering Technology Program. Without proper breadth and depth and coverage in subject areas such as operating systems, software and hardware computer systems, the program can be compromised. Therefore, the program is required to demonstrate that its graduates have (1) knowledge and hands-on competence in the application of operating systems and, (2) the ability to analyze, design, and implement hardware and software computer systems.

Due Process Response: The institution provided documentation of ECET curriculum mapping to program criteria.

Status after Due Process: This finding remains a Concern until the program demonstrates that graduates have appropriate competence in operating systems, and the ability to implement hardware and software systems.

CRITERION 1. STUDENTS

- **Student Admissions**

The history of admission standards for all freshmen is summarized in Table 1 – 1. This information is not available by program area. Acceptance into the ECET Program does not have additional qualifiers beyond those for acceptance to the university. The enrollment trends and the number of ECET graduates for past five academic years is provided in Table 1 – 2.

Table 1-1. History of Admissions Standards for Freshmen Admissions for Past Five Years

Academic Year	Composite ACT		Composite SAT		Percentile Rank in High School		Number of New Students Enrolled
	MIN.	AVG.	MIN.	AVG.	MIN.	AVG.	
2003	11	19.95	440	1011	1.00	58.03	1495
2004	11	20.18	430	1013	1.00	58.30	1578
2005	8	20.29	460	1016	1.00	57.78	1557
2006	11	20.15	490	1010	1.00	58.49	1568
2007	12	20.43	490	1006	1.00	58.36	1259

Source – WCU Institutional Research and Planning

Table 1-2. Enrollment Trends for Past Five Academic Years

	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Full-time Students	29	52	57	59	65
Part-time Students	4[2]	4[2]	4[2]	1	1
Student FTE[1]	31	54	59	59.5	65.5
Junior-Senior ECET Students[3]	30	37	23	26	37[4]
Graduates[3]	8	16	19	10	10

[1] FTE = Full-Time Equivalent
[2] Estimated
[3] Source: 2007 Fact Book and University Data, WCU Office of Institutional Research and Planning. http://www.wcu.edu/stratplan/2007_Factbook/fb2007.htm
[4] Source: WCU Banner On-line System

- **Evaluating Student Performance**

  Faculty evaluate the academic performance of each student in the classes that they teach. Faculty are encouraged by the administration to inform students concerning their progress in each course. One of the items on the student evaluation questionnaire is whether or not the professor provided periodic feedback concerning the students' progress in the course.

  Faculty are required to assign a letter course grade to each student in the classes that they teach. The allowable letter grades are shown in Table 1-3. For each letter grade that a faculty member assigns, the grade recording system automatically assigns a corresponding quality point ranging from 0.0. to 4.0, for each earned credit hour. The

assignment of these quality points are provided in Table 1-3. From the quality points and the total earned credit hours, a grade point average (GPA) is computed as follows:

$$GPA = \frac{\text{Quality Points}}{\text{Credit Hours}}$$

Table 1-3. Assignment of Course Grades

Grade	Interpretation	Quality Points Per Credit Hour
A	Excellent	4.00
A-		3.67
B+	Good	3.33
B		3.00
B-		2.67
C+	Satisfactory	2.33
C		2.00
C-		1.67
D+	Poor	1.33
D		1.00
D-		0.67
F	Failure	0.33
I	Incomplete	-
IP	In Progress	-
S	Satisfactory	-
U	Unsatisfactory	-
W	Withdrawl	-
AU	Audit	-
NC	No Credit	-

A few courses offered by the university are pass/fail only. The letter grades ‘S’ or ’U’ are assigned in pass/fail courses. The grade point average is not affected by a student’s performance in these courses. In the ECET program, there is only one course designated as pass/fail. This course is ECET 478 Senior Design Project Proposal. If an ECET student receives a ‘U’ grade in this required course, he / she must retake the course.

The computation of the grade point average will now be explained in detail. Suppose a student has the following semester grades: A in a 1 credit hour course, B- in a 2 credit hour course, C in a 3 credit hour course and A- in a 4 credit hour course. The computation of the semester GPA is shown in Table 1 – 4. In this example, the student earns 31 quality points for 10 credit hours, resulting in a 3.10 semester GPA.

Table 1-4. Sample calculation of Grade Point Average

Course	Credit Hours (CH)	Assigned Course Grade	Quality Points Per Credit Hour (QP/CR)	Computed Quality Points = (CH) * (QP/CR)
Course 1	1	A	4.00	4.00
Course 2	2	B-	2.67	5.33
Course 3	3	C+	2.33	7.00
Course 4	4	A-	3.67	14.67
Totals	**10**			**31.00**
Computed GPA = Quality Points / Credit Hours = 31.00 / 10 = 3.10				

Student progress is monitored by individual faculty and by academic advisors. The first line of defense in detecting struggling students is the individual faculty member. Faculty of 100 and 200-level courses are required to submit interim course grades immediately after the first five weeks of the semester. There are fifteen weeks of classes in each fall and spring semester. Students and academic advisors have access to these interim grades. This allows academic advisors to monitor the progress of many of theirs advisees early in the semester. By monitoring student progress early in a course, the faculty can take some action to encourage and motivate struggling students.

Faculty also have a resource called the Early Warning System. If a faculty notices that a student is struggling in a course, is performing poorly on assignments and quizzes, then he/she can report this information to the Early Warning System. The faculty can recommend that a student withdraw from the class. This information is distributed to the academic advisor, to a staff member in the registrar's office, and to all faculty who are teaching this student in the current semester. When a faculty reports a student to the Early Warning System, the academic advisor receives a notice and is requested to contact the student, and from this conversation determine the circumstances that may have lead to the lack of progress. The academic advisor is requested to discuss with the student his/her options and to provide some positive advice. The academic advisor is requested to report his/her findings to the registrar staff member. The Early Warning System is made available early in the semester, but does not extend past the last day to withdraw from a course. By reporting poor student progress early in a course through the Early Warning System, the faculty can help a student to make positive steps for

improved performance. For this same reason, the Early Warning System is effective in reducing the number of students placed on academic probation or academic suspension.

- **Transfer Students and Transfer Courses**

Transfer students are admitted to the university through the admission office. When a transfer student is admitted, the admissions office assigns transfer credit. Articulation agreements between WCU and numerous other universities and community colleges have been established. Articulation agreements are in place between WCU and all the North Carolina Community Colleges. These articulation agreements assist the admissions office in assigning transfer credit.

When no articulation agreement exists, then the assigned faculty advisor will submit waivers for course within the major. For example if the student has five courses within an equivalent major, then the academic advisor will determine if these courses are compatible with courses within the major of interest. After identifying the compatible courses, the academic advisor will write waiver forms to waive the requirements for the selected courses. The waivers must be approved by the department chair of the major of interest as well as the registrar's office.

The university holds six orientation days for transfer students each summer as well as one orientation day during the winter break. Transfer students are encouraged but not required to attend the orientation. One of the important activities during the orientation day is when the admitted transfer student meets with a faculty member within the major of interest. The faculty member provides guidance concerning suggested courses to take during the first several semesters.

For the purpose of this report, the definition of a transfer student is any admitted student who transfers at least 15 hours of college credit. It is estimated that about 8 students per year (Table 1 – 5) are admitted to the university who meet this criteria and also declare ECET as their major. A survey of 26 recent ECET graduates indicate that 50 % of these graduates transferred at least 15 credit hours of course work to WCU from other institutions or from College Board Advanced Placement, and 67 % of these graduates transferred at least 1 credit hour. Table 1- 6 summarizes these findings.

Table 1-5. Transfer Students for Past Five Academic Years

Academic Year	Number of Transfer Students Enrolled
2007-2008	8 (estimated)
2006-2007	8 (estimated)
2005-2006	8 (estimated)
2004-2005	8 (estimated)
2003-2004	8 (estimated)

- **Advising and Career Guidance**

As soon as a student is admitted to the university, he/she is assigned an academic advisor. If the student has not declared a major, the academic advisor is a trained staff member of the university Advising Center. If the student has declared a major, the academic advisor is a faculty member who teaches courses in the declared major.

Every student is required to meet with his or her academic advisor at least once per semester. Students can not register for classes without first meeting with their academic advisor. Academic advisors are required to inform students of the necessity to schedule an advising session prior to the course registration period and are required to contact advisees who are delinquent in scheduling an advising session. Most academic advisors provide sign up sheets for this purpose. During a typical advising session the advisor will access student progress, provide appropriate advice concerning the future course work, ask the student if he/she is still interested in the major, and if the situation arises provide information concerning career options. The academic advisor is required to keep a record of the decisions made and the advice given during the advising session. The advisor must maintain this data over the academic career of the advisee.

Students are provided with career guidance through 1) the Career Center, 2) individual faculty members, 3) the student's academic advisor, and 4) through student organizations. The Career Center offers job fairs as well as workshops in interviewing skills and resume writing. The first Science, Engineering, Technology, & Mathematics (STEM) Career Day at WCU was held in the spring semester of 2007. Since then the event has repeated once per semester. Typically 10 to 20 engineering firms participate in this event every semester.

Table 1-6. Transfer Credit of ECET Graduates

Numerical Identifier	Year Matriculated	Year Graduated	Transferred Credit from	# of Credits Hours Transferred
1	Summer 2004	Spring 2008	N/A	0
2	Fall 2005	Spring 2008	Blue Ridge CC	50
3	Fall 2005	Spring 2008	Tri-County Tech. Coll. & AB-Tech	43
4	Fall 2005	Spring 2008	Calhoun CC & Pensacola Junior Coll & Montana State U. & Haywood CC & Military Credit	154
5	Fall 2004	Spring 2008	College Bd. Adv. Placement	6
6	Fall 2004	Spring 2008	N/A	0
7	Fall 2004	Spring 2008	N/A	0
8	Fall 2005	Spring 2008	Carteret CC	77
9	Fall 2005	Spring 2008	Catawba Valley CC	66
10	Fall 2001	Fall 2007	N/A	0
11	Fall 2003	Sum. 2007	Western Piedmont CC	12
12	Fall 2003	Sum. 2007	Southwestern CC	64
13	Fall 2004	Spring 2007	Southwestern CC	57
14	Fall 2003	Spring 2007	Mcdowell Technical CC	3
15	Fall 2004	Spring 2007	Aviation School & App. State & Tidewater CC - Portsmouth & Haywood CC	48
16	Fall 2003	Spring 2007	N/A	0
17	Fall 2002	Fall 2006	Pfeiffer U & HCC	58
18	Fall 1996	Sum. 2006	Blue Ridge CC & UNCA & Haywood CC & AB- Tech & Coastal Carolina U	119.4
20	Fall 2002	Spring 2006	College Bd. Adv. Placement	8
23	Fall 2002	Spring 2006	N/A	0
24	Fall 2001	Spring 2006	Cleveland CC & College Bd. Adv. Placement	17
25	Fall 2005	Spring 2006	U of Utah & AB-Tech	102
28	Fall 2002	Spring 2006	Cleveland CC	1
29	Fall 2001	Spring 2006	N/A	0
30	Fall 2004	Spring 2006	AB-Tech & UNCA & UNCC	121
31	Fall 1999	Spring 2006	N/A	0
Average number of credits transferred per Graduating Senior				**38.7**
Number of Students in Survey				**26**
Proportion of students who transferred at least 1 credit hour:				**69 %**
Proportion of students who transferred at least 15 credit hours:				**50%**

All Engineering and Technology faculty are required upon employment to have at least three years of US industrial experience. This means that ECET students will hear about career options from faculty within their major simply by attending class. Engineering and Technology faculty often discuss with students their own work experiences. Since these faculty have applicable work experience they have a realistic vision of future

technology and can direct class work and class project towards this vision. Hence Engineering and Technology students receive career guidance by their own actions and perseverance in the classroom.

During a typical advising session, the academic advisor will discuss with the advisee his / her interests and attempts to direct the student towards careers that utilize the student's interest and abilities. By meeting at least once per semester, the academic advisor has many opportunities to monitor the advisee's interest and reinforce career options.

Student organizations help with career guidance and professional development. Involvement with student organizations can develop a student's leadership skills. For ECET students, the IEEE student branch hosts field trips to regional engineering firms, and invites representatives from these firms to visit the university. By participating in these IEEE events, the ECET student can learn about what a typical engineer technologist does on the job.

- **Graduation Requirements**

One main focus of the advising session is to assess where the student is concerning the graduation requirements. The Academic Advisor is familiar with all university graduation requirements as well as all requirements of the major. It is the responsibility of the advisor to make sure the student understands all the graduation requirements. During each advising session, the Academic Advisor will plan out several future semesters of class work. When the student is in the second semester of the junior year, the Academic Advisor will provide the advisee with a course plan to satisfy the graduation requirements. Typically this is in the spring semester in which the Academic Advisor provides a suggested course plan for the following fall and spring semesters. An updated course plan is devised by the Academic Advisor just prior to the last semester.

During the semester in which the student wishes to graduate, the student submits a graduation application to the registrar. The registrar distributes the application to the department who in turn sends the application to the Academic Advisor. The Academic

Advisor reviews the student's academic record and determines whether or not it is possible for the student to graduate within that semester. The advisor makes his/her decision based upon the courses in which the student is currently registered as well as the student's GPA overall and within the major. If it is possible for the student to graduate within that current semester, then the Academic Advisor signs a statement to that effect and forwards the application on to the registrar. If it is not possible for the student to graduate within that current semester, then the Academic Advisor informs the student and holds onto the application until a semester in which it is possible for the student to graduate.

The Academic Advisor signs a statement that upon successful completion of all registered courses, the student will have met all the requirements of the major. The graduation application is then copied and saved by the department and then sent to the registrar. After all the course grades have been submitted at the end of the semester, the registrar verifies that the student has completed the course work in the major as specified by the academic advisor. The registrar also verifies that the student has met the university's Liberal Studies requirements and has met all other university academic requirements. Only at this point will the decision be made to grant a degree.

The current employment status of the last two years of ECET graduates is summarized in Table 1-7.

Table 1-7. Employment Status of ECET Graduates

Numerical Identifier	Year Matriculated	Year Graduated	Certification/ Licensure (If Applicable)	Initial or Current Employment/ Job Title/ Other Placement
1	Summer 2004	Spring 2008		
2	Fall 2005	Spring 2008		Uninterruptible power supplies, Eaton, Raleigh, NC
3	Fall 2005	Spring 2008		Electrical Engineer and Management Trainee, Belcan Industries, Cary, NC
4	Fall 2005	Spring 2008		Graduate Student, M.S. in Technology, WCU
5	Fall 2004	Spring 2008		
6	Fall 2004	Spring 2008		
7	Fall 2004	Spring 2008		Engineering Intern, Progress Energy, Harris Nuclear Plant
8	Fall 2005	Spring 2008		Systems Engineer, Lockheed Martin, Baltimore, MD
9	Fall 2005	Spring 2008		
10	Fall 2001	Fall 2007		Sales Associate, Lowes Home Improvement
11	Fall 2003	Summer 2007		Graduate Student, M.S. in Technology, WCU
12	Fall 2003	Summer 2007		Power Engineer, TRC Engineering Services
13	Fall 2004	Spring 2007		Test Engineer, Kidde Industries
14	Fall 2003	Spring 2007		Engineer, Cincinnati, OH
15	Fall 2004	Spring 2007		
16	Fall 2003	Spring 2007		
17	Fall 2002	Fall 2006		Team Manager for Youth Baseball, Waynesville, NC
18	Fall 1996	Summer 2006		Process Engineer, ArvinMeritor, Fletcher, NC
19		Spring 2006		
20	Fall 2002	Spring 2006		
21		Spring 2006		
22		Spring 2006		Systems Engineer, Lockheed Martin, Baltimore, MD
23	Fall 2002	Spring 2006		
24	Fall 2001	Spring 2006		
25	Fall 2005	Spring 2006		Inside Sales Engineer, Eaton Corp., Arden, NC
26	Fall 2001	Spring 2006		Engineer, Blue Ridge Paper, Waynesville, NC. & WCU grad. student.
27	Fall 2003	Spring 2006		Graduate Student, PhD in Technology, Purdue University
28	Fall 2002	Spring 2006		Earthlink
29	Fall 2001	Spring 2006		
30	Fall 2004	Spring 2006		Sales Manager, Advanced Superabrasives, Inc, Mars Hill, NC
31	Fall 1999	Spring 2006		Embedded C Programmer
32		Spring 2006		Test Engineer, Kidde Industries

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

ABET Definition: *Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.*

- **Mission Statement**

The "Statement of Mission" as published on the on the website of the Office of Institutional Research and Planning (insert link) reads:

> A member of the University of North Carolina, Western Carolina University offers courses in the arts, sciences, technologies, humanities, and professions. Students can elect degree programs at the bachelor's or master's level, or doctoral level study in educational leadership. As a regional comprehensive institution, it serves the people of North Carolina from its residential campus at Cullowhee and through off-campus instruction in Asheville and other locations.
>
> Teaching and learning constitute the central mission of Western Carolina University. The University seeks to create a community of scholarship in which the activities of its members are consistent with the highest standards of knowledge and practice in their disciplines. The commitment of the community to service, research, and creative activities complements the central mission and extends the benefits of its scholarship to society. As a major public resource for western North Carolina, the university promotes regional economic development through its teaching, research and service. Western Carolina University seeks to provide an environment in which students, faculty, and staff jointly assume responsibility for learning, where free exchange of ideas, intellectual challenge, and high standards of scholarship prevail.

Mission and Vision statements for the Kimmel School are published at http://www.wcu.edu/3830.asp. In summary, the Kimmel School is committed to its statewide mission for education and its regional mission for engagement and fulfills the academic missions of teaching (learning), scholarship (discovery), and service (engagement).

The following statement regarding the thrust of the ECET program is currently displayed in the WCU catalog:

> The program emphasizes the application of microcomputers to the solution of industrial problems relating to automation, instrumentation, and control, in systems

involving robotics, data communications, networks, and/or automated testing. In all cases, microcomputer hardware and software are used for data acquisition, transfer, and analysis.

- **Program Educational Objectives**

Program Educational Objectives (PEOs) are listed in the ECET Assessment Plan (see Appendix D) and are provided below.

1. Assume entry-level positions in system design, development, and implementation related to electrical and computer systems.
2. Apply current industrial practices and design procedures in support of electrical and computer systems.
3. Pursue appropriate career advancement, promotion and occupational mobility.
4. Pursue additional education and/or on-the-job training and certification.

- **Consistency of the Program Educational Objectives with the Mission of the Institution**

Western is a regional comprehensive institution, serving the people of North Carolina, with a variety of program offerings. As indicated in the mission statement, "technologies" are an integral part of the academic offerings. Therefore, the PEOs, based on established program outcomes, are congruent with the educational mission of Western Carolina University.

- **Program Constituencies**

Program constituencies include the following:

ECET Faculty
ECET Students
ECET Alumni
ECET Employers
ECET Advisory Council
Engineering & Technology Department Head

- **Process for Establishing Program Educational Objectives**

The ABET accreditation visit in Fall 2006 cited program weaknesses related to "published educational objectives that are consistent with the mission of the institution

and applicable ABET criteria" and "a documented process by which the objectives are determined and periodically evaluated based on the needs of constituencies served by the program."

The ECET Assessment Plan was drafted in Spring 2007. During that semester, PEOs were developed with input from the ECET faculty. The assessment plan was placed into effect beginning Fall 2007.

Time lines for assessment of the PEOs are listed below in Table 2-1.

Table 2-1. Time Line for Assessment of PEOs

Program Educational Objectives	Spring 2008	Spring 2010	Spring 2012
1. Assume entry-level positions in system design, development, and implementation related to electrical and computer systems.	×	×	×
2. Apply current industrial practices and design procedures in support of electrical and computer systems.	×	×	×
3. Pursue appropriate career advancement, promotion and occupational mobility.	×	×	×
4. Pursue additional education and/or on-the-job training and certification.	×	×	×

Assessment, evaluation activity, and responsibility are listed below in Table 2-2.

Table 2-2. Assessment and Evaluation Responsibilities

Assessment and Evaluation Activity	Activity Responsibility
Data Collection and Evaluation; Determine Findings	ECET Faculty; Department Head; Assessment Director
Initiate Action Where Necessary	ECET Faculty
Review Program Outcomes, Performance Criteria and Program Educational Objectives	ECET Faculty; Advisory Council; Department Head; Assessment Director
Determine Targeted Courses, Assessment Activities & Methods	ECET Faculty; Department Head; Assessment Director
Develop/Review Assessment Methods	ECET Faculty; Advisory Council; Department Head; Assessment Director
Continuous Summary of Assessment/Evaluation Activities and Results	Department Head; Assessment Director

- **Achievement of Program Educational Objectives**

Data collection to determine the level of achievement of the PEOs will be initiated in an alumni survey in Spring 2009.

The Program Educational Objective:

1. Assume entry-level positions in system design, development, and implementation related to electrical and computer systems.

was assessed using data from Alumni Surveys performed by the WCU Office of Institutional Research and Planning during Fall 2007. This was the first time these surveys have been done by the institution since the last ABET visit. The university plans to continue doing Alumni Surveys in the future. The level of achievement is distributed into five categories. Table 2 – 3 provides a summary of the student responses to questions that relate to the Program Educational Objectives. Five ECET alumni and one EET alumnus replied to the survey. 100 % of the respondents were very or moderately satisfied with how the university had prepared them for employment. 83 % of the respondents stated that their current position is either directly or indirectly related to their major.

Table 2-3. Program Educational Objective Assessment and Evaluation

Educational Objective	Alumni Survey Assessment Question	Evaluation summary
1. Assume entry-level positions in system design, development, and implementation related to electrical and computer systems.	Overall, how satisfied are you with how WCU prepared you for employment? 1. Very satisfied 2. Moderately satisfied 3. Neither satisfied or dissatisfied 4. Moderately dissatisfied 5. Very dissatisfied	1. 33 % 2. 67 % 3. 0 % 4. 0 % 5. 0 % 6 respondents
	Which one choice best describes your relationship between your job and your academic major? 1. directly related 2. indirectly related 3. not related 4. currently not employed 5. other	1. 33 % 2. 50 % 3. 17 % 4. 0 % 5. 0 % 6 respondents

CRITERION 3. PROGRAM OUTCOMES

ABET definition: *Program outcomes are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program.*

- **Process for Establishing and Revising Program Outcomes**

The ABET accreditation visit in Fall 2006 cited program weaknesses related to "demonstrating that ECET graduates have achieved outcomes (a) through (k) of Criterion 2" and "demonstrating that multiple assessment measures are used in a process that provides documented results to demonstrate that the program outcomes are being met".

The ECET Assessment Plan was drafted in Spring 2007. During that semester, POs were developed with input from the ECET faculty. The assessment plan was placed into effect beginning Fall 2007.

- **Program Outcomes**

Program Outcomes (POs) are listed in the ECET Assessment Plan (Appendix E) and are provided below.

Program Outcomes with Performance Criteria

1. Analyze and interpret experimental data and apply it in a practical manner in the design and development of electrical and computer systems.
   a. Demonstrate proper use of laboratory equipment.
   b. Build and test circuits and/or systems.
   c. Analyze and interpret experimental data in laboratory settings.
   d. Record and present experimental data in appropriate formats.
   e. Apply appropriate design concepts to electrical and computer systems.

2. Apply current technical information, circuit simulation software, and appropriate mathematics to identify, analyze, and solve technical problems associated with electrical and computer systems.
   a. Solve electrical circuits problems fundamental to electrical and computer systems.
   b. Demonstrate the application of appropriate software to solve technical problems.
   c. Demonstrate the application of mathematics in solving technical problems.

d. Solve technical problems given a set of specifications.
e. Solve open-ended technical problems.
f. Resource applicable technical information.

3. Apply project management fundamentals with a commitment to quality, timeliness and continuous improvement in electrical and computer systems design and development.
   a. Demonstrate fundamental project management techniques.
   b. Discuss the basic principles of quality assurance and continuous improvement.
   c. Demonstrate appropriate team skills.

4. Communicate technical information clearly and concisely.
   a. Present oral reports.
   b. Produce written technical reports.

5. Exhibit knowledge necessary for career advancement in engineering/technical professions.
   a. Discuss the need and nature of lifelong learning.
   b. Discuss professional, ethical and social issues related to the workplace.
   c. Recognize and describe several challenges when working in a diverse team environment.
   d. Describe several issues related to technology and society that are of a global nature.

The relationship of the POs to Criterion 3 and the PEOs is shown in Table 3-1.

- **Relationship of Program Outcomes to Program Educational Objectives**

The POs are related to the PEOs through the established performance criteria for each PO. An alumni survey with regard to the PEOs will include assessment of the extent to which the POs supported the achievement of the PEOs.

- **Relationship of Courses in the Curriculum to the Program Outcomes**

The relationship between the courses required for the ECET degree and the ECET program outcomes is summarized in Table 3-2.

- **Documentation**

Assessment Planning Matrices have been developed which relate POs and performance criteria to targeted courses as well as to Criterion 3. An example is shown below.

Program Outcome 1: Analyze and interpret experimental data and apply it in a practical manner in the design and development of electrical and computer systems.

Performance Criteria	Map a-k	Targeted Course	Assessment Activity	Assessment Method
1.a. Demonstrate proper use of laboratory equipment	a, c	ECET 242 TEL 345 ECET 479	Lab Perf. Exam Lab Experiment Equip. Use Demo.	Performance Exam Rubric Observation

Table 3-1. Program Objectives & Program Outcomes Mapped to ABET (a-k) (page 1 of 2)

Program Educational Objectives	Program Outcomes Performance Criteria	ABET Criterion 3 Outcome
1, 2	1a. Demonstrate proper use of laboratory equipment.	a
1, 2	1b. Build and test circuits and/or systems.	
1, 2	1e. Apply appropriate design concepts to electrical and computer systems.	
1, 2	2a. Solve electrical circuits problems fundamental to electrical and computer systems.	
1, 2	2b. Demonstrate the application of appropriate software to solve technical problems.	
1, 2	2c. Demonstrate the application of mathematics in solving technical problems.	
1, 2	2d. Solve technical problems given a set of specifications.	
1, 2, 3	2e. Solve open-ended technical problems.	
1, 2, 4	2f. Resource applicable technical information.	
2, 3	3a. Demonstrate fundamental project management techniques.	
2, 3	3b. Discuss the basic principles of quality assurance and continuous improvement.	
1, 2	1e. Apply appropriate design concepts to electrical and computer systems.	**b**
1, 2, 3	2e. Solve open-ended technical problems.	
1, 2, 4	2f. Resource applicable technical information.	
3, 4	5a. Discuss the need and nature of lifelong learning.	
1, 2	1a. Demonstrate proper use of laboratory equipment.	**c**
1, 2	1b. Build and test circuits and/or systems.	
1, 2	1c. Analyze and interpret experimental data in laboratory settings.	
1, 2	1d. Record and present experimental data in appropriate formats.	
2, 3	3b. Discuss the basic principles of quality assurance and continuous improvement.	
1, 2	1e. Apply appropriate design concepts to electrical and computer systems.	**d**
1, 2	2b. Demonstrate the application of appropriate software to solve technical problems.	
1, 2	2c. Demonstrate the application of mathematics in solving technical problems.	
1, 2, 3	2e. Solve open-ended technical problems.	
1, 2, 4	2f. Resource applicable technical information.	

Table 3-1. Program Objectives & Program Outcomes Mapped to ABET (a-k) (page 2 of 2)

Program Educational Objectives	Program Outcomes Performance Criteria	ABET Criterion 3 Outcome
2, 3	3a. Demonstrate fundamental project management techniques.	e
2, 3	3c. Demonstrate appropriate team skills.	
3, 4	5b. Discuss professional, ethical and social issues related to the workplace.	
3, 4	5c. Recognize and describe several challenges when working in a diverse team environment.	
1, 2	2a. Solve electrical circuits problems fundamental to electrical and computer systems.	f
1, 2	2b. Demonstrate the application of appropriate software to solve technical problems.	
1, 2	2c. Demonstrate the application of mathematics in solving technical problems.	
1, 2	2d. Solve technical problems given a set of specifications.	
1, 2, 3	2e. Solve open-ended technical problems.	
1, 2, 4	2f. Resource applicable technical information.	
1, 2	1d. Record and present experimental data in appropriate formats.	g
1, 3, 4	4a. Present oral reports.	
1, 3, 4	4b. Produce written technical reports.	
3, 4	5a. Discuss the need and nature of lifelong learning.	h
3, 4	5d. Describe several issues related to technology and society that are of a global nature.	
3, 4	5b. Discuss professional, ethical and social issues related to the workplace.	i
3, 4	5d. Describe several issues related to technology and society that are of a global nature.	
3, 4	5b. Discuss professional, ethical and social issues related to the workplace.	j
3, 4	5c. Recognize and describe several challenges when working in a diverse team environment.	
3, 4	5d. Describe several issues related to technology and society that are of a global nature.	
2, 3	3a. Demonstrate fundamental project management techniques.	k
2, 3	3b. Discuss the basic principles of quality assurance and continuous improvement.	
3, 4	5d. Describe several issues related to technology and society that are of a global nature.	

Table 3-2. Mapping the Curriculum to Program Outcomes

Semester	Course Number	Course Title	Program Outcomes				
			1	2	3	4	5
1st Semester (15 hours)	ENGL 101	Composition I ……				x	x
	Health & Wellness	Liberal Studies…….				x	x
	First Year Seminar	Liberal Studies ……				x	x
	Perspective	Liberal Studies ……				x	x
	Perspective	Liberal Studies ……				x	x
2nd Semester (16 hours)	ENGL 102	Composition II ……				x	x
	CMCH 201	Introduction to Speech Communication …….				x	x
	MATH 146	Precalculus…….. ……	x	x			
	Perspective	Liberal Studies ……				x	x
	Perspective	Liberal Studies ……				x	x
3rd Semester (17 hours)	ECET 231	Circuit Analysis I ……..	x	x		x	
	CS 140	Problem Solving & Programming ……..	x	x			
	PHY 130	Introductory Physics I ……	x	x		x	
	C5 Elective	CHEM 139 General Chemistry – Recommended ……..	x	x		x	
	Elective	Elective ……..	x	x			
4th Semester (17 hours)	ECET 290	Computer Engineering Fundamentals ……	x	x		x	
	ECET 242	Electronics Circuits ……	x	x	x	x	
	MATH 170	Statistics ……..	x	x			
	PHYS 131	Introductory Physics II ……..	x	x		x	
	Perspective	Liberal Studies ……				x	x
5th Semester (16 hours)	ECET 331	Digital Integrated Circuits ……..	x	x		x	
	ECET 321	Circuit Analysis II ……..	x	x		x	
	TEL 345	Introduction to LANs ……	x	x	x	x	
	MATH 153	Calculus I ……..	x	x			
6th Semester (17 hours)	ECET 332	Microcontrollers ……	x	x		x	
	ECET 341	Advanced Circuit Analysis ……..	x	x			
	TEL 312	Electronic Communication Fundamentals (Recommended)	x	x		x	
	MATH 255	Calculus II ……..	x	x			
7th Semester (17 hours)	ECET 431	Microprocessor Interfacing ……	x	x	x		
	ECET 452	Control Systems ……	x	x			
	ECT 478	Senior Project Proposal ……..	x	x	x	x	x
	Technical Elective	Technical Elective ……..	x	x		x	
	Technical Elective	Technical Elective ……..	x	x		x	
	Elective	Elective ……..					
8th Semester (16 hours)	ECET 461	Digital Signal Processing ……..	x	x	x	x	
	ECET 464	Instrumentation ……	x	x		x	
	ECET 479	Senior Project ……	x	x	x	x	x
	Technical Elective	Technical Elective ……..	x	x		x	
	Perspective	Liberal Studies ……..				x	x

- **Achievement of Program Outcomes**

The assessment cycle for program outcomes is a three year time period as shown in Table 3-3. Initial assessment data has been gathered for PO1 and PO4 and will be available at the time of the accreditation visit. Information will also be available as to strategies to compensate for weak student performance within these program outcomes.

Table 3-3. Time Lines for Assessment of Program Outcomes

Program Outcome	Academic Year					
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
PO1.	Five Performance Criteria			Five Performance Criteria		
PO4.	Two Performance Criteria			Two Performance Criteria		
PO2.		Six Performance Criteria			Six Performance Criteria	
PO3.		Three Performance Criteria			Three Performance Criteria	
PO5.			Four Performance Criteria			Four Performance Criteria

CRITERION 4. CONTINUOUS IMPROVEMENT

ABET definition: *Assessment is one or more processes that identify, collect, and prepare data to evaluate the achievement of program outcomes and program educational objectives.*

ABET definition: *Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program outcomes or program educational objectives are being achieved, and results in decisions and actions to improve the program.*

- **Assessment of Program Educational Objectives**

  Data collection to determine the level of achievement of the PEOs will be initiated in an alumni survey in Spring 2009. The timeline is displayed in Table 4-1.

Table 4-1. Time Line for Assessing Program Educational Objectives

Evaluation Activities	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Data Collection	**x**		**x**		**x**	
Data Evaluation	**x**		**x**		**x**	
Report Findings	**x**		**x**		**x**	
Initiate Action, if Necessary	**x**		**x**		**x**	
Review/Modify PEOs, if Necessary		**x**		**x**		**x**
Review/Modify Assessment Process		**x**		**x**		**x**
Summarize Evaluation Information	**x**	**x**	**x**	**x**	**x**	**x**

- **Evaluation of Program Educational Objectives**

  The ongoing process used to evaluate the level of achievement of the PEO's is summarized in Tables 2-2 and 4-1.

- **Assessment of Program Outcomes**

  The assessment data for each performance criteria within a program outcome will be collected on a master form as shown in Figure 4-1. This data will then be used to determine the level of the achievement of the program outcome.

- **Evaluation of Program Outcomes**

  The information gathered on the assessment results forms will be analyzed by the ECET faculty to determine to what extent any program outcome is achieved.

Figure 4-1. Sample Assessment Results Form

Assessment Results Form
(Sample)

Program Outcome 4: Communicate technical information clearly and concisely.

Performance Criteria	Course & Instructor	Assessment Activity	Assessment Method	Assessment Results
4.a. Present oral reports	Course #1		PO 4.a. Rubric	*From the data generated, indicate how many students were exceptional, proficient, marginal, or unsatisfactory.*
4.a. Present oral reports	Course #2		PO 4.a. Rubric	
4.a. Present oral reports	Course #3		PO 4.a. Rubric	

Program Outcome 4.a. Summary Statement of Assessment Results: The statements below will combine the assessment results for PO 4.a.

Course #1:

Course #2:

Course #3:

- **Continuous Improvement of the Program**

The ECET Assessment Plan was placed into operation Fall 2007. The first year cycle did generate certain initial results that will be reviewed by faculty prior to the start of the Fall 2008 term to determine instructional strategies to cope with weaknesses in certain performance criteria.

CRITERION 5. CURRICULUM

- **Program Curriculum**

A diagram of all the courses in the ECET program is shown in Table 5 – 1. The credit hours required for the BS ECET degree are divided into 4 areas: 1) communications, 2) math & sciences, 3) technical content, and 4) social sciences & humanities. The percentage of the total 128 credit hours are distributed as 7 % in communications, 23 % in math & sciences, 47 % in technical content, 16 % in social sciences & humanities, and 7 % allocated to electives and the first year seminar.

The university requires a first year seminar course for all freshmen. This is a course of the students choosing. It is intended to introduce the student to their major, however students are free to choose any of the first year seminar courses. If an ECET student chooses ENGR 199 or ET 190, then the credit hour distribution will be changed to 7 % in communications, 23 % in math & sciences, 49 % in technical content, 16 % in social sciences & humanities, and 5 % allocated to electives.

ECET students must satisfy the following minimum requirements:

1. Complete a minimum of 128 semester hours for the bachelor's degree, excluding deficiency courses and remedial work. The 128 hours is distributed as follows:

   English (6 credit hours)
   Oral Communication (3 credit hours)
   Health / Wellness (3 credit hours)
   First Year Seminar (3 credit hours)
   Humanities and Social Science Electives (18 credit hours)
   General Science Elective (3 credit hours)
   General Electives (6 credit hours)
   Mathematics (15 credit hours, including a 3-hour course in statistics)

Physics (8 credit hours)

Computer Science – C Programming (3 credit hours)

Technical electives (7 credit hours)

Program technical courses (53 credit hours): ECET 231, 242, 290, 321, 331, 332, 341, 431, 452, 461, 464, 478, 479, TEL 312 and 345.

2. The social science and humanities electives must include one course at a 300 or 400 level and be chosen to satisfy the University's Liberal Studies Requirements. The science elective must be chosen from physical, life, or earth sciences and must complement the student's overall education plan. The technical electives are chosen by students in consultation with their academic advisors. Students can use these electives to obtain breadth within electrical and computer engineering technology, significant depth in a particular area of electrical and computer engineering technology, and also to prepare for graduate work in electrical and computer engineering technology. The technical electives must contain course work dealing with engineering science, analysis, synthesis and design.
3. Students must earn an overall average of 2.0 grade points including hours passed or failed. If a student is deficient in grade points, he or she must take additional courses that have been approved by his or her academic advisor to secure these points. The students, however, must also obtain an average of 2.0 or more in his or her major field. Deficient GPA in the major must be made up by taking courses in electrical and computer engineering technology.
4. Students must complete the last 30 credit hours as a student in residence at the University.
5. Students must clear all academic conditions by the end of the semester preceding graduation.

ECET students gain experience through coursework, research opportunities, and participation in professional organizations that prepare them for a professional career and further study in the ECET field. Many of the courses have a design aspect that pushes students to use what they have learn to solve an engineering problem. The courses ECET 478 Senior Project Proposal and ECET 479 Senior Design Project require all students to devise an engineering problem and solve it. Working in teams is

encouraged in these courses. Many of these projects have been carried out to fulfill a current need of a company, an organization, or a government agency. Collaborators in the past include: The Ridell Institute, the organization Watershed Area of the Tuckaseegee River, ArvinMeritor, ConMet, and the US Department of Education GEAR UP Program.

Research opportunities are made available to ECET students who demonstrate an interest and ability for research. These students are typically teamed with M.S. Technology graduate students and they typically perform the research in association with the courses ECET 478 and ECET 479. In the past, ECET students have presented the results of their research at the National Conference for Undergraduate Research and the WCU Graduate Research Symposium.

Criterion 5 requires that "Baccalaureate programs must consist of a minimum of 124 semester hours or 186 quarter hours of credit." The ECET program requires 128 credit hours.

Many courses in the ECET program provide learning experiences which develop technical and non-technical skills in problem solving. The courses ECET 478 Senior Project Proposal and ECET 479 Senior Design Project teach project management skills. Student enrolled in these classes must develop a timeline and a budget for the completion of the senior design project. These two courses along with several others teach interpersonal skills. Students are encouraged to ask for help when they hit a roadblock. Students are taught the importance of getting along with team members and how to be a responsible team member.

The development of technical and non-technical skills in problem solving begins in the courses ECET 231 Circuit Analysis I, ECET 321 Circuit Analysis II, ECET 242 Electronic Circuits, and ECET 331 Digital Electronics. These four courses have a 2-hour lecture class, a 2-hour recitation and a 2-hour laboratory. In the two hour recitation class, students work on problems assigned by the instructor. Students are encouraged to work in groups. Students who possess strong technical skills often end

up teaching the less-equipped students. This process develops camaraderie and trust among students.

Adequate time and attention are given to each curricular component, consistent with the objectives of the program and the institution with the use of repetition and overlap of topics between courses. In order to meet the objectives of the program and of the institution, a typical student must be exposed to the desired learning objective many times throughout the curriculum. For this reason, the ECET curriculum has considerable course overlap. For example, the course ECET 231 is a prerequisite for ECET 242 Electronic Circuits and ECET 321 Circuit Analysis II, among others. From the student's perspective, certain fundamentals topics of electric circuit analysis are reviewed and applied in a new way, throughout the course sequence of ECET 242 and ECET 231. Course overlap is applied again with Fourier Analysis introduced in TEL 312 and applied further in ECET 462 and with Laplace Transform Methods introduced in ECET 341 and applied further in ECET 452. The courses ECET 331 Digital Electronics, ECET 242 Electronic Circuits, and ECET 290 Computer Engineering Fundamentals introduce the skills of analog and digital electronics and computer software and hardware. These three courses provide the background needed for a three course sequence in embedded programming, interfacing, and sensors : ECET 332 Microcontrollers, ECET 431 Microprocessor Interfacing, and ECET 464 Instrumentation. In each of these three courses, some of the fundamentals learned in ECET 331, 242, and 290 is reviewed and applied to new topics

Students have the option of a co-op course as an approved elective. The course ET-389 is listed as a co-op course, but meets the general definition of an internship (short term work experience). The goal of the course is provide a real-world experience for the student in an engineering technology environment. The co-op experience is not integrated into any particular technical content course. Students are required to write a paper detailing their experience and provide evidence of hours worked. The co-op site is visited by a program faculty member and an evaluation is written by the faculty member and the work supervisor.

Course material from all technical content courses will be available for review. This material will be organized into course folders in electronic form. These course folders will contain material for courses taught in Fall 2007 and Spring 2008. Syllabi and samples of student work for each assignment and examination will be included. Additional course materials and graded student work too bulky to scan electronically will be assembled in paper form in course binders.

Current textbooks will also be available.

- **Prerequisite Flow Chart**

  A suggested course plan for the ECET program is provided in Table 5 – 3. The red and blue arrows designate prerequisite and corequisite courses, respectively. One will notice that the course ECET 231 Circuit Analysis I is a prerequisite for three other ECET courses. For this reason, ECET 231 is considered the gateway course to the ECET program.

- **Course Syllabi**

  Course syllabi for courses in the ECET program are attached in Appendix A.

Table 5-1 ECET Curriculum

Semester Number	Course (Department, Number, Title)	Credit Hours				
		Communica-tions	Math & Sciences	Technical Content	Social Sciences & Humanities	Other
1	First Year Seminar*					3
1	Wellness				3	
1	English 101 Composition I	3				
1	Perspective				3	
1	Perspective				3	
2	English 102 Composition II	3				
2	CMCH 201 Communications	3				
2	Math 146 Precalculus		4			
2	Perspective				3	
2	Perspective				3	
3	CS 140 Problem Solving and Programming		3			
3	ECET 231 Circuit Analysis I			4		
3	PHYS 130 Physics I		4			
3	Perspective				3	
3	C5 Science		3			
4	ECET 242 Electronic Circuits			4		
4	ECET 290 Computer Engineering Fund.			3		
4	MATH 170 Statistics		3			
4	PHYS 131 Physics II		4			
4	Perspective				3	
5	ECET 321 Circuit Analysis II			4		
5	ECET 331 Digital Integrated Circuits			4		
5	MATH 153 Calculus I		4			
5	TEL 345 Local Area Networks			4		
6	ECET 332 Microcontrollers			4		
6	ECET 341 Advanced Circuit Analysis			3		
6	MATH 255 Calculus II		4			
6	TEL 312 Electronic Communications			4		
7	ECET 431 Microprocessor Interfacing			4		
7	ECET 452 Control Systems			4		
7	ECET 478 Senior Design Proposal			1		
7	Technical Elective			4		
7	Elective					3
8	ECET 461 Digital Signal Processing			3		
8	ECET 464 Instrumentation			4		
8	ECET 479 Senior Design Project			3		
8	Technical Elective			3		
8	Elective					3
TOTALS		9	29	60	21	9
Total Credit Hours Required for Completion of the Program			128			

Table 5-2. Course and Section Size Summary of the ECET Program

Course No.	Title	Responsible Faculty Member	No. of Sections Offered in 2007 - 8	Avg. Section Enrollment	Lecture	Laboratory	Recitation
ECET 231	Circuit Analysis I	Yanik	1	24	33%	33%	33%
ECET 242	Electronic Circuits	Yanik	1	17	33%	33%	33%
ECET 290	Computer Engineering Fundamentals	Tay	1	15	50%	50%	0%
ECET 321	Circuit Analysis II	Howell	1	18	33%	33%	33%
ECET 331	Digital Integrated Circuits	Yanik	1	15	33%	33%	33%
ECET 332	Microcontrollers	Tay	1	19	60%	40%	0%
ECET 341	Advanced Circuit Analysis	Yanik	1	17	100%	0%	0%
ECET 431	Microprocessor Interfacing	Howell	1	10	60%	40%	0%
ECET 452	Control Systems	Tay	1	11	60%	40%	0%
ECET 478	Senior Design Proposal	Howell	1	12	100%	0%	0%
ECET 461	Digital Signal Processing	Tay	1	11	50%	50%	0%
ECET 464	Instrumentation	Howell	1	10	60%	40%	0%
ECET 479	Senior Design Project	Adams / Howell	2	6	20%	80%	0%
TEL 312	Electronic Communication Fundamentals	Adams	1	17	60%	40%	0%
TEL 345	Local Area Networks	Heggen	1	20	60%	40%	0%

The enrollment figures are the actual section enrollments during the 2007-8 academic year.

Table 5-3 Prerequisite and Co-requisite Flow Chart of the Electrical and Computer Engineering Technology Program

→ = Prerequisite → = Corequisite

Freshman Year

Fall Semester	Hours	Spring Semester	Hours
C1 ENGL 101 Composition I	3	C1 ENGL 102 Composition II	3
C4 Wellness	3	C3 CMHC 201 Speech Communication	3
First Year Seminar	3	C2 MATH 146 Precalculus	4
Perspective	3	Perspective	3
Perspective	3	Perspective	3
	15		**16**

Sophomore Year

Fall Semester	Hours	Spring Semester	Hours
CS 140 Problem Solving and Programming	3	ECET 242 Electronic Circuits	4
ECET 231 Circuit Analysis I	4	ECET 290 Computer Engineering Fund.	3
PHYS 130 Physics I	4	MATH 170 Statistics	3
Perspective	3	PHYS 131 Physics II	4
C5 Science	3	General Elective	3
	17		**17**

Junior Year

Fall Semester	Hours	Spring Semester	Hours
ECET 321 Circuit Analysis II	4	ECET 332 Microcontrollers	4
ECET 331 Digital Integrated Circuits	4	ECET 341 Advanced Circuit Analysis	3
MATH 153 Calculus I	4	MATH 255 Calculus II	4
TEL 345 Local Area Networks	4	TEL 312 Electronic Communications	4
	16		**15**

Senior Year

Fall Semester	Hours	Spring Semester	Hours
ECET 431 Microprocessor Interfacing	4	ECET 461 Digital Signal Processing	3
ECET 452 Control Systems	4	ECET 464 Instrumentation	4
ECET 478 Senior Design Proposal	1	ECET 479 Senior Design Project	3
Technical Elective	4	Technical Elective	3
Upper Level Perspective	3	General Elective	3
	16		**16**

Senior standing and instructor permission

Total Program requires **128 hours.** Liberal Studies **42 hours.** Major Requirements **89 hours.**

> C5 Science must be other than Physics to meet Liberal Studies requirement of two different sciences. CHEM 132 is recommended.

> ECET and TEL courses are offered once per year, in the semester shown above.

> Technical electives from ECET, ET, TEL, or CS. Must be at 300-400 level.

> One Perspective course must be at the 300-400 level.

> To enroll in the junior-senior major courses, students must have completed the following courses with a "C" or better: ECET 231, 321 and MATH 153.

CRITERION 6. FACULTY

- **Faculty**

  Courses in the ECET program are taught at Western Carolina University by three tenure-track professors and two non-tenure track professors. Table 6-2 provides an analysis of credentials of the faculty teaching in the ECET program. The level of professional activity is indicated as 'E' for excellent and 'S' for satisfactory and reflects an average over the current year plus the two previous years. Table 6-1a summarizes the faculty workload and Table 6-1b provides the faculty schedules for the Fall 2007 and Spring 2007 semesters.

- **Faculty Competencies**

  The curriculum of the ECET program covers basic electric circuit theory, computer engineering fundamentals, embedded C programming, microprocessors, microcontrollers, computer networks, linear control theory, electronic communications, and digital signal processing. Dr. Adams has an educational background in digital signal processing and industrial experience in automated computer testing of RF equipment, and electronic circuit design. For these reasons, Dr. Adams is suitable for teaching courses in electric circuit theory, analog electronics, C programming, and linear control theory, electronic communications, and digital signal processing. Professor Heggen has an educational background in telecommunications engineering technology. Hence Professor Heggen is suitable for teaching courses in computer networks and electronic communications. Dr. Howell has extensive research and industrial experience in the design of microcontroller-based instrumentation. For this reason, Dr. Howell is more than suitable for teaching courses in C programming, microcontrollers, microprocessor interfacing and instrumentation, as well as electric circuit theory. Dr. Howell also has research and industrial experience in the development and application of neural networks to instrumentation. For this reason, he is suitable for teaching wireless sensor networks. Dr. Tay has a strong educational background in mathematics, electrical engineering, computer engineering and digital signal processing and industrial experience in digital signal processing and software design. For this reason, he is suitable for teaching courses

in control theory, digital signal processing, C/C++ programming, computer engineering fundamentals, and microcontrollers. Professor Yanik has a strong educational background in communications theory, digital design, and control theory. Professor Yanik has 15 years of industrial experience in hardware design in broadband communications. He has extensive industrial experience in the design of digital electronics. For these reasons he is more than suitable to teach courses in electric circuit theory, analog and digital electronics, electronic communications, and control theory.

- **Faculty Size**

  The number of the ECET faculty is adequate to teach all the required courses and to accommodate the needs of approximately 65 ECET students. The average size of classes taught by ECET faculty is 15 students. All ECET faculty have a reasonable number of advisees and are able to contribute to departmental and university services needs. All ECET faculty are able to develop professionally.

- **Authority and Responsibility of Faculty**

  All ECET faculty play a significant role defining, revising, and implementing the program educational objectives. Periodically joint meetings are held with the ECET faculty, EE faculty, the Engineering & Technology Department Head and the Engineering & Technology Assessment Officer. During these meetings PEO's may be discussed as necessary. Any program changes that are agreed upon will go through an approval process involving the Kimmel School Dean and a university committee.

  All faculty have input to any suggested changes and are free to offer their own suggested changes to the PEO's. During these meetings one of the main goals is to discuss the responsibilities of individual faculty in assessing program outcomes. These faculty responsibilities help assure consistency and quality of the ECET courses. Course outcomes have been established for each course in the ECET program. It is the responsibility of the individual faculty member to assure that these outcomes are achieved. One way that this is accomplished is with the use of assessment methods. Each faculty rates the accomplishments of student performance for a given set of criteria

at the end of each semester. The ECET program has developed a 0.0 to 4.0 system for rating student performance. This rating system is based on rubrics for each criteria. The ratings of outcomes from these assessment practices provide a gauge of the strengths and weaknesses of our students. ECET faculty discuss the outcomes from these assessment practices and provide suggestions concerning what changes can be made to help improve student performance.

- **Faculty Development**

The professional development and activities of ECET faculty are listed on their resumes and on the Kimmel School web site, http://et.wcu.edu/. They also serve on numerous program committees, chair, and organize many sessions of technical conferences. The majority of them are active members of Professional Societies such as IEEE, ASEE, etc.

- **Leadership Responsibilities**

The Dean of the Kimmel School has administrative responsibility for programs in the school. The Department Head of the Engineering and Technology is responsible budget and personnel issues in the engineering and engineering technology programs. The Program Director for Engineering Technology has academic responsibility for the Engineering Technology program.

Academic program directors are faculty members who have been assigned responsibility for the coordination and oversight of a degree program. Although the department head and dean may identify a variety of responsibilities for program directors, typical responsibilities include:

Program Leadership **-** The program director is responsible for providing overall leadership for the program and its faculty, which may include: conducting periodic meetings of faculty to discuss programmatic and departmental issues; ensuring the flow of critical information between the department or school/college and all program faculties; and soliciting and submitting program budget requests to the department head.

Curriculum Oversight **-** The program director is responsible for all modifications to the curriculum, which may include: submission of course/program modification forms such

as AA-4's and AA-5's; course sequencing and scheduling; and development and maintenance of the program's curriculum guide.

Faculty recruitment, load, and, when appropriate, evaluation - The program director, in concert with the department head, is responsible for management of the program faculty, which may include: certifying and maintaining documentation related to faculty credentials; assigning courses, in concert with the department head, to achieve workload balance and to ensure adequate coverage for course offerings; conducting faculty searches; and when appropriate, providing feedback for tenure/promotion/rank decisions to department heads.

Program Planning & Evaluation - The program director is responsible for all program planning and evaluation activities, which may include: coordinating program goals and strategies from the departmental strategic plan; assessment of student learning outcomes including submission of the 5-year Program Assessment Plan and the annual Assessment Report; oversight of periodic program review including development and submission of the Program Portfolio and

Job descriptions for the deans and department heads may be found in Section 1.3 of the Faculty Handbook.

Table 6-1a. Faculty Workload Summary for the Academic Year 2007 - 2008

	Range	Average
Credit Hours	7 to 12	9.9
Contact Hours Per Week	10 to 18	14.1
Laboratory Size[1]	5 to 16	11.0
Class Size[1]	5 to 25	14.8
Advisees[2]	1 to 36	13.8

[1]Source: On-Line Class Schedule Search, https://banssb4.wcu.edu:9000/PROD/bwckschd.p_disp_dyn_sched
[2]Source: Banner, http://bannerportal/sites/Banner/default.aspx

Table 6-1b. Faculty Workload Summary for the ECET Program

Faculty Member	Full or Part Time	Classes Taught (Course No./Credit Hrs.)						Total Activity Distribution[2]		
		Fall 2007			Spring 2008			Teaching	Consulting	Other[3]
		Course	Credit hours	Contact hours	Course	Credit hours	Contact hours			
Robert Adams	FT	ECET 479-70	3	1	ECET 479-72	3	1	67 %	0 %	33 % (administrative)
		ECET 479-71	0	4	ECET 479-76	0	4			
		EE 341-01	2	3	TEL 312-01	4	3			
		TEL 444-01	4	3	TEL 312-30	0	2			
		TEL 444-30	0	2						
Scott Heggen	FT	ECET 301-70	3	2	ECET 211-02	3	2	100 %	0 %	0 %
		ECET 301-75	0	2	ECET 211-32	0	2			
		ECET 301-76	0	2	EE 312-70	1	3			
		TEL 345-01	4	3	TEL 346-01	4	3			
		TEL 345-30	0	2	TEL 346-70	0	2			
		TEL 345-31	0	2	TEL 446-01	3	2			
		TEL 445-01	3	2	TEL 446-70	0	2			
		TEL 445-75	0	2						
Brian Howell	FT	ECET 321-01	4	2	ECET 464-01	4	3	100 %	0 %	0 %
		ECET 321-25	0	2	ECET 464-30	0	2			
		ECET 321-30	0	2	ECET 479-70	3	1			
		ECET 431-01	4	3	ECET 479-75	0	4			
		ECET 431-75	0	2	TEL 495-01	3	3			
		ECET 478-01	1	1						
Peter Tay	FT	ECET 452-01	4	3	ECET 290-01	3	2	100 %	0 %	0 %
		ECET 452-75	0	2	ECET 290-30	0	2			
		EE 200-70	3	3	ECET 332-01	4	3			
		ET 644-70	3	3	ECET 332-75	0	2			
					ECET 461-01	3	2			
					ECET 461-30	0	2			
					EE 222-01	2	3			
Paul Yanik	FT	ECET 231-01	4	2	ET 472-01	3	2	100 %	0 %	0 %
		ECET 231-25	0	2	ET 472-30	0	2			
		ECET 231-30	0	2	ECET 242-01	4	2			
		ECET 331-01	4	2	ECET 242-25	0	2			
		ECET 331-25	0	2	ECET 242-30	0	2			
		ECET 331-30	0	2	ECET 242-75	0	2			
		ECET 331-75	0	2	ECET 341-01	3	3			
		ENGR 199-70	3	2						
		ENGR 199-75	0	2						

FT = Full Time Faculty PT = Part Time Faculty

Table 6-2. ECET Faculty Analysis, Academic Year 2007 - 2008

Name	Rank	Type of Academic Appointment	FT or PT	Degrees	Institution from which Degrees Earned & Year	Years of Experience			Professional Registration/ Certification	Level of Activity (high, med, low, none) in:		
						Govt./Industry Practice	Teaching	This Institution		Professional Society	Professional Development	Work in Industry
Robert Adams	AP	TT	FT	BSEE MSEE PhD, EE	Clarkson University, 1993 Johns Hopkins U., 1991 U. of AL, Huntsville, 2004	10	10	5		E	E	E
Scott Heggen	I	NTT	FT	B.S. Telecomm. Eng. Tech. M.S. Technology	WCU, 2005 WCU, 2006	0	2	2		NA	NA	NA
Brian Howell	AP	TT	FT	BA, Physics MEEE PhD, Ocean Eng.	Bridgewater College, 1978 U of Virginia, 1981 Florida Institute of Technology, 2004	21	6	4		E	E	E
Peter Tay	VAP	NTT	FT	B.S. Math M.A. Math PhD., ECE	U. of Oklahoma, 1990 U. of Oklahoma, 1995 U. of Oklahoma, 2003	4	1	1		NA	NA	NA
Paul Yanik	VAP	NTT	FT	BSEE MSEE	NC State University, 1989 NC State University, 1995	14	3	3		NA	NA	NA

Column 2 Code: AP = Assistant Professor VAP = Visiting Assistant Professor I = Instructor
Column 3 Code: TT = Tenure Track T = Tenured NTT = Non Tenure Track
Column 4 Code: FT = Full Time Faculty PT = Part Time Faculty
Level of Activity Code: E = Exceptional S = Satisfactory

CRITERION 7. FACILITIES

- **ECET Laboratory Overview**

ECET lectures and labs are held in the Belk Building and the Center for Applied Technology (CAT). The Engineering and Technology Department supports five laboratories for undergraduate ECET instruction. These include the Analog Electronics lab, the Digital Electronics lab, the Telecommunications lab, The Digital Logic and Communications Lab, and the Embedded Computer Engineering Sensor Laboratory. Each of these labs is equipped with a digital overhead projector and screen for classroom instruction. A Senior Project Lab is available for the ECET Senior Design Project. A student study room equipped with high quality office furniture, five internet-enabled desktops, a printer, a scanner, and an extensive library of EE/ECET textbooks is available for Engineering and Technology students during regular business hours.

The laboratory equipment and software available to ECET students is state-of –the-art and is typical of what one would find in fully equipped modern electronic and RF labs in industry. The equipment and software is adequate to support the program educational objectives. The laboratory classrooms are extremely conductive to learning. The lab benches and the table tops are all the same height. The student can face forward in his chair and listen to the lecture, then later rotate the chair around to work at a lab bench. While listening to a lecture the student can use one of the university-provided laptops. The instructor can show students how to use engineering software via a digital projector. The laboratory classrooms are wirelessly connected. If the instructor wants to show students something on the internet, both student and teacher can view the same site simultaneously; the instructor via his laptop and the digital projector and the student via a laptop.

- **Changes since previous accreditation cycle in 2006**

The primary change in the facilities available for ECET students is the construction of the student study room. At the time of the previous accreditation cycle, there was a basic student room with several computers. In the time interval since then, an old storage room was completely refurbished to accommodate the new student study room. The old study room was converted into an office for M.S. Technology students.

Another major change is the addition of communications test equipment. Eight Agilent spectrum analyzers capable of measuring power up to 6 GHz and eight Agilent 1 GHz 4-channel oscilloscopes have been added to the Digital Logic and Communications Lab. The addition of this equipment greatly enhances the capabilities for radio frequency design and testing as well as instruction in the methods of RF testing and design. Eight Agilent 100 MHz 2-channel oscilloscopes were moved from the Digital Logic and Communications Lab to the Embedded Computer Engineering Sensor Laboratory.

Another change is the addition of SumoBots for classroom use. The SumoBot is a robot that is controlled by a microcontroller. They were used in the course ECET 332 Microcontrollers during Spring 2008 as part of a course project and competition.

- **Description of the ECET Laboratories**

In the Digital Logic and Communications Lab, students learn basic communication theories and system testing methods. Students also learn to design and construct digital circuits using breadboard circuit stations and digital integrated circuits. They also learn methods of programming CPLD's and FPGA's using the Altera UP2 programmable logic board. Test equipment available in this lab for student use includes Agilent mixed signal oscilloscopes, digital multimeters, power supplies and function generators, as well as Mini-Circuits 900 MHz communication system components.

The Analog Electronics Lab is used for classroom instruction and experimentation in four ECET courses covering electric circuits, analog electronics and fabrication. Skills developed in this lab provide a solid foundation for further study in electrical and computer engineering technology. The skills developed in this lab include 1) Pspice simulation of electric and electronic circuits, 2) proficiency in the use of electronic test equipment, 3) soldering, 4) printed circuit layout using Eagle software, 5) printed circuit fabrication using OrCAD, and 6) analysis, design, and testing of DC and AC circuits, power supplies, transistor switches, transistor logic gates, transistor amplifiers, and operational amplifiers.

In the Telecommunications Lab, students study networking theory and practice with contemporary CISCO systems. The lab is equipped with 24 Dell desktops and a Dell server.

Instructors typically use the lab to create a corporate scenario of a local network. Student teams are given specific challenges to administrate a network created within the lab.

The Digital Electronics Lab is used for classroom instruction and experimentation in five ECET courses covering microcontrollers, microprocessor interfacing, instrumentation, control systems and digital signal processing. Skills learned in this lab include the design and testing of microcontroller circuits for use in applications such as robotics and sensor networks. For these applications, students use the MC68HC11 and the PIC16F877 microcontrollers. Students also learn about DC motor control using LabVIEW and the Quanser motor controller. In this lab, students learn about the design and testing of Digital Signal Processing applications using the Texas Instruments C6416 DSP starter kit. Test equipment available in this lab for student use includes Agilent mixed signal oscilloscopes, digital multimeters, power supplies and function generators.

The Embedded Computer Engineering Sensor Lab is used for classroom instruction and experimentation involved with embedded microprocessors, sensors, and sensor networks. The lab is equipped with Agilent mixed signal oscilloscopes, digital multimeters, power supplies and function generators and Apple and Dell desktop computers.

ECET students use the Senior Project Lab to complete requirements in the capstone design projects course. Projects typically require printed circuit board layout, cutting, and component insertion.

- **Major Instructional and Laboratory Equipment**

Twenty four Dell laptops on a mobile cart are available for Engineering and Technology classroom use. These laptops are commonly used to help students become skilled with the use of engineering software. Software that is available for ECET classroom use is MATLAB, LabVIEW, Quartus, OrCAD Pspice, Eagle, and COMSOL.

A list of all instructional and laboratory equipment available for ECET student and faculty use is provided in Appendix C.

CRITERION 8. SUPPORT

- **Program Budget Process and Sources of Financial Support**

  The budget for WCU from the State of North Carolina is provided in two pools: the continuing budget and the enrollment growth allocation. For a growing institution like WCU, the enrollment growth funds are a significant portion of the budget and provide support for the expanding student body. The college receives its allocation from Academic Affairs based on enrollment, student fee generation (fees are highest for engineering technology students), and a differential tied to the matrix developed by the UNC System whereby high cost programs like engineering technology receive greater funding than other relatively lower cost programs. Resources are provided from Academic Affairs in four principal ways: (1) faculty position allocation (from enrollment growth), (2) operating budget (continuing budget + enrollment growth), (3) student fees and (4) yearly one-time equipment allocations.

  Each spring all departments develop their proposed budgets for the next fiscal year, including faculty requests, staff requests, academic equipment requests, and operational budget requests. The departmental proposals are reviewed and consolidated at the College/School level, and sent on to the Provost. The Provost reviews and consolidates based on his allocation from the Chancellor (and the state). Further negotiation is discussed at the Dean's Council Meetings, and a final budget is typically ready in August. Allocations are based on past performance and identified needs as reported by the Deans and Department Heads, and by university-wide initiatives.

  To supplement operating funds and student fees each year, Academic Affairs sends a request for one-time equipment needs to the colleges. The Dean directs each department to submit their request in priority order with justification. The Dean compiles the list and ranks college priorities based on the justification and strategic plan. These funds primarily support educational laboratory equipment, but also provide research equipment in strategic areas.

- **Sources of Financial Support**

  Table 8-1 summarizes the financial support for the Department and Table 8-2 is the data for the program.

Table 8-1. Sources of financial support for the Department of Engineering and Technology

Financial Support Category	Academic Year			
	2005-06	2006-07	2007-08	Budgeted 2008-09
Faculty / Staff Salary	13.5 / 1.5	13.5 / 1.5	17 / 1.5	18 / 2.5
Operational	50,927	82,137	56,000	60,000
Student Fees		27,369	26, 840	27,000
Grants and gifts	$592,000	280,129	937,526	50,000
One-time support			15,000	0
Dean's Office	n/a	n/a	5,600	2,000

Table 8-2. Sources of financial support for the Electrical and Computer Engineering Technology Program

Financial Support Category	Academic Year			
	2005-06	2006-07	2007-08	Budgeted 2008-09
Faculty / Staff Salary	4 / .5	4 / .5	5 / .5	5 / .5
Operational		10,827	6,500	9,200
Student Fees		6,774	3,139	11,250
Grants and gifts		7,634	7,455	0
One-time support			5,000	0
Dean's Office	n/a	n/a	1,000	1,000

At Western, the salaries for faculty and staff are maintained and monitored in the Provost's Office, not in the Departments. The numbers in the two tables above indicate the number of full time faculty and staff, not the total salaries. Salary for on-campus adjuncts and part time faculty also come from the Provosts Office.

The total amount of money given to the programs in the Kimmel School has remained constant throughout the college re-organization, but the names on the accounts have been in flux. The Kimmel School was created in the summer of 2006, and the Department of Engineering and Technology was created in the spring of 2007. This past year is the first full year with the Departmental funds separated from the Kimmel School accounts and with Banner accessibility. Separate account numbers were generated for each program to help track expenses but most of the activity is "after the fact", in that only after the money was

spent was it placed into the correct account. The main departmental account is also used for faculty development and travel expenses. The Dean also contributed equipment money from his portion of the total allocated to the Kimmel School.

There is a Student Technology Fee of $75/semester for all (on-campus) students in the Kimmel School. This is given to the Dean and allocated according to the census numbers each semester. Within the Department the amount is roughly split by census numbers, but there is more flexibility for one time expenses, such as repairs or large purchases. This money is strictly for student related expenses such as lab supplies, computer supplies, and student lab assistants.

The Department of Engineering and Technology has received three large grants over the past seven years (DARPA, $4,725,000; SBA 887,979 and $987,228). These monies have been used for renovations and lab equipment. Much of the total has been spent on equipment that is used both in the instructional laboratories and the center for Rapid Product Realization. The goals have been to increase our regional engagement capabilities, to enhance our engineering technology programs, and to start engineering programs. The amounts shown allocated to individual programs are somewhat arbitrary, as many of the labs are used by all programs.

Each year as the fiscal year ends, the Provosts Office rolls-up unspent monies and provides one time support for academic equipment and software. In the past, requisitions were sent to the Provosts Office and the purchasing and invoicing was handled by that office and no accounting was done in the Department. Consequently it is difficult to know how much was allocated in the past. This year the policy changed and the $30,000 was given to the Kimmel School and was spent on a priority list of equipment.

- **Adequacy of Budget**

Our salaries are competitive with our regional peers and allow us to recruit and retain excellent faculty. Since we are a state institution, raises are primarily determined by the state legislature. For the past several years, raises for staff have been a fixed percentage across the board, while faculty raises have include a fixed cost-of-living increase and merit

percentages. The University uses a small portion of the merit monies to handle wage compression and other inequities. The Provosts Office typically allocates $1000 per position for faculty searches. In the past, this was done completely in the Provosts Office, but is now done at the school level. The department received $2000 this year for faculty recruitment.

The total amount of money given to the programs in the Kimmel School has remained constant throughout the college re-organization and implementation of Banner. It has been difficult to track the accounts, as the people, account numbers, and organizational units have all changed. However, from a user perspective, there have been no issues with lab supplies, repairs, office equipment, travel, or professional development expenses. As the Provost and new Dean implement their plans for fiscal management, it will be easier to track these various categories for each program.

The large grants that have been used to enhance the programs' capabilities will end in September 2008. At this time there is sufficient operating money to keep this equipment running under warranty. The challenge will be to fund the next round of updates.

- **Support of Faculty Professional Development**

  On campus, the University supports the Coulter Faculty Center for Excellence in Teaching and Learning, which provides support for teaching and learning, teaching with technology, and faculty research. This Center is widely used by faculty, and provides year-round training in all aspects of teaching, from syllabi to on-line pedagogy. (http://facctr.wcu.edu/index.htm)

  The University administration supports the Chancellor's Travel Fund and the Scholarly Development Assignment Program (sabbatical). Both of these funds encourage and strengthen faculty scholarship. Three of the Department faculty received Chancellor Travel Awards of $1000 during this past year.

  The Office of Research Administration (http://www.wcu.edu/6779.asp) is available to assist faculty with grant proposals. Within the Kimmel School, the Rapid Center is another resource to gain support for both research and engagement related projects. Collaboration across campus and with other campuses is strongly encouraged.

As shown in Table D-3 in Appendix D, the Department provided more than $10,000 in travel and conference fees this year. This does not include the Chancellors Travel Funds or other award money from individual faculty. Typically, the unit provides travel only when a paper is being presented, or if the topic is of strategic importance to the unit. For instance, seven (out of 14 tenure track) faculty attended ASEE meetings this year, another five attended professional society national meetings, and others attended ETLI and ABET meetings. No one that has a paper accepted at a national conference has been denied travel in at least the last seven years.

- **Adequacy of Equipment**

  As can be seen in Table 8 – 1, the department has been able to utilize several large grants to acquire outstanding equipment for the undergraduate instructional labs and the laboratories used for engagement through the Rapid Center. More than $5M has been spent on renovations and equipment for this department over the past seven years.

  Service contracts on software and hardware run about $67,000 per year and are currently being paid in the Provosts Office.

- **Adequacy of Support Personnel and Institutional Services**

  The Department of Engineering and Technology, being recently created, shares some staff resources with the Kimmel School. At this time, the Department has one full time staff engineer supporting the ECET and the EE programs. Another staff engineer supports the ET program and the Construction Management program. A third full time person maintains the computer and networking infrastructure for the entire Kimmel School. The main office of the Kimmel School has two administrative support specialists that also are assisting the Department until a separate position is created for this unit.

  The three staff engineers provide excellent support in the laboratories, and maintain our parts inventories, do the purchasing, and coordinate any repair work for the labs and offices. Additional engineering help is needed as our regional engagement grows. Secretarial help for this department is needed and is being addressed by the Dean.

Institutional support includes support programs for ET students and faculty, as well as budget allocations. The principal institutional support units include the following:

Hunter Library
Writing Resource Center
University Learning Center
University Career Center
Office of International Programs (OIP)
University Office for Research Services & Proposal Development
Office for Institutional Research
University Faculty Development Programs.

These are further described in Appendix D

- **Program Advisement**

The ECET Industrial Advisory Committee consists of ECET faculty members and 8 practicing engineers from industry and academia and 6 retired engineers and active members of the Western North Carolina Section of the IEEE. A list of the IAC members and their credentials is provided in Table 8 – 3. The IAC meets at least once a year to discuss ECET curriculum issues, such as proposed changes in the curriculum, weaknesses / proposed improvements to the selected core courses, weaknesses / proposed improvements to laboratory facilities. IAC members have provided suggestions to help improve the ECET program. The most recent meeting was held on June 11, 2008. Suggestions raised were as follows:

J. Erickson suggested that IAC meeting be conducted via teleconferencing. J. Corr mentioned that the 2010 IEEE Southeastcon Planning Committee uses Skype for holding teleconference meetings among the members. This item is under serious consideration for the next meeting.

P. Sprawls suggested that the IAC establish a web page in which documents of interest to the IAC members be made available.

J. Corr encouraged the ECET program at WCU to get students involved with the student competitions at the annual IEEE Southeastcon. He suggested the ECET students should

team up with Appalachian State University's Physics department, as they are involving students in robotics projects.

P. Sprawls provided a suggestion for a senior project: "Web-based Simulator for Student Interactive Laboratory Activities" and provided a detailed description of the project requirement. He would work with our students to provide medical images and system specifications. This project is under consideration for implementation in the senior design sequence ECET 478 & ECET 479 during the upcoming academic year.

Table 8-3. Industrial Advisory Committee Members

Kelly Carter, Elk Products, Hickory, NC.

James Corr – Education: B.E.E, M.S.E.E, J.D. Retired. Chair, IEEE Western North Carolina Section. Specialty: digital design, CPU design, and test engineering.

Richard Cryer, United Technologies

Ben Deridder, GE Lighting.

Jim Erickson, Chairman, IEEE Western North Carolina Section. Retired. Specialty: plant engineering.

John Kelvin, Metrostat Technologies, Inc. Sylva, NC.

Frank Micelli, Chairperson, Electronics Engineering Technology Program, Asheville-Buncombe Technical Community College. WCU Alumnus, M.S. Technology.

Fred Orland, – Education: B.S.E.E, M.S.E.E. Retired. Treasurer, IEEE Western North Carolina Section. Specialty: Analog circuit design, Avionics.

Matt Peace, Cytech Products, Inc.

Robert Pettigrew – Education: B.S.E.E, M.S.E.E. Retired. Nominations & Appointments Officer, IEEE Western North Carolina Section. Specialty: Engineering management.

Tom Rodgers, retired Air Force electrical engineer.

Perry Sprawls, Professor Emeritus, Emory University. Vice Chair, IEEE Western North Carolina Section. Specialty: medical image processing and medical equipment

Jonathan Szucs, Sales Manager, Advanced Superabrasives, Inc, Mars Hill, NC. 2006 WCU alumnus, B.S. ECET.

Beth Woodson, Electrical Engineer, Eaton Corporation, Arden, NC

CRITERION 9. PROGRAM CRITERIA

For a description of how the ECET program satisfies the program criteria, refer to the ECET Program Assessment Plan in Appendix E.

APPENDIX A – COURSE SYLLABI

Syllabi for the courses in the ECET major are presented below in the following order:

Course No.	Course Title
ECET 211	Electronic Drafting and Fabrication
ECET 231	Circuit Analysis I
ECET 242	Electronic Circuits
ECET 290	Computer Engineering Fundamentals
ECET 321	Circuit Analysis II
ECET 331	Digital Integrated Circuits
ECET 332	Microcontrollers
ECET 341	Advanced Circuit Analysis
ECET 431	Microprocessor Interfacing
ECET 452	Control Systems
ECET 461	Digital Signal Processing
ECET 464	Instrumentation
ECET 478	Senior Design Proposal
ECET 479	Senior Design Project
TEL 312	Electronic Communication Fundamentals
TEL 345	Local Area Networks

Course Syllabus for Spring 2007

ECET 211 - Electronic Drafting and Fabrication
3 Credits

Instructor: Scott Heggen

Contact Info: Office hours: See schedule posted at 368 Belk
Office: 828-227-2525
E-mail: sheggen@wcu.edu

Office Location: 368 Belk Building

Meeting Periods: **Section 01**: Lecture: Tues, 9:05am - 10:45am.
Section 31: Lab: Thurs, 9:05am – 10:45am
Section 02: Lecture: Tues, 2:30pm - 4:10pm.
Section 32: Lab: Thurs, 2:30pm – 4:10pm

Course Description: Electronic drafting and graphics; design, assembly and fabrication of electronic circuits and equipment.

Course Goals: Upon the completion of the course, the student will be able to:

1. Identify electronic components and component packages common to circuit fabrication.
2. Perform the various skills and methods of electronics project prototyping, such as breadboarding, point-to-point soldering, wire wrapping, and printed circuit board design and fabrication.
3. Create electronic prototypes using computer-based tools for schematic capture and layout of printed circuit boards.
4. Utilize laboratory instruments and equipment to build and test breadboarded and printed circuit boards.

Prerequisites: None.

Required Text: Reis, R.A. (2005). *Electronic Project Design and Fabrication,* 6th Edition. Columbus, Ohio: Prentice Hall. ISBN: 0-13-113054-4.

References: Handouts of pertinent information will be given in class as needed. Additionally, students may be required to research component data using materials from the senior project lab library located in Belk 354.

Instructional Approach: This is a laboratory-based course. Although reading assignments, lectures and homework will be used to introduce and clarify concepts needed for laboratory exercises and projects, much of the student's learning experience will arise through hands-on activity. Students are responsible for all material included in reading assignments whether or not they are covered during lecture.

Evaluation: Each student will be evaluated base on six areas of performance. These areas and their respective percentage weights are as follow:

- Midterm Exam 10%
- Attendance 10%
- Labs 50%
- Semester Project(s) 20%
- Final Exam 10%

Grading Scale: A 10-point grading scale will be used to determine final grades:

100-93	A
92-90	A-
89-87	B+
86-83	B
82-80	B-
79-77	C+
76-73	C
72-70	C-
69-67	D+
66-63	D
62-60	D-
<60	F

Attendance: Attendance of each class meeting is very important. In addition to gaining knowledge of the subject, sufficient time must be spent by the student to hone practical skills necessary to complete assignments in a quality manner. Also, information may be covered in class which is not covered by reading or homework assignments. Students are expected to attend each class and laboratory session. Make-up tests or laboratory sessions will be provided only at the instructor's discretion.

Assignments: Timely and full completion of assignments is vital to student success in this course. To this end, the following policies will be in force:

- Students are expected to submit work on time!
- Late work is defined as any work submitted after the beginning of class.
- Any late work will receive an automatic 30% grade reduction.
- Any work received more than one week after its due date will not be accepted.
- Any assignment missed due to an excused absence will be due at the beginning of the next class period.
- If you absolutely cannot attend class, you must notify the instructor prior to the absence. This is the only way you will be allowed to make up any work or test.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue**.** Visit WCU's Undergraduate Student Handbook for all related policies and procedures.
http://www.wcu.edu/studentd/StudentHandbook

Evidence of academic dishonesty will result in a grade of F (numerically "0") for that assignment on the first infraction. A second infraction will result in a grade of F or for the course. Students should review the University's policy on academic dishonesty in the *WCU Student Handbook*

Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

Weekly Lesson Plan: This course will cover the topics below in roughly the order listed. The duration of attention to each individual area is tentative and topics may overlap as needed.

- Overview of Electronic Design and Fabrication
- Electronics laboratory safety
- Soldering
- Basic electrical theory
- Electronic component identification
- Electronic Drafting (CAD)
- Breadboarding and laboratory equipment use
- Wire wrapping
- Surface Mount Technology (SMT)
- Printed Circuit Board (PCB) design and layout
- Electronic circuit prototyping with numerical control (NC) technology

Safety: Students are expected to maintain an attitude of safety at all times. Proper respect for laboratory materials and equipment must be maintained to avoid injury to the individual and their classmates or damage to their project work.

- Special care should be taken to turn off power to equipment and trainers before wiring circuits or adjusting tool configurations.
- Unsafe behavior may result in dismissal from the class/lab session and a failing grade for the current assignment.

Classroom Policies: The following policies will be in effect during class meetings:

- Cell phones must be turned off during class time.
- Drinks, food and tobacco are not permitted in classrooms or laboratories.
- Computers used during class are to be used strictly for coursework – No web surfing.

The Kimmel School of Construction Management and Technology
Department of Engineering and Technology

Course Syllabus for Fall 2007

ECET 231 – Circuit Analysis I
4 Credits

Instructor(s): Paul Yanik (lecture, recitation and lab section 30)
Jerry Denton (lab section 75)

Contact Info:

Paul Yanik
Office: 338 Belk Building
Office Hours: See scheduled posted at 338 Belk
Office Phone: 828-227-2166
E-mail: pyanik@wcu.edu
Website: paws.wcu.edu/pyanik

Jerry Denton
Office: 218 CAT Building (Subject to change)
Office Hours: by appointment
Office Phone: 828-227-2516
E-mail: jdenton@email.wcu.edu

Meeting Periods:

Lecture:	1:25pm – 3:05pm Monday
Recitation:	1:25pm – 3:05pm Wednesday
Lab:	1:25pm – 3:05pm Friday (section 30)
	3:35pm – 5:15pm Monday (section 75)

Course Description: Fundamental electrical theory involving DC/AC circuits. Topics include series, parallel, series-parallel networks; electromagnetic theory; transient circuit analysis; introduction to AC electricity.

Course Goals: Upon completion of the course, students will be able to accomplish the following:

1. State the basic theories of electricity, passive electrical component behaviors, and DC and AC circuit phenomena.
2. Characterize the behavior of voltage and current sources, resistors, capacitors, and inductors.
3. Apply knowledge of theories, component behaviors and appropriate software to solve technical problems in DC and AC circuit analysis.
4. Utilize laboratory instruments and equipment to perform basic measurements for the analysis and assembly of electrical circuits.
5. Write effective technical laboratory reports.

Prerequisites: College algebra such as MATH 130

Corequisites: MATH 146

Required Text: Robbins, Allan H., & Miller, Wilhem C. (2004). *Circuit Analysis with Devices: Theory and Practice*. Clifton Park, New York: Thomson Delmar Learning. ISBN: 1-4018-7985-5

References: None.

Instructional Approach: Course material will be introduced during lecture. Reading assignments and homework will be assigned to reinforce material covered in class. Regular quizzes will be given to ensure that students are maintaining pace with the assigned reading and homework. Time will be allocated during lectures for homework review. Occasionally, students may work together during class on short assignments.

In addition to lectures, homework and quizzes, students will conduct laboratory experiments. As a minimum, each student will learn how to build and test electronic circuits using the following lab equipment: digital multimeters, oscilloscopes, signal generators, and breadboards. Attendance is mandatory at all laboratory experiments.

Students will work on laboratory experiments in groups of one or two. Informal lab reports will be required for most lab experiments, however, formal reports will be required for certain labs. Formal reports must be written according to guidelines provided.

Evaluation: Each student will be evaluated based on performance in the following areas. Respective weights of each performance area are as noted.

- 3 tests 45%
- Homework, Quizzes, In-Class Activities 10%
- Labs 25%
- Final exam 20%

Grading Scale: The grading scale below will be used to determine final grades:

Numerical Course Average	Grade Assigned
92 – 100	A
90 – 91	A-
88 – 89	B+
82 - 87	B
80 – 81	B-
78 – 79	C+
72 - 77	C
70 – 71	C-
68 – 69	D+
62 – 67	D
60 - 61	D-
0 - 59	F

Attendance: Although students are strongly encouraged to attend lecture, attendance will not be required. Regardless of whether a student attends class, it is their responsibility to obtain any material or assignments from fellow class members.

Assignments: Timely and full completion of assignments is vital to student success in this course. To this end, the following policies will be in effect:

- Students are expected to submit work on time.
- Any late homework will receive an automatic 30% grade reduction.
- Any work which is not submitted prior to the next regular semester test will not be accepted. Work assigned after the 3rd regular semester test will not be accepted after the last regular class meeting of the semester.
- No credit will be given for labs which are not attended.
- No makeup tests or quizzes will be given unless the instructor is notified prior to the absence and/or corroborating documentation of the reason for the absence is provided.
- No makeup tests or quizzes will be given unless the instructor is notified prior to the absence and/or corroborating documentation of the reason for the absence is provided.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue**. Visit WCU's Undergraduate Student Handbook for all related policies and procedures. http://www.wcu.edu/studentd/StudentHandbook.** Evidence of academic dishonesty will result in a grade of F (numerically "0") for that assignment on the first infraction. A second infraction will result in a grade of F or for the course.

Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Carol Mellen for more information. Phone: (828) 227-7127; E-mail: mellen@email.wcu.edu.

Classroom Policies: The following policies will be in effect during class meetings:

- Cell phones must be turned off during class time. Cell phones must not be within view during tests.
- Drinks, food and tobacco are not permitted in classrooms or laboratories.
- Instant messenger, AOL or other non-instructional software is not permitted on classroom or lab computers. Printing of material in lab which is not course-related is also not permitted.

Weekly Lesson Plan: The tables below gives an approximate week-by-week plan of topics and lab exercises. The actual duration of attention to each lecture topic may be altered as best meets the needs of the class members.

Week	Week of	Topic
1	8/20	Chapter 1 – Introduction
2	8/27	Chapter 2 – Voltage and Current
3	9/3	Chapter 3 - Resistance
4	9/10	Chapter 4 – Ohm's Law, Power and Energy
5	9/17	Chapter 5 – Series DC Circuits
6	9/24	Test 1 – Covers chapters 1 - 4
7	10/1	Chapter 6 – Parallel Circuits
8	10/8	Chapter 7 – Series-Parallel Circuits
9	10/15	Chapter 7 - Continued
10	10/22	Chapter 8 – Methods of Analysis
11	10/29	Test 2 – Covers chapters 5 - 7
12	11/5	Chapter 8 - Continued
13	11/12	Chapter 9 – Network Theorems
14	11/19	Chapter 9 - Continued
15	11/26	Chapter 10 – Capacitors and Capacitance
16	12/3	Test 3 (Monday) – Covers chapters 8, 9 Chapter 13 (Wednesday) – Inductors and Inductance
Finals	12/10	Final Exam, Wednesday, 12/12, 3:00-5:30pm

Lab	Lab Title	Date Conducted	
		Monday Section (75)	Friday Section (30)
Lab 1	Resistance Measurement	9/10	9/7
Lab 2	Ohm's Law	9/17	9/14
PreLab 3	Using PSpice for Series DC Circuits	9/24	9/21
Lab 3	Series DC Circuits	10/1	9/28
Lab 4	Series DC Circuits with LEDs	10/8	10/5
PreLab 5	Using PSpice for Parallel DC Circuits	10/22	10/19
Lab 5	Parallel DC Circuits	10/29	10/26
PreLab 6	Using PSpice for Series-Parallel DC Circuits	11/5	11/2
Lab 6	Series-Parallel DC Circuits	11/12	11/9
Lab 7	Superposition and Mesh Analysis	11/19	11/16
Lab 8	Thevenin's Theorem and Maximum Power Transfer Theorem	11/26	11/30

Western Carolina University
The Kimmel School of Construction Management and Technology
Department of Engineering and Technology

Course Syllabus for Spring 2008

ECET 242– Electronic Circuits
4 Credits

Instructor: Paul Yanik

Contact Info:

Office:	338 Belk Building
Website:	paws.wcu.edu/pyanik
Office hours:	See scheduled posted at 338 Belk or on my website
Office Phone:	828-227-2166
E-mail:	pyanik@wcu.edu

Meeting Periods:

Lecture:	1:25pm – 3:05pm Monday
Recitation:	1:25pm – 3:05pm Wednesday
Lab:	1:25pm – 3:05pm Friday (section 30)
	3:35pm – 5:15pm Monday (section 75)

Course Description: Study of analog electronic circuits including amplifiers, regulators, and special applications. Both discrete semiconductor devices and integrated circuits used in analog applications will be covered. 2 hours lecture, 2 hours lab, 2 hours recitation.

Course Goals: Upon completion of the course, students will be able to:

1. Utilize electrical test equipment including the digital multimeter, signal generator and oscilloscope to perform circuit analysis.
2. Understand the physical phenomena of semiconductor devices including the p-n junction, barrier potential, saturation current and avalanche breakdown.
3. Describe the basic operation of semiconductor devices including diodes, transistors, and operational amplifiers.
4. Analyze circuits containing various forms of transistors including the BJT, JFET and MOSFET.
5. Glean relevant information from manufacturer data sheets of semiconductor devices and select appropriate devices for a particular set of design considerations.
6. Analyze, design, build, and test diode circuits, DC transistor circuits, AC small signal models of transistor amplifiers and several basic operational amplifier circuits.
7. Write effective technical laboratory reports.

Program Outcomes: Students successfully completing this course should achieve the following outcomes of the Electrical and Computer Engineering Technology Program:

1a. Demonstrate the proper use of laboratory equipment.

Prerequisites: ECET 231 or equivalent course in DC circuit analysis.

Corequisites: None.

Required Text: Robbins, Allan H., & Miller, Wilhem C. (2004). *Circuit Analysis with Devices: Theory and Practice*. Clifton Park, New York: Thomson Delmar Learning. ISBN: 1-4018-7985-5

References: R.W. Goody, *OrCAD Pspice for Windows, Volume 2: Devices, Circuits, and Operational Amplifiers*, Prentice Hall, 2001. ISBN 0130157961.

Instructional Approach: Course material will be introduced during lecture. Reading assignments and homework will be assigned to reinforce material covered in class. Regular quizzes will be given to ensure that students are maintaining pace with the assigned reading and homework. Time will be allocated during lecture and/or recitation for homework review.

In addition to lectures, homework and quizzes, students will conduct laboratory experiments. As a minimum, each student will learn how to build and test electronic circuits using the following lab equipment: digital multimeters, oscilloscopes, signal generators, and breadboards. Attendance is mandatory at all laboratory sessions.

Students will work on laboratory experiments in groups of one or two. Informal lab reports will be required for most lab experiments, however, formal reports will be required for certain labs. Formal reports must be written according to guidelines provided.

Evaluation: Each student will be evaluated based on performance in the following areas. Respective weights of each performance area are as noted.

Area	Weight (%)
Tests (3)	30
Quizzes	10
Homework	15
Lab exercises, lab exam	25
Final exam	20
Total	**100**

Grading Scale: The grading scale below will be used to determine final grades:

Numerical Course Average	Grade Assigned
92 – 100	A
90 – 91	A-
88 – 89	B+
82 - 87	B
80 – 81	B-
78 – 79	C+
72 - 77	C
70 – 71	C-
68 – 69	D+
62 – 67	D
60 - 61	D-
0 - 59	F

Attendance: Although students are strongly encouraged to attend lecture and recitation, attendance will not be required for these sessions. Regardless of whether a student attends class, it is their responsibility to obtain any material or assignments from fellow class members.

Attendance at all lab sessions is mandatory. No credit will be given for labs which are not performed.

Assignments: Timely and full completion of assignments is vital to student success in this course. To this end, the following policies will be in effect:

- Students are expected to submit work on time.
- Any late homework will receive an automatic 30 point grade reduction.
- Any work which is not submitted prior to the next regular semester test will not be accepted. Work assigned after the 3rd regular semester test will not be accepted after the last regular class meeting of the semester.
- No credit will be given for labs which are not attended and performed.
- No makeup tests or quizzes will be given unless the instructor is notified prior to the absence and/or corroborating documentation of the reason for the absence is provided.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue**. Visit WCU's Undergraduate Student Handbook for all related policies and procedures. http://www.wcu.edu/studentd/StudentHandbook.** Evidence of academic dishonesty will result in a grade of F (numerically "0") for that assignment on the first infraction. A second infraction will result in a grade of F or for the course.

Accommodations for Students with Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828)227-2716 or 144 Killian Annex.

Classroom Policies: The following policies will be in effect during class meetings:

- Cell phones must be turned off during class time. Cell phones must not be within view during tests.
- Drinks, food and tobacco are not permitted in classrooms or laboratories.
- Instant messenger, AOL or other non-instructional software is not permitted on classroom or lab computers. Printing of material in lab which is not course-related is also not permitted.

Weekly Lesson Plan: The tables below gives an approximate week-by-week plan of topics and lab exercises. The actual duration of attention to each lecture topic may be altered as best meets the needs of the class members.

Week #	Week of	Topic
1	1/14	Chapter 24 Overview of Chapter 15 – AC Fundamentals
2	1/21	No class on Monday – MLK Holiday Chapter 25
3	1/28	Chapter 25 - Continued
4	2/4	Chapter 25 - Continued
5	2/11	Chapter 26 - Transistors
6	2/18	Chapter 26 - Continued
7	2/25	Test 1 – Covers chapters 24, 15, 25
8	3/3	Spring Break – No classes
9	3/10	Chapter 26 - Continued
10	3/17	No classes on Wednesday or Friday – Easter Break Chapter 26 - Continued
11	3/24	Test 2 – Covers chapter 26
12	3/31	Chapter 27 – Transistor Amplifiers
13	4/7	Chapter 27 - Continued
14	4/14	Chapter 28 – Operational Amplifiers
15	4/21	Chapter 28 – Continued Basics of digital circuits
16	4/28	Test 3 – Covers chapters 27, 28, digital circuits
Finals		Final Exam Wednesday, May 7, 3:00–5:30 pm

Lab	Lab Title	Date Conducted	
		Monday Section (75)	Friday Section (30)
1	Electrical Characteristics of Silicon and Zener Diodes	1/28	1/31
2	Oscilloscope Measurements	2/4	2/8
3	Rectifier Circuits	2/11	2/15
Prelab 4	Prelab on Regulated Power Supplies	2/18	2/22
4	Regulated Power Supplies	2/25	2/29
4	Continued (if necessary)	3/10	3/14
5	Transistor Measurements: Cutoff, Active, Saturation	3/24	3/28
6	Transistor Amplifiers	4/7	4/11
7	Inverting Operational Amplifiers	4/14	4/18
7	Continued (if necessary)	4/21	4/28

ECET 290 - 01 & 30: Computer Engineering Fundamentals

Spring 2008
Belk 364
Lecture: M 9:05a.m.-10:45a.m.
Lab: W 9:05a.m.-10:45a.m.

Instructor: Peter C. Tay, Ph.D. Belk 221 (828)227-2161 ptay@email.wcu.edu
Office Hours: MW 3:30p.m.-5:00p.m., TR 9:00a.m.-1:00p.m., or by appointment
Schedule: http://paws.wcu.edu/ptay/Spring_2008/Schedule.html
Course Web Page http://paws.wcu.edu/ptay/Spring_2008/ECET290/ECET290.html

I. Course Aims and Objectives:

- **Aims**
  This course will teach the student how to utilize the computer for academic and industry uses.
- **Specific Learning Objectives**:
  With successful completion of this course, the student will:
  - understand the hardware and peripheral components of a personal computer.
  - attain a comprehensive understanding of operating systems.
  - be able to utilize software that is commonly used in academics and industry such as MATLAB® and NI LabView.

II. Course Materials

Course readings:

- C. Raymond, *Personal Computers for Technology Students*, 2001, Upper Saddle River, NJ: Prentice Hall. ISBN: 0-13-020791-8.
- Required supplementary readings will be handed out in class or posted on the course WebCat page.

III. Expectations of Students/Course Policies

- Statement on Accommodations for students with disabilities:

  Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

- Statement on Academic Integrity (including plagiarism):

  Academic Honesty Policy
  Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:
  a. **Cheating—**Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  b. **Fabrication—**Intentional falsification of information or citation in an academic exercise.
  c. **Plagiarism—**Intentionally or knowingly representing the words, ideas, or source codes of someone else as one's own in an academic exercise.
  d. **Facilitation of Academic Dishonesty**—Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his/her department head, and the Associate Dean of the Graduate

School when the student is a graduate student, in writing of the academic dishonesty charge and sanction.
(See Student Handbook http://www.wcu.edu/studentd/StudentHandbook**.)**

- Attendance is required on the first day of class. Otherwise an administrative withdrawal will be issued and the student will have to reenroll to get credit for participating in this course.
- No late and/or makeup assignments, projects, or exams.
- Computer engineering is a very time consuming discipline. As the semester progresses the projects will be more complicated and hence require more time from the student.
- I encourage the use of the internet and other resources to find open-source code(s) to complete the tasks of the course. If source code was acquired via open sources, please follow the licensing rules described at http://www.opensource.org.

IV. Grading Procedures:

	Percentage of Grade Or number of points	***Student's score***
[1]Examination I	10%	
[2]Lab Projects	20%	
[3]Examination II	10%	
[4]Homework	40%	
[5]Final Examination	20%	
	100%	

Letter grades will be assigned according to the following:

Final Grade	Letter Grade	Final Grade	Letter Grade
92 – 100%	A	72 - 77 %	C
90 – 91%	A-	70 – 71%	C-
88 – 89%	B+	68 – 69%	D+
82 – 87%	B	62 – 67%	D
80 – 81%	B-	60 – 61%	D-
78 – 79%	C+	0 – 59%	F

[1]Examination I will test the student on the basic concepts and practices covered in the course thus far.

[2]The lab projects will be accomplished during the designated lab time.

[3,5]Examination II will test the student on topics covered since examination I. The final exam will be comprehensive. Although communications with others will not be allowed, exam II and the final exam will be taken at a designated location and the use of book(s), notes, and computers as resources **will be allowed**.

[4]Homework will be assigned throughout the semester.

V. Tentative Course Schedule

May change to accommodate guest presenters & student needs

Week of	Topic	Book Section	Notes
Jan. 14, 2008	Basic Electricity and Electronics, Computer Numbering Systems and Terminology	Introduction, Chapter 1	
Jan. 21, 2008	Microcomputer Basics and Microprocessors	Chapters 2 and 3	Jan. 21: MLK Day Assignment 1
Jan. 28, 2008	PC and the Expansion Bus	Chapter 4	
Feb. 4, 2008	OS-Windows	Chapters 5 and 6	
Feb. 11, 2008	OS-UNIX, LINUX, MAC OS X and newer		Assignment 2
Feb. 18, 2008	RAM, BIOS, CMOS, I/O	Chapters 7, 8, and 9	
Feb. 25, 2008			Feb. 27: Exam I
Mar. 3-7, 2008	Spring Break		
Mar. 10, 2008	Data Storage Devices, Video Adapters and Monitors, Printers	Chapters 10, 11, 12, and 13	
Mar. 17, 2008	Network Basics	Chapter 14	Mar. 19-21, 2008: Easter Break
Mar. 24, 2008	C/C++ compiler		Assignment 3
Mar. 31, 2008	C/C++ compiler		Assignment 4
Apr. 7, 2008	MATLAB®		Assignment 5
Apr. 14, 2008	MATLAB®		
Apr. 21, 2008	NI LabView		Review
Apr. 28, 2008			April 28: Exam II
May 3-9, 2008	Final Exam		Time and location TBA

ECET-321 – Circuit Analysis II — 4 Credits

Instructor: Dr. Brian Howell- http://paws.wcu.edu/bhowell

Contact Info: Office Hours: Posted on Door Belk 369
Please call or e-mail if additional time is needed. I can be contacted at the following;
Office: 828-227-2472
E-mail: bhowell@email.wcu.edu

Office Location: 369 Belk Building

Meeting Periods: Lecture – Tue, Thurs, 1:25-3:05pm Belk 364, Lab Mon or Wed 1:25-3:05pm Belk 366

Course Description: Fundamentals of DC/AC circuits. Topics include AC series, parallel, series-parallel circuits; analysis techniques; network theorems; resonance, and transformers.
2 Lecture, 2 Lab, 2 Recitation

Prerequisites: PREQ: ECET 231.

Required Text: Robbins and Miller, Circuit Analysis with Devices, Theory and Practice, Thomson-2004
ISBN: 140187984-5

Method: Two lecture/problem solving period per week, one lab per week, and homework assignments. Open class discussion is an important element of this class. Students are responsible for the content of all reading assignments whether or not the material is covered in class. Additionally all students will be required to utilize the assigned software for project administration.

Evaluation There will be two hourly exams, a final, 7-8 homework assignments, 8 laboratory exercises, and a final project lab

Labs:	20%
Homework:	10%
Test1:	20%
Test2:	20%
Final Lab Project:	10%
Final:	20%

Grading Scale: Letter grades will be based on the scale below:

Grade	Average
A	90-100
B	80-89
C	70-79
D	60-69
F	Below 60

Grades between letter grades will be rounded up or down at the instructor's discretion based upon attendance, classroom involvement, etc.

CC Grade- Composition-Condition Marks:

A student whose written work in any course fails to meet acceptable standards will be assigned a composition-condition (CC) mark on the final grade report. All undergraduates who receive two (2) CC grades prior to the semester in which they complete 110 hours at Western Carolina University are so notified by the registrar and are required to pass English 300 before they will be eligible for graduation. This course must be taken within two (2) semesters of receiving the second CC and must be passed with a grade of C (2.0) or better. (Undergraduate Catalog, p. 65)

Attendance: Students are responsible for punctual and regular attendance in all laboratories, classes, and other class activities. Students are urged to reserve their absences for emergencies. Except in extenuating circumstances and with approval from the departmental dean, instructors withdraw students from class when the student exceeds the allowable number of absences. For this class the allowable number of absences is 6 lecture hours.

Assignments: **Students are required to do original work on graded, in-class exams** and to exhibit high ethical standards. They are expected to bring all necessary equipment, texts, etc. to classes and labs. Labs are conducted at scheduled times, and for appropriate credit lab reports are due at specified times. Labs and field trips are scheduled/preformed for the experience of the endeavor; therefore attendance is mandatory for a grade. Work or other conflicts at affect the student's attendance must be approved by the instructor in advance of the schedule lab conflict. Lab reports will be either informal or formal. Informal labs will typically be done during the lab and turned in at the end of the period. For instructions on formal labs see the lab format instructions. Most labs are conducted in a teaming format wherein the students do data gathering and repetitive calculations as a group, but formal lab reports are to be original and done by the individual.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue. **Please see Undergraduate Student Handbook for all related policies and procedures.** **http://www.wcu.edu/studentd/StudentHandbook**

University definition of Academic Dishonesty: From the Student Handbook: Conduct, Article 4:

1. *Acts of dishonesty, including but not limited to, the following:*

   a. *Cheating, plagiarism, or other forms of academic dishonesty.*

   b. *Furnishing false information to any university official, faculty member, or office.*

   c. *Forgery, alteration, or misuse of any university document, record, or instrument of identification.*

   d. *Tampering with the election of any university-recognized student organization.*

   Note: Resolution of academic honesty complaints will normally be handled within the appropriate college according to the provisions of the Academic Honesty Policy. Records of academic dishonesty cases are maintained in the Office of Student Judicial Affairs.

Accommodations for Students with Disabilities:
Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Kimberly Marcus for more information. Phone: (828) 227-7234; E-mail: kmarcus@email.wcu.edu.

Classroom Conduct: Classroom conduct is guided explicitly in the *Student Handook, Code of Conduct, Article 4*. In general the code of conduct your mother probably taught you covers the bases for the class:

1. Use polite speech, no foul or demeaning language
2. No talking during lecture unless we're all discussing the material
3. Please and thank you work quite nicely to get what you want
4. Put back what you take for use in the lab, aka clean up your mess.
5. Don't do anything that disrupts the class for the teacher or more importantly for the other students. It their nickel too!

Cell Phones, DVD, Pagers, Teleportation, or Other Communications/Entertainment devices:

No Cell Phones or radios on in Class. Yon don't like them interrupting you so same goes in class. It's your nickel for tuition, get the most out of it.

WEEKLY LESSON PLAN

Wk#1-3: Basic AC analysis, Impedance, Power

Wk#4-6: AC-Series Parallel, Mesh/Nodal, Bridge

Wk#7-9: AC Network Theorems, Resonance

Wk#10-12: Filters, Bode Plots, Transformers

Wk#13-15: Application to automation problems such as filtering, robotics, sensing, power

Objectives:

Upon satisfactory completion of this course the student will be able to do the following:

A.) Design systems which read and write digital and analog information

B.) Understand the principles of data acquisition and sampling

C.) Be able to design with and analyze circuitry for common sensors and actuators

D.) Integrate analysis functions into the sensing system

E.) Write virtual instruments in Labview for measurement and control

F.) Identify the common elements to PC based control and measurement systems

G) To demonstrate competency in documenting and managing a design activity and reporting in both written and verbal venues, the results

Assessment Objectives:

1. an ability to apply technologies of PC based data acquisition systems and virtual instruments to problems in measurement and control of automated systems
2. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes,
3. an ability to function effectively on teams,
4. an ability to communicate effectively, orally and in written form, technical information, and to discuss this information with peers and others;
5. a recognition of the need for, and an ability to engage in lifelong learning,
6. an ability to understand professional, ethical and social responsibilities,
7. a respect for diversity and a knowledge of contemporary professional, societal and global issues,
8. a commitment to quality, timeliness, and continuous improvement

The Kimmel School of Construction Management and Technology
Department of Engineering and Technology

Course Syllabus for Fall 2007

ECET 331 – Digital Integrated Circuits
4 Credits

Instructor: Paul Yanik

Contact Info:

Office:	338 Belk Building
Website:	paws.wcu.edu/pyanik
Office hours:	See scheduled posted at 338 Belk or on my website
Office Phone:	828-227-2166
E-mail:	pyanik@wcu.edu

Meeting Periods:

Lecture:	9:05am – 10:45am Monday, Belk 365
Recitation:	9:05am – 10:45am Wednesday, Belk 365
Lab:	9:05am – 10:45m Friday (Section 30), Belk 355
	3:35pm – 5:15pm Friday (Section 75), Belk 355

Course Description: Study of combinational and sequential digital circuits using integrated circuit techniques.

Course Goals: Students successfully completing the course will:

1. State the basic concepts of number systems, Boolean algebra, combinatorial and sequential logic circuits and their applications to digital systems.
2. Design, write, simulate and verify digital circuits using a HDL and supporting applications.
3. Design and construct digital circuit prototypes using discrete components. Port HDL-based designs to programmable logic devices and validate their behavior in a hardware environment.
4. Write effective technical laboratory reports.

Prerequisites: ECET 231

Corequisites: None

Required Text: Dueck, R.K. (2001). *Digital Design with CPLD Applications and VHDL*. Albany, New York: Thomson Delmar Learning. ISBN: 0-7668-1160-3.

References: Altera Corporation (2005). *Introduction to Quartus II, Version 5.0*. San Jose, California.

Instructional Approach: Course material will be introduced during lecture. Reading assignments and homework will be assigned to reinforce material covered in class. Occasional quizzes will be given to ensure that students are maintaining pace with the assigned reading and homework. Time will be allocated during lectures for homework review. Students may work together during class on short assignments.

In addition to lectures, homework and quizzes, students will conduct laboratory experiments. During lab, students will learn how to design, build and test digital circuits as breadboard projects as well as through computer-based design capture formats. Attendance is mandatory at all laboratory experiments.

Students will usually work on laboratory experiments individually, although a few labs will require students to work in teams of two. Informal lab reports will be required for most lab experiments, however, formal lab reports will be required for certain labs. Formal reports must be written according to guidelines provided.

Evaluation: Each student will be evaluated based on performance in the following areas. Respective weights of each performance area are as noted.

- 3 tests 45%
- Homework, quizzes, in-class activities 10%
- Informal lab reports 20%
- Formal lab reports 5%
- Final exam 20%

Grading Scale: The grading scale below will be used to determine final grades:

Numerical Course Average	Grade Assigned
92 – 100	A
90 – 91	A-
88 – 89	B+
82 - 87	B
80 – 81	B-
78 – 79	C+
72 - 77	C
70 – 71	C-
68 – 69	D+
62 – 67	D
60 - 61	D-
0 - 59	F

Attendance: Although students are strongly encouraged to attend lecture, attendance will not be required. Regardless of whether a student attends class, it is their responsibility to obtain any material or assignments from fellow class members.

Assignments: Timely and full completion of assignments is vital to student success in this course. To this end, the following policies will be in effect:

- Students are expected to submit work on time.
- Any late homework will receive an automatic 30% grade reduction.
- Any work which is not submitted prior to the next regular semester test will not be accepted. Work assigned after the 3rd regular semester test will not be accepted after the last regular class meeting of the semester.
- No credit will be given for labs which are not attended.
- No makeup tests or quizzes will be given unless the instructor is notified prior to the absence and/or corroborating documentation of the reason for the absence is provided.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue**. Visit WCU's Undergraduate Student Handbook for all related policies and procedures. http://www.wcu.edu/studentd/StudentHandbook.** Evidence of academic dishonesty will result in a grade of F (numerically "0") for that assignment on the first infraction. A second infraction will result in a grade of F or for the course.

Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Carol Mellen for more information. Phone: (828) 227-7127; E-mail: mellen@email.wcu.edu.

Classroom Policies: The following policies will be in effect during class meetings:

- Cell phones must be turned off during class time. Cell phones must not be within view during tests.
- Drinks, food and tobacco are not permitted in classrooms or laboratories.
- Instant messenger, AOL or other non-instructional software is not permitted on classroom or lab computers. Printing of material in lab which is not course-related is also not permitted.

Weekly Lesson Plan: The table below gives an approximate week-by-week plan of topics and lab exercises. The actual duration of attention to each topic may be altered as best meets the needs of the class members

Week	Week of	Topic	Lab Exercise
1	8/20	Chapter 1 – Basic Principles of Digital systems	No Lab
2	8/27	Chapter 2 – Logic Functions and Gates	Lab 1 – Introduction to the Digital Laboratory
3	9/3	Chapter 3 – Boolean Algebra and Combinational Logic	Lab 2 – Two-bit Adder
4	9/10	Chapter 5 – VHDL Chapter 6 – Combinational Logic Functions	Lab 2 continued
5	9/17	Test 1 – Covers chapters 1-3	Lab 3 – Two-bit Adder using Quartus II
6	9/24	Chapter 5, 6 continued	Lab 3 - Continued
7	10/1	Chapter 7 – Digital Arithmetic and Arithmetic Functions	Lab 4 – Decoders and BCD Encoding
8	10/8	Test 2 – Covers chapters 5-7	Lab 5 – BCD Adder
9	10/15	Chapter 8 – Sequential Logic	No Lab – Fall Break
10	10/22	Chapter 8 continued	Lab 6 – Flip-flop Counters
11	10/29	Chapter 9 – Counters and Shift Registers	Lab 7 – Flip-flops and Latches
12	11/5	Chapter 9 continued	Lab 8 – Counter features
13	11/12	Chapter 10 – State Machine Design	Lab 9 – Counters and Shift Registers
14	11/19	Chapter 10 continued	Lab 10 – Finite State Machine Design
15	11/26	Test 3 – covers chapters 8-10	Lab 10 continued
16	12/3	Chapter 4 – Programmable Logic Devices	No Lab
Finals	12/10	Final Exam Tuesday, 12/11, 8:30 – 11:00am	

ECET 332 - 01 & 75: Microcontrollers

Spring 2008
Belk 364
Lecture: TR 2:05p.m.-3:20p.m.
Lab: R 3:35p.m.-5:15p.m.

Instructor: Peter C. Tay, Ph.D. Belk 221 (828)227-2161 ptay@email.wcu.edu
Office Hours: MW 3:30p.m.-5:00p.m., TR 9:00a.m.-1:00p.m., or by appointment
Schedule: http://paws.wcu.edu/ptay/Spring_2008/Schedule.html
Course Web Page http://paws.wcu.edu/ptay/Spring_2008/ECET332/ECET332.html

I. Course Aims and Objectives:

- **Aims**
  This course will teach the student embedded microcontroller utilizations.
- **Specific Learning Objectives**:
  With successful completion of this course, the student will:
  - become familiar with the fundaments of C programming syntax.
  - be able to design application specific projects using microcontrollers.
  - be able to implement algorithms by designing, writing, and debugging C codes.
  - develop a comprehensive understanding of the Microchip PIC.
  - be familiar with the CCS-PICC compiler and integrated development environment.

II. Course Materials

Course readings:

- R. Barnett, L. O'Cull, and S. Cox, *Embedded C Programming and the Microchip PIC*, 2004, Thomson ISBN: 140183748-4.
- Required supplementary readings will be handed out in class or posted on the course WebCat page.

III. Expectations of Students/Course Policies

- Statement on Accommodations for students with disabilities:

  Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

- Statement on Academic Integrity (including plagiarism):

  Academic Honesty Policy
  Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:
  a. **Cheating—**Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  b. **Fabrication—**Intentional falsification of information or citation in an academic exercise.
  c. **Plagiarism—**Intentionally or knowingly representing the words, ideas, or source codes of someone else as one's own in an academic exercise.
  d. **Facilitation of Academic Dishonesty**—Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the

event the instructor will inform his/her department head, and the Associate Dean of the Graduate School when the student is a graduate student, in writing of the academic dishonesty charge and sanction.
(See Student Handbook http://www.wcu.edu/studentd/StudentHandbook**.)**

- Attendance is required on the first day of class. Otherwise an administrative withdrawal will be issued and the student will have to reenroll to get credit for participating in this course.
- No late and/or makeup assignments, projects, or exams.
- Engineering is a very time consuming discipline. As the semester progresses the projects will be more complicated and hence require more time from the student.
- I encourage the use of the internet and other resources to find open-source code(s) to complete the tasks of the course. If source code was acquired via open sources, please follow the licensing rules described at http://www.opensource.org.

IV. Grading Procedures:

	Percentage of Grade Or number of points	***Student's score***
[1]**Examination I**	10%	
[2]**Semester Project**	20%	
[3]**Examination II**	10%	
[4]**Homework**	40%	
[5]**Final Examination**	20%	
	100%	

Letter grades will be assigned according to the following:

Final Grade	Letter Grade	Final Grade	Letter Grade
92 – 100%	A	72 - 77 %	C
90 – 91%	A-	70 – 71%	C-
88 – 89%	B+	68 – 69%	D+
82 – 87%	B	62 – 67%	D
80 – 81%	B-	60 – 61%	D-
78 – 79%	C+	0 – 59%	F

[1]The examination I will test the student on the basic concepts and practices covered in the course thus far.

[2]The details of the semester project will be given on April 7, 2008 and will be due on the last day of class (both tentative).

[3,5]Examination II will test the student on topics covered since examination I. The final exam will be comprehensive. Although communications with others will not be allowed, exam II and the final exams will be taken at a designated location and the use of book(s), notes, and computers as resources **will be allowed**.

[4]Homework will be assigned throughout the semester.

V. Tentative Course Schedule

May change to accommodate guest presenters & student needs

Week of	Topic	Book Section	Notes
Jan. 14, 2008	Introduction and Overview	Preface	
Jan. 21, 2008	C Language	Chapter 1	
Jan. 28, 2008	C Language	Chapter 1	Assignment 1
Feb. 4, 2008	PIC Microcontroller	Chapter 2	
Feb. 11, 2008	PIC Microcontroller	Chapter 2	Assignment 2
Feb. 18, 2008	I/O and Preprocessor Directives	Chapter 3	
Feb. 25, 2008			Exam I (Feb. 27)
Mar. 3-7, 2008	Spring Break		
Mar. 10, 2008	I/O and Preprocessor Directives	Chapter 3	Assignment 3
Mar. 17, 2008	CCS-PIC C Compiler and IDE	Chapter 4	Mar. 19-21, 2008: Easter Break
Mar. 24, 2008	CCS-PIC C Compiler and IDE	Chapter 4	
Mar. 31, 2008			Advising Day (April 1) Exam II (April 3)
Apr. 7, 2008	Project Development	Chapter 5	Assignment 4
Apr. 14, 2008	Project Development		
Apr. 21, 2008	Project Development		
Apr. 28, 2008	Project Development		
May 3-9, 2008	Final Exam		Time and location TBA

Western Carolina University
The Kimmel School of Construction Management and Technology
Department of Engineering and Technology

Course Syllabus for Spring 2008

ECET 341 – Advanced Circuit Analysis
3 Credits

Instructor: Paul Yanik

Contact Info:

Office:	338 Belk Building
Website:	paws.wcu.edu/pyanik
Office hours:	See scheduled posted at 338 Belk or on my website
Office Phone:	828-227-2166
E-mail:	pyanik@wcu.edu

Meeting Periods: Monday, Wednesday, Friday: 11:15am – 12:05pm.

Course Description: Study of linear systems; introduction to digital signal processing.

Course Goals: Upon completion of the course, students will be able to:

1. Perform circuit analysis based on the mathematical and physical forms of common waveforms found in systems along with the response of circuit components to such waveforms.
2. Deduce the transient response and steady state response of passive components.
3. Apply Laplace and Fourier transforms to analysis of electric circuits.
4. Utilize the basic concepts of digital signal processing.
5. Solve technical problems involving the topics stated above.

Program Outcomes: Students successfully completing this course should achieve the following outcomes of the Electrical and Computer Engineering Program:

4a. Present oral reports.

4b. Produce written technical reports.

Prerequisites: ECET 321, MATH 153

Corequisites: MATH 255

Required Text: Stanley, William D. (2003). *Transform Circuit Analysis for Engineering and Technology, 5th Edition*. Upper Saddle River, New Jersey: Prentice Hall.

References: None

Instructional Approach: Course material will be introduced during lecture. Reading assignments and homework will be assigned to reinforce material covered in class. Regular quizzes will be given to ensure that students are maintaining pace with the assigned reading and homework. Time will be allocated during lectures for homework review. Students will be called upon to deliver homework and test problem solutions orally as part of review sessions.

Evaluation: Each student will be evaluated based on performance in the areas given by the following table. Respective weights of each performance area are as noted.

Area	Weight (%)
Tests (3)	45
Quizzes (at least 5)	20
Homework	15
Final Exam	20
Total	**100**

Grading Scale: The grading scale below will be used to determine final grades:

Numerical Course Average	Grade Assigned
92 – 100	A
90 – 91	A-
88 – 89	B+
82 - 87	B
80 – 81	B-
78 – 79	C+
72 - 77	C
70 – 71	C-
68 – 69	D+
62 – 67	D
60 - 61	D-
0 - 59	F

Attendance: Although students are strongly encouraged to attend lecture and recitation, attendance will not be required for these sessions. Regardless of whether a student attends class, it is their responsibility to obtain any material or assignments from fellow class members.

Assignments: Timely and full completion of assignments is vital to student success in this course. To this end, the following policies will be in effect:

- Students are expected to submit work on time.
- Any late homework will receive an automatic 30% grade reduction.
- Any work which is not submitted prior to the next regular semester test will not be accepted. Work assigned after the 3rd regular semester test will not be accepted after the last regular class meeting of the semester.
- No credit will be given for labs which are not attended and performed.
- No makeup tests or quizzes will be given unless the instructor is notified prior to the absence and/or corroborating documentation of the reason for the absence is provided.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue**. Visit WCU's Undergraduate Student Handbook for all related policies and procedures. http://www.wcu.edu/studentd/StudentHandbook.** Evidence of academic dishonesty will result in a grade of F (numerically "0") for that assignment on the first infraction. A second infraction will result in a grade of F or for the course.

Accommodations for Students with Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828)227-2716 or 144 Killian Annex.

Classroom Policies: The following policies will be in effect during class meetings:

- Cell phones must be turned off during class time. Cell phones must not be within view during tests.
- Drinks, food and tobacco are not permitted in classrooms or laboratories.

Weekly Lesson Plan: The tables below gives an approximate week-by-week plan of topics and lab exercises. The actual duration of attention to each lecture topic may be altered as best meets the needs of the class members.

Week #	Week of	Topic
1	1/14	Chapter 1 – Introductory Considerations Chapter 2 – Waveform Analysis
2	1/21	No class Monday – MLK holiday Chapter 2 – Continued
3	1/28	Chapter 2 – Continued
4	2/4	Chapter 3 – Circuit Parameters
5	2/11	Chapter 3 - Continued
6	2/18	Chapter 3 – Continued
7	2/25	Chapter 4 – The Basic Time Domain Circuit
8	3/3	No classes – Spring Break
9	3/10	Chapter 4 - Continued
10	3/17	No class Wednesday or Friday – Easter Break Chapter 5 – Laplace Transform
11	3/24	Chapter 5 - Continued
12	3/31	Chapter 5 – Continued
13	4/7	Chapter 6 – Circuit Analysis by Lapalace Transform
14	4/14	Chapter 6 – Continued
15	4/21	Chapter 6 - Continued Chapter 7 – System Considerations
16	4/28	Chapter 7 - Continued
Finals		Final Exam Monday, May 5, 3:00-5:30pm

ECET-431 – Microprocessor Interfacing 4 Credits

Instructor: Dr. Brian Howell http://paws.wcu.edu/bhowell

Contact Info: Office Hours: Posted on Door Belk 369
Please call or e-mail if additional time is needed. I can be contacted at the following;
Office: 828-227-2472
E-mail: bhowell@email.wcu.edu

Office Location: 369 Belk Building

Meeting Periods: Lecture – Tues, Thurs, 9:30-10:45 pm Belk 370, Lab Tues 3:35-5:15 Belk 370

Course Description: Study of microprocessor fundamentals including architecture, instruction sets, and programming. Interfacing 8086 microprocessor based equipment to external hardware. 3 Lecture, 2 Lab.

Prerequisites: ECET 331 and CS 301 or CS 140

Required Text: Barnett, Cox, and O'Cull, Embedded C Programming and the Microchip PIC, Thomson-2004. ISBN: 140183748-4

Method: Two lecture/discussion period per week, one lab per week, and reading assignments. Open class discussion is an important element of this class. Students are responsible for the content of all reading assignments whether or not the material is covered in class. Additionally all students will be required to utilize the assigned software for project administration.

Evaluation There will be one hourly exam, a final, 7-8 homework assignments, 10 laboratory exercises, and one project

Labs:	20%
Homework:	10%
Test1:	20%
Final:	20%
Project:	30%

Grading Scale: Letter grades will be based on the scale below:

Grade	Average
A	90-100
B	80-89
C	70-79
D	60-69
F	Below 60

Grades between letter grades will be rounded up or down at the instructor's discretion based upon attendance, classroom involvement, etc.

CC Grade- Composition-Condition Marks:

A student whose written work in any course fails to meet acceptable standards will be assigned a composition-condition (CC) mark on the final grade report. All undergraduates who receive two (2) CC grades prior to the semester in which they complete 110 hours at Western Carolina University are so notified by the registrar and are required to pass English 300 before they will be eligible for graduation. This course must be taken within two (2) semesters of receiving the second CC and must be passed with a grade of C (2.0) or better. (Undergraduate Catalog, p. 65)

Attendance: Students are responsible for punctual and regular attendance in all laboratories, classes, and other class activities. Students are urged to reserve their absences for emergencies. Except in extenuating circumstances and with approval from the departmental dean, instructors withdraw students from class when the student exceeds the allowable number of absences. For this class the allowable number of absences is 6 lecture hours.

Assignments: **Students are required to do original work on graded, in-class exams** and to exhibit high ethical standards. They are expected to bring all necessary equipment, texts, etc. to classes and labs. Labs are conducted at scheduled times, and for appropriate credit lab reports are due at specified times. Labs and field trips are scheduled/preformed for the experience of the endeavor; therefore attendance is mandatory for a grade. Work or other conflicts at affect the student's attendance must be approved by the instructor in advance of the schedule lab conflict. Lab reports will be either informal or formal. Informal labs will typically be done during the lab and turned in at the end of the period. For instructions on formal labs see the lab format instructions. Most labs are conducted in a teaming format wherein the students do data gathering and repetitive calculations as a group, but formal lab reports are to be original and done by the individual.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue. **Please see Undergraduate Student Handbook for all related policies and procedures. http://www.wcu.edu/studentd/StudentHandbook**

University definition of Academic Dishonesty: From the Student Handbook: Conduct, Article 4:

1. *Acts of dishonesty, including but not limited to, the following:*

   a. *Cheating, plagiarism, or other forms of academic dishonesty.*

   b. *Furnishing false information to any university official, faculty member, or office.*

   c. *Forgery, alteration, or misuse of any university document, record, or instrument of identification.*

   d. *Tampering with the election of any university-recognized student organization.*

   Note: Resolution of academic honesty complaints will normally be handled within the appropriate college according to the provisions of the Academic Honesty Policy. Records of academic dishonesty cases are maintained in the Office of Student Judicial Affairs.

Disabilities: Accommodations for Students with Disabilities:
Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Kimberly Marcus for more information. Phone: (828) 227-7234; E-mail: kmarcus@email.wcu.edu.

Classroom Conduct: Classroom conduct is guided explicitly in the *Student Handook, Code of Conduct, Article 4*. **In general the code of conduct your mother probably taught you covers the bases for the class:**

1. *Use polite speech, no foul or demeaning language*
2. *No talking during lecture unless we're all discussing the material*
3. *Please and thank you work quite nicely to get what you want*

4. *Put back what you take for use in the lab, aka clean up your mess.*

5. *Don't do anything that disrupts the class for the teacher or more importantly for the other students. It their nickel too!*

Cell Phones, DVD, Pagers, Teleportation, or Other Communications/Entertainment devices:

No Cell Phones or radios on in Class. Yon don't like them interrupting you so same goes in class. It's your nickel for tuition, get the most out of it.

WEEKLY LESSON PLAN

Wk#1-2:	CCS PIC Compiler, Embedded C Fundamentals
Wk#4-6:	Digital I/O, Timers, Interrupts, A/D
Wk#7-9:	Port D/E, "Intel" Type Interfacing, external chip expansion
Wk#10-11:	Serial I/O- UART, SPI, I2C
Wk#12-15:	Projects, Multidrop, RS485, embedded Internet, USB, CAN

Objectives:

Upon satisfactory completion of this course the student will be able to do the following:

A.) Develop microcontroller based products for mixed signal applications

B.) Expand the capabilities of a microcontroller using external components

C.) Connect multiple microcontrollers in various configurations to communicate and control information

D.) Identify the steps in project development and demonstrate said in a guided design activity

E) To demonstrate competency in documenting and managing a design activity and reporting in both written and verbal venues, the results

Assessment Objectives:

1. an ability to apply technologies of embedded microprocessor/microcontroller systems to problems in measurement and control of automated systems
2. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes,
3. an ability to function effectively on teams,
4. an ability to communicate effectively, orally and in written form, technical information, and to discuss this information with peers and others;
5. a recognition of the need for, and an ability to engage in lifelong learning,
6. an ability to understand professional, ethical and social responsibilities,
7. a respect for diversity and a knowledge of contemporary professional, societal and global issues,
8. a commitment to quality, timeliness, and continuous improvement

ECET 452-01 & 75: Control Systems

Thank God for mathematics!

Fall 2007
BL 370
ECET 452-01 (Lecture) TR 12:35p.m.-1:50p.m.
ECET 452-75 (Lab) R 3:35p.m.-5:15p.m.

Instructor: Peter C. Tay, Ph.D. Belk 360 (temp) (828)227-2161 ptay@email.wcu.edu
Office Hours: T 2:00p.m.-5:00p.m., W 10:00a.m.-12:00p.m., and by appointment
Schedule: http://paws.wcu.edu/ptay/Fall_2007/Schedule.html
Course Web Page http://paws.wcu.edu/ptay/ECET452/ECET452_Fall_2007.html

I. Course Aims and Objectives:

- **Aims**
  This course will teach the students the fundamentals of control theory.
- **Specific Learning Objectives**:
  With successful completion of this course, the student will:
  - understand fundamentals of control system theory and system parameters.
  - apply Laplace transform techniques to the analysis of and design of a variety of continuous-time control systems.
  - mathematically design proportional, integral, and derivative controllers given a set of system criteria.
  - write computer programs for the simulation of control system performance.
  - analyze, design, and test operational amplifiers used in control systems
- **ECET 452-75 (Lab)**
  - The lab will be aimed specifically to address students' deficiencies (mathematics, Matlab programming, etc).
  - The content of the lab will be determined by the students in attendance.
  - Although the lab is scheduled to end at 5:15p.m., the instructor will stay as long as needed.

II. Course Materials

Course readings:

- S.K. Gupta, *Elements of Control Systems*, Prentice Hall, 2002.
- G. F. Franklin, J. D. Powell, and M. Workman, **Digital Control of Dynamic Systems Third Edition**, Addison Wesley Longman, 1998. ISBN: 0-201-82054-4
- Required supplementary readings will be handed out in class or posted on the course WebCat page.

III. Expectations of Students/Course Policies

- Statement on Accommodations for students with disabilities:

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c. **Plagiarism—**Intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.
d. **Facilitation of Academic Dishonesty**—Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his/her department head, and the Associate Dean of the Graduate School when the student is a graduate student, in writing of the academic dishonesty charge and sanction.

(See Student Handbook http://www.wcu.edu/studentd/StudentHandbook**.)**

- Attendance is required on the first day of class. Otherwise an administrative withdrawal maybe issued and the student may have to reenroll to get credit for participating in this course.
- No late assignments, projects, or exams, please.
- I encourage the use of the internet and other resources.

IV. Grading Procedures:

	Percentage of Grade Or number of points	***Student's score***
[1]**Mid-Term Examination (no aids)**	15%	
[2]**End of Term Examination**	15%	
[3]**Homework**	50%	
[4]**Final Examination**	20%	
	100%	

Letter grades will be assigned according to the following:

Final Grade	Letter Grade	Final Grade	Letter Grade
92 – 100%	A	72 - 77 %	C
90 – 91%	A-	70 – 71%	C-
88 – 89%	B+	68 – 69%	D+
82 – 87%	B	62 – 67%	D
80 – 81%	B-	60 – 61%	D-
78 – 79%	C+	0 – 59%	F

[1]The mid-term examination will test the student on the basic concepts and practices covered in the course thus far. This examination will be taken at a designated location. This exam will be closed book/closed notes. The use of a non-programmable calculator will be allowed. A sheet of Laplace Transforms will be given at the start of the exam for the student to use.

[2]The end of term examination will test the student on topics covered since the mid-term examination. This examination will be taken at a designated location. This exam will be open book and open notes. The use of a non-programmable calculator will be allowed.

[3]Homework will be assigned throughout the semester.

[4]The final exam will be taken at a designated location. The use of book(s), notes, and the use of a non-programmable calculator will be allowed.

V. Tentative Course Schedule

May change to accommodate guest presenters & student needs

Week of	Topic	Book Section	Homework
Aug. 20, 2007	Basic Concepts, Block Diagrams	Chapter 1,2	Assignment 0
Aug. 27, 2007	Block Diagrams, Laplace Transforms	Chapter 2, 3	
Sept. 3, 2007	Laplace Transforms	Chapter 3	Labor Day, Assignment 1
Sept. 10, 2007	Laplace Transforms	Chapter 3	
Sept. 17, 2007	Modeling of Linear Systems	Chapter 4	Assignment 2
Sept. 24, 2007	Review	Chapters 1-4	Mid Term Exam (Sept. 27, 2007)
Oct. 1, 2007	Transient Response	Chapter 5	Assignment 3
Oct. 8, 2007	Transient Response	Chapter 5	
Oct. 11-15, 2007	Fall Break		
Oct. 15, 2007	Frequency Response	Chapter 6	Assignment 4
Oct. 22, 2007	Frequency Response	Chapter 6	
Oct. 29, 2007	Transfer Functions	Chapter 7	Assignment 5
Nov. 5, 2007	Transfer Functions	Chapter 7	
Nov. 19, 2007	Stability	Chapter 8	Assignment 6
Nov. 21-25	Thanksgiving		
Nov. 26, 2007	Stability	Chapter 8	
Dec. 3, 2007	Review	Chapters 5-8	End of Term Exam (Dec. 6, 2007)
Dec. 8-14, 2007	Final Exam	Chapters 1-8	Time and location TBA
If time allows	Various Controllers	Chapters 9, 10, & 12	

ECET 461 - 01 & 30: Digital Signal Processing

Spring 2008
Belk 370
Lecture: M 1:25p.m.-3:05p.m.
Lab: W 1:25p.m.-3:05p.m.

Instructor: Peter C. Tay, Ph.D. Belk 221 (828)227-2161 ptay@email.wcu.edu
Office Hours: MW 3:30p.m.-5:00p.m., TR 9:00a.m.-1:00p.m., or by appointment
Schedule: http://paws.wcu.edu/ptay/Spring_2008/Schedule.html
Course Web Page http://paws.wcu.edu/ptay/Spring_2008/ECET461/ECET461.html

I. Course Aims and Objectives:

- **Aims**
  This course will teach the student the basic topics in digital signal processing (DSP).
- **Specific Learning Objectives**:
  With successful completion of this course, the student will:
  - understand the basic concepts of DSP like the z and Fourier transforms, sampling, quantization, and noise.
  - be able to design finite and infinite impulse response (FIR, IIR) filters.
  - be familiar with several denoising techniques.
  - be proficient in the use of Matlab programming.

II. Course Materials

Course readings:

- V. K. Ingle and J. G. Proakis, *Digital Signal Processing Using MATLAB®* (2nd ed.), 2007, Thomson. ISBN: 978-0-495-07311-6.
- A. V. Oppenheim and A. S. Willsky, *Signals and System* (2nd ed.), 1997, Prentice Hall, ISBN: 0-13-814757-4.
- Required supplementary readings will be handed out in class or posted on the course WebCat page.

III. Expectations of Students/Course Policies

- Statement on Accommodations for students with disabilities:

  Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

- Statement on Academic Integrity (including plagiarism):

  Academic Honesty Policy
  Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:
  a. **Cheating—**Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  b. **Fabrication—**Intentional falsification of information or citation in an academic exercise.
  c. **Plagiarism—**Intentionally or knowingly representing the words, ideas, or computer codes of someone else as one's own in an academic exercise.
  d. **Facilitation of Academic Dishonesty**—Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his/her department head, and the Associate Dean of the Graduate School when the student is a graduate student, in writing of the academic dishonesty charge and sanction.
(See Student Handbook http://www.wcu.edu/studentd/StudentHandbook**.)**

- Attendance is required on the first day of class. Otherwise an administrative withdrawal will be issued and the student will have to reenroll to get credit for participating in this course.
- No late and/or makeup assignments, projects, or exams.
- Engineering is a very time consuming discipline. As the semester progresses the projects will be more complicated and hence require more time from the student.
- I encourage the use of the internet and other resources to find open-source code(s) to complete the tasks of the course. If source code was acquired via open sources, please follow the licensing rules described at http://www.opensource.org.

IV. Grading Procedures:

	Percentage of Grade Or number of points	***Student's score***
[1]**Examination I**	10%	
[2]**Lab Projects**	20%	
[3]**Examination II**	10%	
[4]**Homework**	40%	
[5]**Final Examination**	20%	
	100%	

Letter grades will be assigned according to the following:

Final Grade	Letter Grade	Final Grade	Letter Grade
92 – 100%	A	72 - 77 %	C
90 – 91%	A-	70 – 71%	C-
88 – 89%	B+	68 – 69%	D+
82 – 87%	B	62 – 67%	D
80 – 81%	B-	60 – 61%	D-
78 – 79%	C+	0 – 59%	F

[1]Examination I will test the student on the basic concepts and practices covered in the course thus far.

[2]The details of the lab projects will be given throughout the semester.

[3,5]Examination II will test the student on topics covered since examination I. The final exam will be comprehensive. Although communications with others will not be allowed, exam II and the final exam will be taken at a designated location and the use of book(s), notes, and computers as resources **will be allowed**.

[4]Homework will be assigned throughout the semester.

V. Tentative Course Schedule

May change to accommodate guest presenters & students' needs

Week of	Topic	Book Section	Notes
Jan. 14, 2008	Introduction and MATLAB®	Handout Chapter 1	
Jan. 21, 2008	Discrete-Time Signals and Systems	Chapter 2	Jan. 21: MLK Day Assignment 1
Jan. 28, 2008	Discrete-Time Signals and Systems	Chapter 2	
Feb. 4, 2008	Discrete-Time Fourier Transform	Chapter 3	
Feb. 11, 2008	Discrete-Time Fourier Transform	Chapter 3	Assignment 2
Feb. 18, 2008	Discrete-Time Fourier Transform	Chapter 3	
Feb. 25, 2008	z-Transform	Chapter 4	
Mar. 3-7, 2008	Spring Break		
Mar. 10, 2008	z-Transform	Chapter 4	
Mar. 17, 2008	Discrete Fourier Transform	Chapter 5	Mar. 19-21, 2008: Easter Break
Mar. 24, 2008			March 24: Exam I
Mar. 31, 2008	Digital Filters	Chapter 6	Assignment 3
Apr. 7, 2008	FIR Filters	Chapter 7	
Apr. 14, 2008	IIR Filters	Chapter 8	Assignment 4
Apr. 21, 2008	Quantization and Sample Rate Conversion	Chapter 9 & 10	Review
Apr. 28, 2008			April 28: Exam II
May 3-9, 2008	Final Exam	Time and location TBA	

ECET-464 – Instrumentation 4 Credits

Instructor: Dr. Brian Howell

Contact Info: Office Hours: Wed 9-12 and 1:30-3:30 pm or as announced.
Please call or e-mail if additional time is needed. I can be contacted at the following;
Office: 828-227-2472
E-mail: bhowell@email.wcu.edu

Office Location: 369 Belk Building

Meeting Periods: Lecture – Tues, Thurs, 9:30-10:45 am Belk 370, Lab Tues 4:00-5:40 Belk 370

Course Description: Data acquisition using virtual instruments. Sensors, transducers, and signal conditioning used in the measurement of physical parameters..

Prerequisites: PREQ: ECET 332.

Required Text: Garrett, Patrick, Multisensor Instrumentation 6sigma Design, Wiley, 2002
ISBN 0-471-20506-0

References: Bishop, Robert (2004). Learning with Labview Express, Upper Saddle River, N.J: Pearson/Prentice Hall, ISBN 0-13-117605-6

Derenzo, Stephen (2003). Practical Interfacing in the Laboratory, Cambridge: Cambridge University Press, ISBN 0-521-81527-4

Method: Two lecture/discussion period per week, one lab per week, and reading assignments. Open class discussion is an important element of this class. Students are responsible for the content of all reading assignments whether or not the material is covered in class. Additionally all students will be required to utilize the assigned software for project administration.

Evaluation There will be two hourly exams, a final, 7-8 homework assignments, 10 laboratory exercises, and a final DAQ vi project

Labs:	20%
Homework:	10%
Midterm:	20%
Project	30%
Final:	20%

Grading Scale: Letter grades will be based on the scale below:

Grade	Average
A	90-100
B	80-89
C	70-79
D	60-69
F	Below 60

Grades between letter grades will be rounded up or down at the instructor's discretion based upon attendance, classroom involvement, etc.

CC Grade- Composition-Condition Marks:

A student whose written work in any course fails to meet acceptable standards will be assigned a composition-condition (CC) mark on the final grade report. All undergraduates

who receive two (2) CC grades prior to the semester in which they complete 110 hours at Western Carolina University are so notified by the registrar and are required to pass English 300 before they will be eligible for graduation. This course must be taken within two (2) semesters of receiving the second CC and must be passed with a grade of C (2.0) or better. (Undergraduate Catalog, p. 65)

Attendance: Students are responsible for punctual and regular attendance in all laboratories, classes, and other class activities. Students are urged to reserve their absences for emergencies. Except in extenuating circumstances and with approval from the departmental dean, instructors withdraw students from class when the student exceeds the allowable number of absences. For this class the allowable number of absences is 6 lecture hours.

Assignments: **Students are required to do original work on graded, in-class exams** and to exhibit high ethical standards. They are expected to bring all necessary equipment, texts, etc. to classes and labs. Labs are conducted at scheduled times, and for appropriate credit lab reports are due at specified times. Labs and field trips are scheduled/preformed for the experience of the endeavor; therefore attendance is mandatory for a grade. Work or other conflicts at affect the student's attendance must be approved by the instructor in advance of the schedule lab conflict. Lab reports will be either informal or formal. Informal labs will typically be done during the lab and turned in at the end of the period. For instructions on formal labs see the lab format instructions. Most labs are conducted in a teaming format wherein the students do data gathering and repetitive calculations as a group, but formal lab reports are to be original and done by the individual.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue**. Please see Undergraduate Student Handbook for all related policies and procedures.** http://www.wcu.edu/studentd/StudentHandbook

University definition of Academic Dishonesty: From the Student Handbook: Conduct, Article 4:

1. Acts of dishonesty, including but not limited to, the following:
   a. Cheating, plagiarism, or other forms of academic dishonesty.
   b. Furnishing false information to any university official, faculty member, or office.
   c. Forgery, alteration, or misuse of any university document, record, or instrument of identification.
   d. Tampering with the election of any university-recognized student organization.

   Note: Resolution of academic honesty complaints will normally be handled within the appropriate college according to the provisions of the Academic Honesty Policy. Records of academic dishonesty cases are maintained in the Office of Student Judicial Affairs.

Disabilities: Accommodations for Students with Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

WEEKLY LESSON PLAN

Wk#1-3: Sensor Basics, Basic Labview

Wk#4-6: Power Supply Circuits (Handouts)**Midterm Exam**

Wk#7-9: Analog Tools, Amplifiers, Filters, Structures in Labview

Wk#10-12: A-D Conversion and Sampling, Files in Labview

Wk#13-15: Advanced Topics DAQ in Labview **Final Exam**

Classroom Conduct: Classroom conduct is guided explicitly in the *Student Handbook, Code of Conduct, Article 4*. In general the code of conduct your mother probably taught you covers the bases for the class:

1. Use polite speech, no foul or demeaning language
2. No talking during lecture unless we're all discussing the material
3. Please and thank you work quite nicely to get what you want
4. Put back what you take for use in the lab, aka clean up your mess.
5. Don't do anything that disrupts the class for the teacher or more importantly for the other students. It their nickel too!

Cell Phones, DVD, Pagers, Teleportation, or Other Communications/Entertainment devices:

No Cell Phones or radios on in Class. Yon don't like them interrupting you so same goes in class. It's your nickel for tuition, get the most out of it.

Objectives:

Upon satisfactory completion of this course the student will be able to do the following:

A.) Design systems which read and write digital and analog information

B.) Understand the principles of data acquisition and sampling

C.) Be able to design with and analyze circuitry for common sensors and actuators

D.) Integrate analysis functions into the sensing system

E.) Write virtual instruments in Labview for measurement and control

F.) Identify the common elements to PC based control and measurement systems

G) To demonstrate competency in documenting and managing a design activity and reporting in both written and verbal venues, the results

Assessment Objectives:

1. an ability to apply technologies of PC based data acquisition systems and virtual instruments to problems in measurement and control of automated systems
2. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes,
3. an ability to function effectively on teams,
4. an ability to communicate effectively, orally and in written form, technical information, and to discuss this information with peers and others;
5. a recognition of the need for, and an ability to engage in lifelong learning,
6. an ability to understand professional, ethical and social responsibilities,
7. a respect for diversity and a knowledge of contemporary professional, societal and global issues,
8. a commitment to quality, timeliness, and continuous improvement

ECET-478 – Senior Project Proposal — 1 Credits

Instructor: Dr. Brian Howell- http://paws.wcu.edu/bhowell

Contact Info: Office Hours: Posted on Door Belk 369
Please call or e-mail if additional time is needed. I can be contacted at the following;
Office: 828-227-2472
E-mail: bhowell@email.wcu.edu

Office Location: 369 Belk Building

Meeting Periods: Lecture – Wed 9:00-9:50 AM Belk 370

Course Description: Research methodology, literature review, and industrial writing styles, culminating in a written proposal for a senior design project. S/U grading.

Prerequisites: Senior Standing, and permission of the instructor.

Required Text: None: All previous textbooks as references

Method: Two lecture/problem solving period per week, one lab per week, and homework assignments. Open class discussion is an important element of this class. Students are responsible for the content of all reading assignments whether or not the material is covered in class. Additionally all students will be required to utilize the assigned software for project administration.

Evaluation Written reports.

ECET 478, Senior Project Proposal, is graded as a Pass/Fail course. In accordance with this grading method, each part of the proposal phase will be graded as pass/fail. There are five component parts of the proposal phase. You must get a passing grade for Part 5, and you must pass 3 of the other 4 Parts.

1. Initial Project Definition. A written non-technical overall description of the proposed project. See Initial Proposal Instructions.

2. Oral Presentation on Project Schedule. An informal discussion of the project with the class. Describe your project in general terms and the timeline for complete project. The class will grade you on your presentation.

3. Oral Presentation of Preliminary Hardware Design and Parts List. Conduct any needed research and identify all of the crucial parts needed to complete you project. Crucial parts are those that are not normally in ECET supply stock or cannot be bought locally. Submit a schematic and parts list. Parts are to be identified by part number, manufacturer, and source. Your instructor will place parts supplied by the lET department on order at this time.

4. Final Oral Presentation of the complete proposal. The class will grade you on your oral presentation.

5. Final Written Project Proposal. The final proposal consists of a detailed written technical description of your project. Refer to the Final Report Instructions. A status report on the parts must be included. This is also the first action item of ECET 479, Senior Design Project.

Grading Scale: S/U

CC Grade- Composition-Condition Marks:

A student whose written work in any course fails to meet acceptable standards will be assigned a composition-condition (CC) mark on the final grade report. All undergraduates who receive two (2) CC grades prior to the semester in which they complete 110 hours at Western Carolina University are so notified by the registrar and are required to pass English 300 before they will be eligible for graduation. This course must be taken within two (2) semesters of receiving the second CC and must be passed with a grade of C (2.0) or better. (Undergraduate Catalog, p. 65)

Attendance: Students are responsible for punctual and regular attendance in all laboratories, classes, and other class activities. Students are urged to reserve their absences for emergencies. Except in extenuating circumstances and with approval from the departmental dean, instructors withdraw students from class when the student exceeds the allowable number of absences. For this class the allowable number of absences is 6 lecture hours.

Assignments: **Students are required to do original work on graded, in-class exams** and to exhibit high ethical standards. They are expected to bring all necessary equipment, texts, etc. to classes and labs. Labs are conducted at scheduled times, and for appropriate credit lab reports are due at specified times. Labs and field trips are scheduled/preformed for the experience of the endeavor; therefore attendance is mandatory for a grade. Work or other conflicts at affect the student's attendance must be approved by the instructor in advance of the schedule lab conflict. Lab reports will be either informal or formal. Informal labs will typically be done during the lab and turned in at the end of the period. For instructions on formal labs see the lab format instructions. Most labs are conducted in a teaming format wherein the students do data gathering and repetitive calculations as a group, but formal lab reports are to be original and done by the individual.

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   d. *Tampering with the election of any university-recognized student organization.*

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Classroom Conduct: Classroom conduct is guided explicitly in the *Student Handook, Code of Conduct, Article 4*. In general the code of conduct your mother probably taught you covers the bases for the class:

1. Use polite speech, no foul or demeaning language
2. No talking during lecture unless we're all discussing the material
3. Please and thank you work quite nicely to get what you want
4. Put back what you take for use in the lab, aka clean up your mess.
5. Don't do anything that disrupts the class for the teacher or more importantly for the other students. It their nickel too!

Cell Phones, DVD, Pagers, Teleportation, or Other Communications/Entertainment devices:

No Cell Phones or radios on in Class. Yon don't like them interrupting you so same goes in class. It's your nickel for tuition, get the most out of it.

Deliverables Schedule:

Meeting	Deliverable
8/23	None
8/29	None
9/5	None
9/12	Initial Paragraph with project selection
9/19	Paragraph returned to student
9/26	Initial Concept Proposal Due
10/3	None
10/10	None
10/17	Initial Technical Report Due : Theory of Operation, Hardware Block Diagram, Software Flow Chart
10/24	None
10/31	SOW, Schedule, Budget Report
11/7	None
11/14	Draft Proposal Report Complete
11/21	None
11/28	Draft Oral Presentation
12/5	External Peer Review, Oral Presentation
12/12	Final Written Report Due, Parts List as addendum

Objectives:

Upon satisfactory completion of this course the student will be able to do the following:

The student will be able to define a project with a limited scope and achievable goals. The student will use accepted engineering practices to achieve the goals and be able to integrate course work from previous studies. One objective is to develop in each student an appreciation of the realities in designing and constructing an electronic system or project. This includes evaluating technical feasibility, system or product cost, parts availability, construction or manufacturing techniques, schedules, and testability.

The student will provide interim progress reports, submit a formal written proposal, and present a formal oral report to the class. Upon completion of the course, each student will have selected a satisfactory senior project and will have a written plan to implement this project.

Assessment Course Learning Objectives:

1. Define a systems level project incorporating appropriate research methods, prior course material, and an analysis of necessary resources.

2. Incorporate fundamental elements of project management, including milestones, time lines, resource allocation, budget analysis, and success criteria.

3. Prepare and present a formal oral report of design project proposal.

4. Prepare a written technical report of design project proposal.

5. Effectively collaborate with other class members or outside vendors.

COURSE SYLLABUS

Instructors:

Dr. Robert Adams
Office Hours: see office door
Office Room: 335 Belk Building
Office Tel.: 227-2437
e-mail: radams@email.wcu.edu

Dr. Brian Howell
Office Hours: see office door
Office Room: 339 Belk Building
Office Tel.: 227-2472
e-mail: bhowell@email.wcu.edu

COURSE DESCRIPTION:

Organizing, planning, and implementing a project using acceptable industrial techniques culminating in a formal written report and oral presentation.

PREQ or COREQ: ECET 478.
Semester Credits: 3
Contact Hours: 5 (1 Lecture, 4 Lab).

COURSE TEXTS:

All texts from previous courses.

LEARNING OUTCOMES, ACTIVITIES, AND EVALUATION PROCEDURES:

A. General Course Goals/Objectives:

The Senior Design Project is a capstone course that can verify that the graduating student is able to carry out research and implementation of an applied design in electronics. The student must prove that he/she can take an idea from conception though a working prototype, complete with presentations and documentation. The student will use accepted engineering practices to achieve the goals and be able to integrate course work from previous studies. One objective is to develop in each student an appreciation of the realities in designing and constructing an electronic system or project. This includes evaluating technical feasibility, system or product cost, parts availability, construction or manufacturing techniques, schedules, and testability.

Each student will provide interim progress reports, submit a formal written report, and present a formal oral report to the class. The prerequisite, ECET 478, was devoted to project proposal and selection. ECET 479 will be used for actual construction and implementation of the design. Upon completion of the course, each student will have completed a satisfactory senior project and will have written documentation of the implementation of this project.

B. Specific Goals/Objectives (Knowledge, Skills, and Abilities):

Knowledge:

The student will:

1. Know the elements required to construct and test the project.
2. Understand research methods.
3. Demonstrate mastery of fundamental principles of engineering.

Evaluation Strategy: Written reports and lab notebooks.

Skills:

The student will:

1. Document and present results in a professional manner.
2. Use data books for device selection and operation.
3. Build, troubleshoot, and demonstrate subcomponents as required.
4. Use basic instruments to measure, collect, and present technical data.
5. Use the scientific method to achieve the goals.

Evaluation Strategy: Written reports, lab notebooks.

Abilities:

The student will:

1. Manage the time and resources required to complete the project, using the proposal schedule.
2. Be able to integrate previous course material with a design solution.
3. Demonstrate the ability to communicate effectively through both written and verbal skills.
4. Prepare a formal report.
5. Demonstrate ability to use engineering references and resources.

Evaluation Strategy: Written and oral reports.

COURSE REQUIREMENTS:

Computer Usage:
All projects must have a computer component that can be part of the design process, an integral part of the system operation, a simulation of the design, or the processing and analysis of data developed by the project. In addition, students are expected to be able to use computers in the presentation of this project.

Calculus Usage:
As required.

Library Usage:
In this course, a formal report is required, and the students are expected to thoroughly research their topics. While much material for these reports is available in the University library, some information is available in the Departmental data book library. The student is expected to be able to find the necessary references, either from the University library, the Departmental libraries, the manufacturers, or from work.

Oral and Written Communications Requirements:
A major emphasis of the senior project is the oral and written presentation of interim and final results. As the students develop their designs, they must deliver oral progress reports, written progress reports, and the final written report.

The University policies on Attendance, Grading, Conduct, and Honesty will be strictly adhered to. University regulations may be found in the Student Handbook.

Students who are covered under the American Disability Act should privately inform the teacher of the fact so that appropriate instructional arrangements can be made.

GRADING STANDARDS:

ECET 479, Senior Design Project, is graded using the traditional letter grades.

1. Progress reports. Each week a written progress report is due. Oral reports may be spontaneously requested. A mid-term oral presentation will be required. 40%

2. Mid-term oral presentation 10%

3. Notebooks. Three times during the semester, students will exhibit their notebooks during the weekly progress reporting. 10%

4. Final Oral Presentation. The class and the IEEE local chapter will grade you on your oral presentation. 20%

5. Final Written Project Report, using the required format (attached). 20%

Attachment 1. Course Activities

A. Lecture and Special Assignments:

WEEK	DATE	ASSIGNMENT DUE	Focus
1	1/16		Course Intro., Review of Schedules
2	1/23	Gantt Chart	Objectives
3	1/30	Progress Report 1, Objectives	Theory of Operation
4	2/6	Progress Report 2 Theory of Operation	Schedule and Notebook review
5	2/13	Progress Report 3, Notebook	
6	2/20	Progress Report 4	References
7	2/27	Progress Report 5, References	Test Procedures
8	3/5	Spring Break – **No Class**	
9	3/12	**Mid-term Oral presentations**	Presentations
10	3/19	Easter Break – **No Class**	
11	3/26	Progress Report 6, Test Procedures	Appendices
12	4/2	Progress Report 7, Appendices	Schedule and Notebook Review
13	4/9	Progress Report 8, Notebook	Abstract and Summary
14	4/16	Progress Report 9, Abstract and Summary	PowerPoint
15	4/23	Progress Report 10, PowerPoint Presentation	Review of PowerPoint
16	4/30	**Final Oral presentations**, with IEEE local chapter	Presentations
17	5/7	**Final Written Reports** due	

Attachment 2. Final Report Format

ECET 479 SENIOR DESIGN PROJECT
Final Project Report Format

Table of Contents

Abstract

Objectives

Theory of Operation
- Start with **block diagram**
- Function of **circuit components.**

Design Procedure/Process
- Short description of process of completing the project
- Compare to **schedule**

Performance Results
- **Test equipment**
- Test procedures
- Results

Future Work

Summary

Appendices:
- Data sheets
- **Schematics**
- Program listings
- **Drawings**

References

Items in Bold are part of the Senior Project Proposal.

WESTERN CAROLINA UNIVERSITY
DEPARTMENT OF ENGINEERING AND TECHNOLOGY
KIMMEL SCHOOL OF CMET

COURSE SYLLABUS: SPRING 2008

TEL312 ELECTRONIC COMMUNICATIONS FUNDAMENTALS (4 CREDIT HOURS)

Instructor:	Dr. Robert Adams
Office:	335 Belk Building
Office Telephone:	227-2437
E-mail:	radams@email.wcu.edu
Course Web Site:	http://paws.wcu.edu/radams

Class times:	MW 9:05 – 10:20 am, F 9:05 – 10:45 am, BELK 355
Office Hours:	MT 1 – 3 pm, W 5 – 6 pm, F 1 – 2 pm

COURSE DESCRIPTION:

TEL312 involves the study of basic communications theory, as well as typical communications system blocks. Amplitude Modulation (AM) and Frequency Modulation (FM) will be used as examples to cover analog communications fundamentals. Amplitude Shift Keying (ASK) and Frequency Shift Keying (FSK) will be used as examples to cover digital communications fundamentals. Communications system design will be implemented through lab experiments. Additionally, Matlab® will be used for communications system simulation and signal analysis.

Prerequisites:	ECET 242 Electronics and Math 153 Calculus I
Credit Hours:	4
Contact Hours:	5 (Lecture: 3 Lab: 2)

REQUIRED TEXT:

Tomasi, W., *Electronic Communications Systems: Fundamentals through Advanced*, Fifth Edition, Prentice Hall, Upper Saddle River, New Jersey, 2004. ISBN 0130494925.

LEARNING OUTCOMES, ACTIVITIES, AND EVALUATION PROCEDURES:

A. General Course Goals/Objectives:

The objective of this course is to introduce the students' knowledge of electronic communications fundamentals. Laboratory experiments are used to verify the lecture contents, and to enhance the students' abilities in communications system block design, measurements, data collection, presentation and analysis.

B. Course Learning Objectives

Upon completion of this course, the student will be able to accomplish the following:

1. Understand and apply basic communications concepts such as signal representation, spectral analysis, signal-to-noise ratio, modulation, and demodulation.
2. Design and implement communications systems using mixers, local oscillators, filters, and amplifiers.
3. Apply software tools to the design and simulation of communications systems.
4. Apply Fourier Series and Fourier Transforms fro the analysis of communication systems.
5. Utilize laboratory instruments and equipment to implement communication systems.
6. Prepare write formal reports of the design, analysis and implementation of communication systems.
7. Understand and discuss government regulations regarding the transmission of communication signals.

Evaluation strategies: Unit tests, and performance with lab experiments with reports.

ADDITIONAL EVALUATION STRATEGIES:

Comprehensive final exam

COURSE REQUIREMENTS:

Computer Usage:
Computers are used for signal generation and Matlab® analysis.

Calculus Usage:
Some knowledge in Calculus required.

Library Usage:
In this course, no formal library assignment is required. However, the students are expected to research for their lab reports. In addition to resources available in the university library, a wide collection of books and magazine articles are available in the Department's data book library in Belk 360.

Oral and Written Communications Requirements:
During the semester, each student will give an oral presentation on circuits studied in the lab. For each lab, the student will discuss the schematic capture procedure and present their data and any corresponding analysis. Each presentation will be evaluated by the instructor and by the other class members. Each student must submit a copy of the presentation to the instructor.

Separate written reports on lab techniques are also required. The topics will be announced during the semester.

The university policies on Attendance, Grading, Conduct, and Honesty will be strictly adhered to. University regulations may be found in the student handbook.

B. Course Learning Objectives

Upon completion of this course, the student will be able to accomplish the following:

1. Understand and apply basic communications concepts such as signal representation, spectral analysis, signal-to-noise ratio, modulation, and demodulation.
2. Design and implement communications systems using mixers, local oscillators, filters, and amplifiers.
3. Apply software tools to the design and simulation of communications systems.
4. Apply Fourier Series and Fourier Transforms fro the analysis of communication systems.
5. Utilize laboratory instruments and equipment to implement communication systems.
6. Prepare write formal reports of the design, analysis and implementation of communication systems.
7. Understand and discuss government regulations regarding the transmission of communication signals

TEL312 Course Syllabus, Spring 2008

Students who are covered under the American Disability Act should privately inform the teacher of the fact so that appropriate instructional arrangements can be made.

GRADING POLICY:
The percentage weights of the semester grade will be distributed as follows:

Hour tests/exams (2)	30	%
Final Exam	30	%
Homework	15	%
Lab Reports	25	%
Total	100	%

Instructor's Special Grading Policy Comments:

Homework is due on Wednesday for the previous week.
All labs must be observed, signed and dated by the instructor.
Late labs and homework will receive a zero.
Lab books are due in class on Friday following the last lab period.
No make-up exams without prior approval from the instructor.
Any assignment missed due to an excused absence will be due during the next class period.
All exams are closed book, closed notes.
A sheet of useful formulas will be provided for each exam.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

Course Activities – Lectures (Tentative)

Week		Subject	Exam dates
1	1/14-1/18	Chapter 1 – Intro. To Electr. Communications	
No Class on Monday Jan. 21			
2	1/23-1/25	Chapter 2 – Signal Analysis and Mixing	
3	1/28-2/1	Chapter 2 – Signal Analysis and Mixing	
4	2/4-2/8	Chapter 2 – Signal Analysis and Mixing	
5	2/11-2/15	Chapter 4 – AM Transmission	
6	2/18-2/22	Chapter 4 – AM Transmission	Exam 1 Feb 20
7	2/25-2/29	Chapter 5 – AM Reception	
3/3-3/7		No Class - Spring Break	
8	3/10-3/14	Chapter 5 – AM Reception	
9	3/17	Chapter 7 – FM/PM Transmission	
No Class 3/17 to 3/19 - Easter Break			
10	3/24-3/28	Chapter 7 – FM/PM Transmission	
11	3/31-4/4	Chapter 8 – FM/PM Reception	
12	4/7-4/11	Chapter 8 – FM/PM Reception	Exam 2 April 9
13	4/14-4/18	Chapter 8 – FM/PM Reception	
14	4/21-4/25	Chapter 3 – Phase Locked Loops	
15	4/28-5/2	Review for Final	

The Final Exam is on Tuesday, May 6, 2008, 8:30 – 11:00 am in Belk 355.

Prof. Scott Heggen
Course Syllabus
Fall 2007

Course Description

Local Area Networks – In this course, you will learn about transmission equipment, switching technologies, interconnection, and protocols associated with the telecommunications industry. The first three levels of the OSI model will be emphasized. The transmission of data across small geographical areas is the primary focus of this course.

Learning Objectives

Upon completion of the course, the student will:

- Design and implement local area networks to specified operational criteria.
- Apply software tools to the design and operation of computer-based networks.
- Analyze various computer network data structures.
- In a laboratory setting, utilize hubs, bridges, routers, and switches to implement local area networks.
- Prepare written formal reports of the design, analysis and implementation of local area networks.

Prerequisites

ECET 290 or permission of instructor.

Instructor

Scott Heggen
Office: Belk 368
Phone: (828) 227-2525
Email: sheggen@wcu.edu

Office Hours

If you are having difficulty with any material, do not hesitate to visit me in my office or contact me through the above contact information. My office hours will be posted on my door.

Required Text

Odom, Wendell and Knott, Tom, *Networking Basics: CCNA 1 Companion Guide*, 2006, Cisco Press.

Class Procedures

In addition to class lectures and reading assignments, there will be a weekly lab session. Classes will be held in CAT 220. Labs will be held in CAT 221. The student is expected to attend all classes and labs. Absences will be reflected in your grade.

Evaluation and Grading

Final grades will be determined by the following grading scale and weights.

Assignment/Activity	**Points**
Final Exam/Lab Final	20%
Midterm	20%
Labs	40%
Quizzes and Assignments	15%
Attendance and Participation	5%
Total	100%

Grading Scale

100-93	A	76-73	C
92-90	A-	72-70	C-
89-87	B+	69-67	D+
86-83	B	66-63	D
82-80	B-	62-60	D-
79-77	C+	<60	F

Honor Code

You are expected to complete your work on your own. Cheating on exams or assignments will result in an F for the course. If you are unsure about what you are allowed to work together on, and what is expected to be individual work, **ask me first!** Any duplicate work will be considered cheating unless it is a group assignment, or is authorized by the instructor. Refer to the Student Handbook for policies and procedures: http://www.wcu.edu/studentd/studenthandbook.

Students with Disabilities

Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Kimberly Marcus for more information. Phone: (828) 227-7234; Email: kmarcus@email.wcu.edu.

Schedule of Classes

Lectures will occur every Tuesday and Thursday from 9:30 am - 10:45 am in CAT 220.
Section 30 labs will occur every Wednesday from 1:25 pm - 3:05 pm.
Section 31 labs will occur every Friday from 1:25 pm - 3:05 pm.

Schedule of Topics

Below is a schedule of topics for each lecture:

Date	Chap.	Classroom Topic	Lab Topic
Aug. 21	1	Overview of the class; Syllabus and topics discussion	
Aug. 23	1	Networking Math	Lab 1 - Setup and Introduction to Basic Tools
Aug. 28	1	Networking Math	
Aug. 30	2	Networking Fundamentals - Devices	Lab 2 – Connecting Two Computers
Sept. 4	2	Networking Fundamentals – Devices and Topologies	
Sept. 7	2	Topologies, Bandwidth, Networking Models	Lab 3 – Cable Building
Sept. 11	2	Networking Models	
Sept. 13	3	Networking Media	Lab 4 – Connecting a Home Network
Sept. 18	5	Cabling LANs and WANs	
Sept. 20	5	Cabling LANs and WANs	Lab 5 – Connecting through a Hub
Sept. 25	6	Ethernet Fundamentals	
Sept. 27	6	Ethernet Operations	Lab 6 – Connecting through a Switch
Oct. 2	7	Ethernet Technologies	
Oct. 4		Review	Lab 7 – Connecting to a Router
Oct. 9		Midterm Exam	
Oct. 11		Fall Break	Review for Midterm (No labs)
Oct. 16	8	Ethernet Switching	
Oct. 18	9	TCP/IP Protocol Suite and IP Addressing	Makeup for any missed labs
Oct. 23		Advising Day (No Classes)	
Oct. 25	9	TCP/IP Protocol Suite and IP addressing	Lab 8 – Layer 3
Oct. 30	9	IP Addressing and Subnetting	
Nov. 1	10	Routing Fundamentals and Subnets	Lab 9 – DHCP
Nov. 6	10	Routing Protocols	
Nov. 8	10	IP Subnetting	Lab 10 – Subnetting (1)
Nov. 13	10	IP Subnetting	
Nov. 15	10	IP Subnetting	Lab 10 – Subnetting (2)
Nov. 20	10	IP Subnetting	
Nov. 22		Thanksgiving Break	No Lab
Nov. 27	11	TCP/IP Transport Layer	
Nov. 29	11	TCP/IP Application Layer	Lab 11 – Comparing Routing Protocols
Dec. 1			
Dec. 4			Review for Final
Dec. 6		Review	
Dec.?		Final Exam	

APPENDIX B – FACULTY RESUMES

The resumes of the ECET faculty are presented below in the following order:

ECET Faculty Member
Robert Adams
Scott Heggen
Brian Howell
Peter Tay
Paul Yanik

ROBERT D. ADAMS

ASSISTANT PROFESSOR
Department of Engineering and Technology
Western Carolina University
Cullowhee, NC 28723
(828) 227-2437
radams@email.wcu.edu

EDUCATION

PhD in Electrical Engineering, University of Alabama in Huntsville, Huntsville, AL. Spring 2004.
Major: Digital Signal Processing
First Minor: Mathematics Second Minor: Electromagnetics
Dissertation Title: "Mathematical Modeling of Electrocardiographic Applications"
M.S. in Electrical Engineering, Johns Hopkins University, Baltimore, MD, 1991.
B.S. in Electrical Engineering, Clarkson University, Potsdam, NY, 1983.

PROFESSIONAL EXPERIENCE

Assistant Professor – Western Carolina University, Cullowhee, NC.
August 2003 -- present. Responsible for teaching courses in Electrical and Computer Engineering Technology, directing the Electrical and Computer Engineering Technology Program, and advising the WCU student branch of the Insitute of Electrical and Electronics Engineers (IEEE).

Graduate Teaching Assistant -- University of Alabama in Huntsville, Huntsville, AL. August 1996 -- December 2001. Responsible for teaching undergraduate electrical engineering courses in Electronics and FORTRAN and C programming and laboratory courses in Introductory Signals and Systems and Digital Signal Processing.

Intern Engineer -- Texas Instruments, Houston, TX, Summer 1999.
Developed a portable heart monitor for the TMS320C54 digital signal processor (DSP).

Lecturer -- Buffalo State College, Buffalo, NY. September 1993 -- June 1996. Responsible for teaching students and developing coursework in a 4-year Electrical Engineering Technology Program. Courses included: Electrical Circuits and Devices, Electronics, Transform Analysis, Electrical Power Distribution, Electrical Machinery, and Energy Systems. Most of these courses involved 2.5 hours of classroom instruction and 2 hours of laboratory instruction per week.

Research Engineer -- IIT Research Institute, Rome, NY. December 1992 -- April 1993. Monitored electromagnetic compatibility (EMC) testing of a VOR/DME aircraft beacon and authored an evaluation of the test results. Aided in the design of EMC improvements.

President – Campus Hill Computers, Syracuse, NY. December 1991 – December 1993. Sales and service of personal computers. Size of company: 3 employees.

Electrical Engineer -- Electromagnetic Compatibility Analysis Center (ECAC), IIT Research Institute, Annapolis, MD. August 1982 -- February 1991. Conducted Electromagnetic Compatibility (EMC) Tests of DME/TACAN Aircraft Interrogators. Provided technical consultation to dozens of engineers working on EMC analyses of Space Systems. Tested and wrote technical documentation for a terrain-dependent medium frequency (MF) propagation model.

PROGRAMMING LANGUAGES Proficient in Assembly, BASIC, C, C++, FORTRAN, MATLAB, Pascal, VHDL, and Unix.

HARDWARE TMS320C30, C5000, and C6000 DSP's, Motorola 68000, Altera FPGA and CPLD.

PUBLICATIONS (last 5 years)

Adams, R.D., Zhang, J.Z, & Burbank, K. (2007). Graduate / Undergraduate Teaming of ECET Students for Applied Research via Senior Projects. *Proceedings of the 2007 American Society for Engineering Education (ASEE) Annual Conference and Exposition*.

Zhang, J.Z., Adams, R.D., & Burbank, K. (2007). Using Matlab to Improve Learning Effectiveness and Quality in an Undergraduate Course on Wireless Communications and Systems. *Global Journal of Engineering Education, Vol.11, No.1*.

Adams, R.D., Zhang, J.Z, Yanik, P. & Burbank, K. (2006). A Digital Logic Based Experimental Design of a DSP/Communication System for ECET Students. *Proceedings of the 2006 American Society for Engineering Education (ASEE) Annual Conference and Exposition,* Session 1029.

Adams, R.D., Zhang, J.Z, & Azadpour, M. (2006). Lossless Image Decomposition and Reconstruction Using Haar Wavelets in Matlab® for ECET Students. *Proceedings of the 2006 American Society for Engineering Education (ASEE) Annual Conference and Exposition,* Session 1126.

Zhang, J.Z, Adams, R.D. & Burbank, K. (2005). The design of RF labs using Mini-Circuit modules to improve the quality of teaching wireless communications and systems. *World Transactions on Engineering and Technology Education*, 4(1), pp. 39-42.

Zhang, J.Z, Adams, R.D. & Burbank, K. (2005). Theory, Practice, and Systems – A New Approach to Teaching Electronic Communications with MATLAB. *Special Issue on MATLAB and SIMULINK in Engineering Education, International Journal of Engineering Education*, 21(4).

Zhang, J.Z, Adams, R.D. & Burbank, K. (2005). A Modular Approach to Teaching "Wireless Communications and Systems" for ECET students. *Proceedings of the 2005 American Society for Engineering Education Annual Conference and Exposition*, Session 1649.

Adams, R.D., Singh, N., Adhami, R. (2004). A Finite Difference Solution to the Forward Problem of Electrocardiography. *Proceedings of the 2004 International MultiConference in Computer Science & Computer Engineering*, pp. 1567-161.

HONORS

IIT Research Institute Commitment to Excellence Award, 1990
WCU College of Applied Sciences Student Engagement Award, 2007
WCU Kimmel School Student Engagement Award, 2008

PROFESSIONAL SOCIETIES Senior member of IEEE and member of ASEE

PROFESSIONAL AND INSTITUTIONAL SERVICE

Reviewer of the International Journal of Modelling and Simulation, 2006 – present
Faculty counselor of the WCU Student Branch of IEEE, 2004 – present
Author of the 2006 and 2008 ABET Self-Studies of the ECET Program
WCU Educational Technologies Advisory Council member, 2004 – 5
Dean's Faculty Advisory Council member, 2007 – present
Kimmel School Safety Committee member, 2004 – present

Percentage of time available for research or scholarly activities: 10 %
Percentage of time committed to the ECET program: 80 %
The remaining 10 % is for professional and institutional service outside of the ECET program.

SCOTT HEGGEN

3803 Tilley Creek Road • Cullowhee, NC, 28723 • Sheggen@wcu.edu • Home: (828) 293-2482 • Work: (828) 227-2525

WORK EXPERIENCE

Western Carolina University
Visiting Assistant Professor *Spring 2007 – Current*

- Courses taught:
  - Electronic Drafting and Fabrication (ECET 211)
  - Electrical Systems (ECET 301)
  - Introduction to Local Area Networks (TEL 345)
  - Wide Area Networks (TEL 346)
  - Network Planning and Design I (TEL 445)
  - Telecommunications Management (TEL 446)
  - Instrumentation and Networks Laboratory (EE 212)
  - Electromagnetic and Electronic Devices Laboratory (EE 312)

Numerous part time jobs were held to finance undergraduate and graduate education. A full list is available upon request.

EDUCATION

Western Carolina University
MS – Technology Fall 2005 – Fall 2006 GPA: 3.85

- Researched ultra wideband technology in communications and sensing applications
- Supervised UNCC/WCU joint program undergraduate electrical engineering courses
- Managed a team of five students and a Microsoft Project Gantt chart for the Foothills Relocation Project
- Led a group in a telecommunications project for implementing a remote laboratory for distance education students
- Created and implemented a bar code-based system for tracking students' attendance
- Fabricated twelve Radio Frequency transmitter and receiver PCBs for undergraduate wireless communication courses
- Successfully completed courses in the following subjects:
  - Project Management
  - Quality Assurance
  - Data Acquisition, Systems Control, and Biometrics
  - Design of Experiments
  - Quantitative Analysis
  - Telecommunications and Network Systems

BS – Telecommunications Engineering Technology | Fall 2003 – Spring 2005 | Magna Cum Laude GPA: 3.800

- Experience with Cisco routers, switches, and firewalls in laboratory environments
- Researched ultra wideband technology in communications applications
- Created transmitter and receiver PCBs for an ultra wideband project
- Simulated electrical circuits using PSpice
- Successfully completed courses in the following subjects:
  - Telecommunications (LAN, WAN, Telecommunications Management, Network Planning and Design)
  - Electrical theory (Electrical communications, Wireless, Fourier Transforms)
  - Mathematics (Calculus II, III, Calculus-based Statistics)
  - Technical writing
  - Public speaking

Central Piedmont Community College

AAS – Computer Engineering Technology | Fall 2001 – Spring 2003 | GPA: 3.419

- Successfully completed courses in the following subjects:
  - C Programming
  - Physics I and II
  - Basic electrical theory (DC, AC, transistor theory, digital logic)

Iowa State University

Computer Engineering | Fall 2000 – Spring 2001

- Successfully completed courses in the following subjects:
  - Trigonometry
  - Calculus I
  - Chemistry
  - C Programming I and II

SOFTWARE EXPERIENCE

- Cisco IOS
- CatOS
- Matlab
- PSpice
- IsoPro
- Eagle Layout Editor
- Orcad
- MS-DOS
- Windows Operating Systems (Windows 3.1 through Vista)
- Visual Basic
- C Programming
- Microsoft Office Suite
- Microsoft Project
- Microsoft Visio

AWARDS AND PUBLICATIONS

- October 2006: Attended the International Journal of Modern Engineering (IJME) conference for work with ultra wideband through-wall sensing project
- April 2005: Published by the National Conference for Undergraduate Research (NCUR) for work on ultra wideband data communications project
- Fall 2004 – Spring 2005: Fidelity National Financial Full Academic Scholarship
- Fall 2003 – Spring 2005: Four consecutive Dean's Lists at Western Carolina University
- 2000: Richard A. Meints Memorial Scholarship Activity

Brian P. Howell, Ph.D.
Assistant Professor
Department of Engineering and Technology
Western Carolina University
Cullowhee, NC 28723
Phone wk:(828)227-2472

Education: 5-2004: **Phd, Ocean Engineering,** Florida Institute of Technology, Melbourne, Fl.
Dissertation Topic: **Evaluation of Neural Networks for Classification, Recognition and Navigation in the Marine Environment.**
1988: **Phd Course work, Materials Science**, Univ of Va., Charlottesville, Va.
1-81: **M.E. Electrical Engineering**, University of Virginia, Charlottesville, Va.
5-78: **B.A. cum laude, Physics**, Bridgewater College, Bridgewater, Va.

Work Experience:

Assistant Professor, Electronic and Computer Engineering Technology, Western Carolina University
8-04 to Present: As teaching faculty, I am involved with the teaching and curriculum development for the junior and senior years of the ECET program. Courses include digital design, microcontrollers, virtual instrumentation, and basic circuit analysis. Both embedded and PC based approaches are developed. In addition, Supervising supervising senior undergraduate students in the development of autonomous vehicles for marine exploration and cooperative exploration. And in self adaptive networks for patient monitoring and microclimate research. As program director, I previously have been responsible for the planning and management of the program of approximately 100 students as well as encouraging external engagement with industry.

Graduate Researcher, Florida Tech.

1-01to 7-04: As recipient of Link Fellowship for 2002-2003, I have been responsible for development of both marine vehicles and instrumentation systems. Taught fluid mechanics laboratories and portions of the Naval Architecture 1 course as well as Matlab and naval architecture CAD computer segments in the Introduction to Ocean Engineering class and the high speed small craft class. In the context of the dissertation, I have demonstrated application of neural networks to ship seakeeping, passive sonar, and geophysical data classification for autonomous underwater monitoring and exploration.

Owner, Phoenician Yachts, Inc., Maryville, Tn.

1-98 to 1-01: Owned and operated small custom boat renovation and new boat construction business. In this context, surveyed and refit several fiberglass sailboats as well as performed new construction on two traditional wooden sailboats. I was involved with all aspects of manufacturing including lofting, cold molding, metal casting, steam bending, as well as electrical and plumbing trades.

President, Shenandoah Products, Inc., Maryville, Tn.

6-93 to 12/97: Was involved in every phase of the business, business planning, sales, marketing, R&D, production engineering, Q.C., and service. Successfully developed a line of single gas analyzers under the MESA product name, using infrared techniques which are capable of detecting any single gas family from a menu of over a thousand gases down to 1 ppm.

Development Engineer; Arizona Instrument, Inc. Jerome/Clarkdale, Az.

7-90 to 6-93**:** Job duties included: Thin film fabrication, maintenance, process development, device development, device modeling, and device characterization. Technology involved use of gold thin film depositions and active ceramic substrate materials.

Visiting Assistant Professor; Northern Arizona University, Flagstaff, Az.

9-86 to 7-90: Responsible for supervision of semiconductor and optics labs as well as full time teaching of undergraduate courses in electrical engineering. Approximately 100-150 students/semester. Voted faculty of year 1987-88, Tau Beta Pi, N.A.U. Chapter. Learned Navajo Language to participate in Joint Sacred Mountain Scholars Program. Successfully taught summer bridge program for Hispanic and Native American students in math and technology and improved their math placement scores by two grade levels.

Principal Engineer, Sperry Flight Systems, Phoenix, Az.

10-84 to 9-86:Designed a Class 10 clean room for integrated optics work and flat panel display fabrication. Also I brought up a reactively sputtered amorphous silicon process, laser diode antireflective coating process, and Ti:LiNbO3 waveguide process.

Lead Engineer, Harris Corporation, Melbourne Fla.

1-81 to 1-83; 7-83 to 10-84:Performed analyses of digital fiber optic data buses and wavelength division multiplexing systems; At Semiconductor division, developed radiation hardened CMOS processes and was device engineer developing over a dozen new part types for strategic, tactical, and commercial applications, including the B1-B, Trident 2(D5), cruise missile, and AM stereo.

Worked in CMOS, linear bipolar, and digital bipolar technologies. Product engineer for Trident 1 linear device production. Designed a variety of photo detector, array, and integrated devices.

Senior Engineer, Isomet Corporation, Springfield, Va.

1-83 to 7-83: Performed acousto-optical electrode design and designed and fabricated a 100W acousto-optic laser deflector for CO2 lasers.

Programming Languages/ Software Proficiency

Profiicient in: Fortran, Basic, C, C++, Forth, Pascal, APL, Assembler for Freescale, Intel, Microchip, and Atmel processors. App software includes Matlab, Mathcad, Labview, and OOPIC software. Cad systems include Rhino 3d, Autocad, DesignCad, PowerCADD, Spice, Suprem, ORcad, EAGLE.

Hardware

Microchip PIC 8 bit, Freescale 8 bit, 32 bit (Coldfire), and DSP chips; Atmel Atmega chips, Rabbit semiconductor 3000 series processors.

Publications (Last 5 years):

Howell, B., R. Houghton, and E. Franklin, "Teaching Teachers Beyond the Tool: Incorporating Robotics and Data Collection into Middle and High Schools," ASEE 2008 National Conference, Pittsburgh, PA. June 2008.

Marston, J., J. Zhang, B. Howell, "Graduate Learning through Engagement: Experience in Environmental Remote Sensing Station Design," ASEE 2008 National Conference, Pittsburgh, Pa. June, 2008.

Stone, W., A. Ball, B. Howell, "Integrating LabVIEW® into Engineering Technology Curricula," ASEE SE Conference 2008, Memphis, Tn.

Howell, B., R. Clapp and J. Marston, Tuckaseegee Watershed Observatory: A Collaborative Environmental Research Tool." Third National Conference on Environmental Science and Technology, NCA&T, Greensboro, NC, September, 2007

Howell, B., S. Wood, " Kamikaze: Investigational Autonomous Underwater Vehicle for Collaborative Research and Undergraduate Education and Training," ASEE 2006 National Conference, Chicago, Il. June 2006.

Howell, B. P. (in press). Application of Neural Networks for Environmental Feature Recognition and Navigation in the Marine Environment. *Research Papers of the Link Foundation Fellows, Volume 4*. Rochester: University of Rochester Press.

Howell, Brian P., S. Wood, S. Koksal, "Passive Sonar Recognition and analysis Using Hybrid Neural Networks," Oceans 2003, IEE/MTS, San Diego, Sept, 2003.

Honors:

Lambda Society, Bridgewater College, 1978
Professor of the Year/Engineering, Northern Az University, 1987.
Outstanding Student, Ocean Engineering, Florida Tech, 2003.
Tau Beta Pi, Florida Tech, 2003.

Professional Societies:

Member, Society of Naval Architects and Marine Engineers, 1997-present
Member, IEEE, 2004 to present.
Member, Marine Technology Society, 2001-present
Member, American Society for Engineering Education, 2004-present
Member AUVSI, 2005 - present

Professional and Institutional Service:

WCU Science and Math Education Advisory Board 2006-present
Member ECET search Committees 2006-2008

Percentage of Time Available for research or scholarly activities 15%
Percentage of time committed to the ECET program: 75%
Remaining 10% for professional and institutional service outside of ECET program

Peter Tay, Ph.D.

Assistant Professor
Western Carolina University
Cullowhee, NC 28723
(828)227-2161
ptay@email.wcu.edu

Education

University of Virginia-Charlottesville, VA
Post Doctorate-Biomedical Engineering & Electrical and Computer Engineering Jan. 2005-Sept. 2006

University of Oklahoma, Norman, OK
Doctorate of Philosophy-Electrical and Computer Engineering Dec. 2003

Master of Arts-Mathematics July 1995
Bachelor of Science-Mathematics Aug. 1990

Professional Experience

2007-present
Western Carolina University
Dept. of Electrical and Computer Engineering Technology
Assistant Professor

2007-2008
Alcorn State University
Dept. of Advanced Technologies-Systems Research Institute
Research Scientist

2005-2006
University of Virginia Charlottesville, VA
Dept. of Biomedical Engineering and the Dept. of Electrical and Computer Engineering:
Research Associate

2003-2005
RS Information Systems, Inc. Norman, OK
National Weather Service: Software Engineer

2000-2002
University of Oklahoma Norman, OK
School of Industrial Engineering:
Graduate Research Assistant

1998-2000
University of Oklahoma Norman, OK
School of Electrical and Computer Engineering: Graduate Teaching Assistant

1999-2003
National Weather Service-Radar Operations Center Norman, OK
National Oceanic and Atmospheric Administration Research Participant
ORISE Graduate Research Fellow

1995-1999
University of Oklahoma Norman, OK
Department of Mathematics: Graduate Teaching Assistant and Adjunct Lecturer

Publications (past 5 years)

Book Chapter:

AM-FM Image Models: Fundamental Techniques and Emerging Trends, Handbook of Image Processing Second Edition, A. C. Bovik (ed), Elsevier Academic Press, 2005.

Journal:

Ultrasound despeckling for contrast enhancement, under review IEEE Trans. Image Proc.

3-D segmentation of ultrasound cine slices , under review Jrnl. Computerized Medical Imaging and Graphics.

Left ventricle segmentation using model fitting and active surfaces, in press at Jrnl of Signal Processing Systems for Signal, Image and Video Technology: Special Issue on Biomedical Imaging.

Conference:

Ultrasound despeckling for active contour segmentation, invited paper at Asilomar Conf. on Signals, Systems, and Computers at Pacific Grove, CA, Oct. 26-29, 2008.

AM-FM Image analysis using the Hilbert Huang transform, 2008 IEEE SSIAI at Santa Fe, MN, March 24-26, 2008, pp. 13-16.

Multidimensional segmentation of a mouse left ventricle, 2006 IEEE Int'l Ultrasonics Sypm. at Vancouver, BC Canada, Oct. 2-6, 2006, pp. 2210-2213.

3D Prostate Elastography: Simulations and Experiments, 2006 IEEE Int'l Ultrasonics Sypm. at Vancouver, BC Canada, Oct. 2-6, 2006, pp. 1230-1233.

Ultrasound despeckling using an adaptive window stochastic approach, 2006 IEEE ICIP at Atlanta, GA, Oct. 8-11, 2006, pp. 2549-2552.

A stochastic approach to ultrasound despeckling, 2006 IEEE Int'l Symposium on Biomedical Imaging at Arlington, VA, April 6-9, 2006, pp. 221-224.

A transform method to remove ultrasound artifacts, 2006 IEEE SSIAI at Denver, CO, March 26-28, 2006, pp. 110-114.

Multi-assignment interacting multiple model for tracking micro-bubbles, Conference Record of the Thirty-Nineth Asilomar Conference on Signals, Systems and Computers, October 30-November 2, 2005.

JPEG 2000 scalar quantization using an optimally frequency localized modulated lapped transform, 2005 IEEE ICIP at Genova, Italy, September 11-14, 2005, vol. I, pp. 93-96.

Frequency implementation of discrete wavelet transforms, 2004 IEEE SSIAI at Lake Tahoe, NV, March 28-30, 2004, pp. 167-171.

Joint uncertainty measure for maximally decimated M-channel prime factor cascaded wavelet filter banks, 2003 IEEE ICIP at Barcelona, Spain, September 14-17, 2003, vol. I, pp. 1033-1036.

Professional Service

Reviewer for Professional Journals and Conferences

IEEE Southwest Symposium for Image Analysis and Interpretation 2008
IEEE Transactions on Image Processing
IEEE Transactions on Medical Imaging
IEEE Transactions on Pattern Analysis and Machine Intelligence
IEEE Transactions on Circuits and Systems II
IEEE Signal Processing Letters
IEEE Pattern Recognition Letters
IEEE Transactions Ultrasonics, Ferroelectrics, and Frequency Control
IEEE Transactions Geosciences and Remote Sensing
IEEE International Conference on Image Processing 2004, 2005, & 2006

Professional Affiliations

IEEE Signal Processing Society
IEEE Computer Society

Percentage of time available for research or scholarly activities: 15 %
Percentage of time committed to the ECET program: 75 %
The remaining 10 % is for professional and institutional service outside of the ECET program.

Paul M. Yanik

Assistant Professor
Department of Engineering and Technology
Western Carolina University
Cullowhee, NC 28723
(828)227-2166
pyanik@wcu.edu

Education:

Ph.D. student in Computer Engineering. August 2007 – Present.
Clemson University. Clemson, SC.
Research interests in intelligent systems including robotics and artificial intelligence.

M.S. in Computer Engineering, 1995.
North Carolina State University, Raleigh, NC.

B.S. in Electrical Engineering, 1989.
North Carolina State University, Raleigh, NC.

Professional Experience:

Western Carolina University. Cullowhee, NC.
Visiting / Assistant Professor. August, 2005 – present.

- Responsible for teaching courses in Electrical and Computer Engineering Technology and student advising. Serve as Faculty Mentor to student branch of the Institute of Electrical and Electronics Engineers (IEEE) and Faculty Advisor to the Women In Engineering (WIE) affinity group of IEEE.

Qualcomm, Inc.. Cary, NC.
Staff Engineer. May, 2004 – July 2005.

- Performed subsystem and chip-level verification for Qualcomm's next generation ARM-based microprocessor for cellular telephone applications. Singularly responsible for integrating Assertion-Based Verification (ABV) techniques into the existing verification methodology to facilitate automated bug detection. Use of ABV was responsible for discovering design flaws which eluded all other verification methods and would have resulted in expensive chip respins.

Mentor Graphics Corporation. Durham, NC.
Technical Marketing Engineer. November, 2002 – May, 2004.

- Prepared and presented customer training classes, and application notes associated with Mentor's digital simulation tool (ModelSim). Assist customer engineers with complex system design and verification issues. Conduct performance benchmark evaluations between ModelSim and competing tools using customer designs.

Vitesse Semiconductor Corporation. Morrisville, NC.
Senior Member of Technical Staff. October, 1998 – November, 2002.

- Applications Engineer (September, 2001 – November, 2002). Developed and delivered product demonstrations for customer visits and trade shows. Wrote documentation and application notes to assist customers with their system development efforts. Performed lab validation of Vitesse's QoS device family.

- Design Engineer (October, 1998 – September, 2001). Implemented output scheduling/shaping algorithm for the company's flagship 2.4Gb QoS management/switch fabric ASIC. This algorithm is capable of searching 32K service queues while performing EDF or HOL scheduling on outgoing cell/packet traffic (100MHz, 0.25µm technology). Also designed the PCI microprocessor bus interface for the entire device family.

BroadBand Technologies, Inc. Research Triangle Park, NC.
Senior Engineer. October, 1993 to October, 1998.

- Performed ASIC and FPGA design to execute Transmission Convergence (TC) sublayer communications functions for SONET/ATM networking equipment. Implemented various protocols for interfacing, arbitration and datapath operations including UTOPIA, STS-3 signaling, Telecom Bus, AAL5 reassembly of MPEG2 video data and other proprietary schemes.

Harris Corporation - Airborne Systems Division. Melbourne FL.
Senior Engineer. February, 1992 to August, 1993.

- Designed ASICs for proprietary communications interfacing. Designs are primary components in communications interfaces for computation and instrumentation electronics of the F22 (Raptor) fighter aircraft.

NCR Corporation. Liberty, SC.
Design Engineer. January, 1990 to January, 1992.

- Performed board-level logic design for personal computer applications including main processor boards, memory boards and MicroChannel peripherals. Worked closely with manufacturing to bring these products to full production.

Computing Skills: EDA tools including Mentor Graphics, Synopsys, Cadence, Verisity.
Hardware description languages including SystemVerilog, Verilog, VHDL, ABEL.
Programming/scripting languages including C, Perl, Pascal, LISP, BASIC, Make, TCL.
Programming, scripting and design in UNIX and PC environments.

Affiliations: Senior Member, IEEE.

Publications:

Adams, R.D., Zhang, J.Z, Yanik, P. & Burbank, K. (2006). A Digital Logic Based Experimental Design of a DSP/Communication System for ECET Students. *Proceedings of the 2006 American Society for Engineering Education (ASEE) Annual Conference and Exposition,* Session 1029.

Honors: NCR Corporation Engineering Excellence Award – 1990.
Harris Corporation Hawk Award – 1993.

Professional & Institutional Service: Faculty Mentor to the WCU student branch of IEEE, 2006 – present.
Faculty Advisor to the WIE affinity group of the student branch of IEEE, 2006 – present.
Faculty Advisor to WCU Rocketry Club, 2006 – present.
WCU Academic Appeals Committee member, 2008 – present.

Time Allocation:

Percentage of time available for research or scholarly activities:	10%
Percentage of time devoted to ECET program:	85%
Percentage of time available for professional and institutional service	5%

APPENDIX C – LABORATORY EQUIPMENT

Table C-1. Laboratory Equipment Available to ECET Students

Equipment Type	Device	Quantity
Oscilloscopes	Agilent 86100B Infiniium DCA Oscilloscope Mainframe	3
	Agilent 86100A Wide Bandwidth Oscilloscope to 50 GHz	1
	Agilent 54622D 2+16-Channel 100-MHz MegaZoom Oscilloscope	26
	Agilent DSO 6104A 4-Channel 1-GHz Oscilloscope	8
	Hitachi V-1100 100 MHz 2-Channel Oscilloscope	4
	Hitachi V-1100A 100 MHz 2-Channel Oscilloscope	7
	Leader 8020 20 MHz 2-Channel Oscilloscope	1
Spectrum Analyzers	Agilent 8590B 9kHz-1.8 GHz Spectrum Analyzer	1
	Agilent E4408B ESA-L 9 kHz-26.5GHz Spectrum Analyzer	1
	Agilent E4407B ESA-E 9 kHz-26.5 GHz Spectrum Analyzer	1
	Agilent CSA N1996A 100 kHz-6 GHz Spectrum Analyzer	8
RF Probes	Agilent 41800A Active probe, 5 Hz to 500 MHz	1
	Agilent 85024A High frequency probe, 300 kHz to 3 GHz	1
Logic and Signal Analyzers	Agilent 16750B Logic Analysis System Frame	1
	HP 1630G Logic Analyzer	1
	Agilent 89441A 2.65 GHz Vector Signal Analyzer	1
	Stanford Research Systems SR785 100 kHz Dynamic Signal Analyzer	1
	Agilent 54754A Differential TDR module	1
	Agilent N4901A Serial Bit Error Rate Tester 13.5 Gb/s	1
Function Generators	Agilent 33250A 80 MHz Function/Arbitrary Waveform Generator	16
	Agilent 33220A 20 MHz Function/Arbitrary Waveform Generator	10
	BK precision 4017A 10 MHz sweep/ function generators	8
Digital Multimeters	Agilent 34401A Digital Multimeter, 6.5 digit	26
	Fluke 8050A Digital Multimeter	10
	Fluke 45 Digital Multimeter	9
	Leader 586 Digital Multimeter	1
DC power supplies	Agilent E3631A DC power supply. Triple output: 0- +25V	26
	HP 6205B DC power supply	2
	HP 6205C DC power supply	6
	HP 6236B DC power supply	8
RF equipment	Leader 3215 VHF/UHF Signal Generator	6
	Leader 3221 VHF/UHF Signal Generator	1
	Mini Circuits ZFL-1000 Amplifier 0.1 – 1000 MHz	12
	Mini Circuits ZFL-4 RF Mixer 5 – 1250 MHz	12
	Mini Circuits ZOS-1025 Voltage Controlled Oscillator 685 – 1025 MHz	12

Power Transmission	LabVolt Trainer - 3 phase 120 Volt electrical source, motors, generators, transformers, and loads	1
Electro-Optical	Agilent 8164A Lightwave measurement system	1
	Agilent 8164B Lightwave Measurement System	3
	Fujikura FSM-40PM ArcFusion Splicer	1
	Agilent 86106B 28 GHz optical / 40 GHz electrical module, 1000-1600 nm	1
	Agilent 86105B 15 GHz optical / 20 GHz electrical module	1
	Agilent 83495A Optical/electrical clock recovery module	1
	Agilent 81940A Compact tunable laser source	1
	Agilent 81910A Photonic All-Parameter Analyzer	1
	Agilent 8169A Optical Polarization Controller with APT 8164B mainframe	1
	Agilent 83433AK01 Standard 83433A 10 Gb/s lightwave transmitter	1
	Agilent 11982A Amplified Lightwave Converter	1
	Agilent 83430A Lightwave Digital Source, 1550 nm, 2.5 Gb/s	1
	Agilent 86146B Benchtop High Performance Optical Spectrum Analyzer	2
	Agilent 86116B 80 GHz Electrical / 65 GHz optical module	1
PC's and Printers	Power Mac 64 Desktop Computer	4
	Gateway E Series Desktop Computer	2
	Dell Desktop Computer	13
	Dell GX280 Desktop Computer	1
	Dell Latitude D800 Laptop Computer	24
	Dell P0137 Laser Printer	2
Printed Circuit Fabrication	T-Tech Quick Circuit 5000, printed circuit board builder	1
	T-Tech AMC 2500	1
	T-Tech Quick Circuit Vacuum	1
Other	National Instruments ELVIS Circuit Design System	9
	Agilent 53132A 225 MHz Universal Counter - 12 digit/s, 150 ps	8
	Keithley 2602 Sourcemeter	1

APPENDIX D – INSTITUTIONAL SUMMARY

General Information

Western Carolina University is a regional comprehensive public university within the University of North Carolina System, offering a broad array of undergraduate and graduate programs in the arts, sciences and professions. The University serves the people of North Carolina from its residential main campus at Cullowhee, situated between the Blue Ridge and Great Smoky Mountains, and through its resident credit programs in Asheville and Cherokee.

The address of the institution is Western Carolina University, Cullowhee, NC 28723. The Chief Executive Officer is Chancellor John Bardo. This report is submitted by Dr. McMahan, Dean of the Kimmel School of Construction Management, Engineering and Technology.

Type of Control

Western Carolina University is one of sixteen public universities in the University of North Carolina System and functions under the University of North Carolina Board of Governors and the Western Carolina University Board of Trustees.

Regional or Institutional Accreditation

Western Carolina University is accredited by the Commission of Colleges of the Southern Association of Colleges and Schools (SACS). As the major accrediting body for public and private institutions of higher education in the 11 southernmost states, SACS Commission on Colleges accredits more than 780 universities and colleges in North Carolina, Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, South Carolina, Tennessee, Texas, Virginia and Latin America. Western Carolina University has been accredited by SACS since 1946; the last accreditation review took place in 2007.

Western Carolina University Mission Statement

Western Carolina University creates engaged learning opportunities that incorporate teaching, research and service through residential, distance education and international experiences. The university focuses its academic programs, educational outreach, research

and creative activities, and cultural opportunities to improve individual lives and enhance economic and community development in the region, state and nation.

History of Institution

WCU was founded in August 1889 as a semi-public secondary school and chartered as Cullowhee High School in 1891. The founder, Professor Robert Lee Madison, wanted to provide an education for the young people in the region and train teachers to spread education throughout the western part of the state. In 1893 the Legislature designated the school as the first publicly funded normal school.

Over the next 40 years, the school expanded its curriculum and evolved into a junior college, and in 1929 it was chartered by the legislature as a four-year institution under the name Western Carolina Teachers College. Often called “the Cullowhee experiment,” Madison’s idea became the model for the other regional colleges in the state.

The demand for the liberal arts and programs in other areas of learning led to an expansion of the school's offerings. Postgraduate studies and the Master of Arts in Education degree were added to the curriculum in 1951 after several decades of rapid growth and sweeping changes. In 1953, the name Western Carolina College was adopted.

In 1967 the institution was designated a regional university by the North Carolina General Assembly and Western Carolina University was given its current title. And, on July 1, 1972, WCU became a member of the University of North Carolina system.

Adjacent to the Great Smoky mountains, WCU has a commitment to the rich traditions of the Appalachian and Cherokee cultures. Its Mountain Heritage Center, Cherokee Center, and Craft Revival Project reflect this influence—at the same time providing irreplaceable educational resources for the region.

The recently announced Millennial Initiative, doubling the size of the campus in 2005, will be a knowledge enterprise zone where university faculty and students, private industry, and government partners conduct research and development into scientific and technological innovations that have commercial applications. WCU continues its promise to the region by giving students intensive, hands-on educational opportunities while simultaneously promoting economic development.

Student Body

In 2006, 1492 freshmen were accepted, 93% of the freshman class came from North Carolina, 9% were non-white and males and females were approximately equal in number.

Regional or Institutional Accreditation

Western Carolina University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (http://www.sacscoc.org/) to award bachelor's, master's, education specialist, and doctor's degrees. The last accreditation visit was in 2007. Also, the university holds 21 special program accreditations and is a member of more than 30 state and national associations and organizations to which its professional programs are related. Please see the WCU Undergraduate Catalog for more specific information about accreditations, and associations and organizations.

Personnel and Policies

WCU is a member of the University of North Carolina System and the guidelines for personnel and policies conform to that institution. The policy of the system may be reviewed at http://www.northcarolina.edu/content.php/hr/policystatements.htm. Western Carolina University policies may be viewed at http://www.wcu.edu/359.asp.

Personnel are employees of the state of North Carolina and have common benefits with other state employees. A detailed overview of these benefits may be seen at http://www.northcarolina.edu/content.php/hr/benefits/Educational_Benefits.htm.

Faculty salaries are determined by the WCU Provost as conforming to a range determined by data from College and University Professional Association for Human Resources (CUPA).

Educational Unit

Erskin Bowles – President, University of North Carolina System

John Bardo, Ph. D. – Chancellor, Western Carolina University

Kyle Carter, Ph. D. – Provost and Vice Chancellor for Academic Affairs

Robert McMahan, Ph. D. – Dean, Kimmel School of Construction Management and Technology

Ken Burbank, Ph. D. – Department Head, Engineering and Technology

Robert Adams, Ph. D. – Program Director, Electrical and Computer Engineering Technology

An organizational chart of university colleges and schools is included as **Figure 1** of the Background Information section of the self study.

Credit Unit

At WCU, one semester credit-hour normally represents one class hour or two to three laboratory hours per week. One academic year represents at least 28 weeks of classes, exclusive of final examinations.

Instructional Modes

Only on-campus modes of instruction are employed by the Electrical and Computer Engineering Technology Program.

Grade-Point Average

A 2.0 grade-point average in WCU courses is required for graduation.

Academic Supporting Units

The core courses within the ECET program include courses in electrical and computer engineering technology, math and computer science. The supporting academic unit for math courses is the Mathematics and Computer Science Department, led by Dr. Mark Holliday, Interim Department head. The supporting unit for physics and chemistry is the Chemistry and Physics Department, led by Dr. Cynthia Atterholt. ECET students take courses from other academic departments throughout the university to fulfill Liberal Studies requirements. Table D-1 lists all the academic departments and department heads within the university.

Table D-1. Western Carolina University Department Chair/Heads

Academic Affairs Division

College of Arts and Sciences **Dr. Wendy Ford, Dean** **Dr. David Butcher, Assoc. Dean** **Dr. Niall Michelsen, Assoc. Dean** **Sarah Rave, Adm. Assistant** **Carolyn Wiggins, Adm. Assistant** **Amy McKenzie, Adm. Assistant (Part-time)**		**340F Stillwell** **340C Stillwell** **340D Stillwell** **347 Stillwell** **340B Stillwell** **340 Stillwell**	**2281** **3808** **3336** **3806** **3903** **3874**
Department	Department Head	Location	Phone number
Anthropology & Sociology	John Williams	101B McKee	2430
Biology	Malcolm Powell	132A Natural Science	3649
Chemistry & Physics	Cynthia Atterholt	231A Natural Science	3667
Communication	Don Connelly	109 Old Student Union	3851
English	Elizabeth Addison	307 Coulter	3976
Geosciences & Natural Resources	Mark Lord	331A Stillwell	2271
History	Richard Starnes	226 McKee	3910
Mathematics & Computer Science	Mark Holliday	426A Stillwell	2271
Modern Foreign Languages	Santiago Garcia-Castanon	122 McKee	3500
Philosophy & Religion	Daryl Hale	230 Stillwell	3853
Political Science & Public Affairs	Gibbs Knotts	358A Stillwell	3862
Social Sciences	Libby McRae	221C McKee	3481
College of Business **Dr. Ronald A. Johnson, Dean** **Dr. Debasish Banerjee, Assoc. Dean** **Dr. Steve Henson, Assoc. Dean** **Dr. Phillip Little, Assoc. Dean** **Dianne Cochran, Adm. Assistant** **Norma Medford, Adm. Assistant**		**292 Belk** **289 Belk** **381 Belk** **282 Belk** **291 Belk** **290 Belk**	**3030** **3385** **3227** **3498** **3340** **3503**
Accounting, Finance and Economics	Leroy Kauffman	273A Belk	3480
Business Administration & Law, Hospitality & Tourism, and Sport Management	Debra Burke	391A Belk	3720
Business Computer Information Systems and Quantitative Analysis	Dan Clapper	279 Belk	3393
Center for Entrepreneurship & Innovation	Louis Buck	182 Belk	3798
Management and International Business	Jerry Kinard	381 Belk	3544
Sales & Marketing	James DeConinck	209A CAT	3704
College of Education & Allied Professions **Dr. Michael Dougherty, Dean** **Dr. Dale Carpenter, Assoc. Dean** **Mary Rompf**		**220 Killian** **221 Killian** **227 Killian**	**3305** **3306** **3304**
Educational Leadership & Foundations	Jacque Jacobs	234 Killian	3320
Elementary & Middle Grades Education	Bob Houghton (Interim)	247 Killian	3354
Health, Physical Education & Recreation	Bob Beaudet (Interim)	100A Reid	3543
Human Services	Lisa Bloom	204 Killian	3288
Psychology	David McCord	302 Killian	3363

College of Fine & Performing Arts **Dr. Robert Kehrberg, Dean** **Dr. John West, Assoc. Dean** **Linda Hambrick**		**230 HFR** **230 HFR** **230 HFR**	**2372** **2756** **2755**
School of Art & Design	Richard Tichich	FPAC 156	2464
School of Music	Will Peebles	Coulter 252	3258
Stage & Screen	Susan Brown-Strauss	Stillwell 233	3963
College of Health & Human Sciences **Dr. Linda Stanford, Dean** **Dr. James Scifers , Assoc. Dean** **Dr. Marie Huff, Assoc. Dean** **Judy Dillard, Adm. Assistant** **Belva Ham, Adm. Assistant**		**207D Belk** **207K Belk** **207G Belk** **207C Belk** **207 F Belk**	**2140** **2164** **2141** **2143** **2144**
Applied Criminology	Marie Huff (Acting)	207G Belk	2141
Communication Sciences & Disorders	Billy Ogletree	G50 McKee	3379
Physical Therapy	Karen Lunnen	312 Moore	2191
School of Health Sciences	Phil Kneller	106 Moore	3511
School of Nursing	Vincent Hall	207 Moore	3526
Social Work	Marie Huff	G04 McKee	3842
Kimmel School of Construction Management & Technology **Dr. Robert McMahan, Dean** **Pat Smith, Adm. Assistant** **Natalie Karycki, Adm. Assistant**		**Belk 165** **Belk 161** **Belk 161**	**2158** **2159** **2434**
Construction Management	Brad Sims	Belk 211	2175
Engineering & Technology	Ken Burbank	Belk 339	2181
OTHER			
Honors College	Dr. Brian Railsback, Dean Dr. Steve Carlisle, Assoc Dean	143 Reynolds 141 Reynolds	2101/7383
Graduate School & Research	Dr. Scott Higgins, Dean Dr. Brian Gastle, Assoc Dean Dr. Michelle Hargis, Assoc Dean	109J Camp 109G Camp 109C Camp	3174/7398 3173/7398 2921/7398
Educational Outreach	Dr. Pat Brown, Dean Dr. Regis Gilman, Assoc Dean	138 Camp 138 Camp	3070/7397 3072/7397
University Librarian	Mr. Bil Stahl, CIO	250 Hunter	3407/7307
WCU – Asheville Programs	Ms. Patsy Miller, Director	120 Karpen Hall	7423

Non-Academic Supporting Units

. Institutional Support Units

The institutional support units that are important to the objectives of the engineering technology programs at WCU are Hunter Library, the Office of International Programs and Services, the Office of Professional Examinations, the University Writing Center, and the Honors College.

a. Hunter Library

Hunter Library considers providing high-quality service to students and faculty as its primary mission. Twelve librarians provide both individualized research assistance and

classroom instruction. The library is open more than 110 hours per week during the semester. All electronic resources are available from on or off campus 24 hours per day. The library has a wide collection of books in engineering technology as well as several technical journals. Phone: (828) 227-7485

b. International Programs and Services.

The Office of International Programs and Services (IPS) coordinates and supports many types of international programs and activities at Western Carolina University, such as student and faculty exchanges through the International Student Exchange Program (ISEP), the University of North Carolina Exchange Program (UNC-EP), and WCU bilateral program; K-12 International Outreach Program to the public schools; Phi Beta Delta Honor Society for International Scholars; international university linkages; the Japan Global Partnership Program, and academic programming. IPS also assists the Host Family Association, the International Club, the annual International Education Week and International festival. IPS has agreements which allow WCU students to pursue international study with over ten universities offering ECET programs. Dr. Lois Petrovich-Mwaniki, IPS Director, Assoc. Professor of Art, Office: Belk 183, Lmwaniki@wcu.edu , Phone: (828) 227-3433

c. Testing Services

The Office of Professional Examinations (OPE) oversees administration of the Graduate Record Examination (subject tests only), the Praxis Series, Scholastic Aptitude Test, ACT, Law School Admission Test, and the National Counselor Examination. The OPE website, http://www.wcu.edu/catcenter/OPE.html allows students to register for exams or obtain exam-preparation information. Chesney Reich, (828) 227-2273

d. University Writing Center

At the University Writing Center, a staff of graduate assistants and undergraduate peer tutors assist students in developing skills for preparing essays, term papers, creative writing assignments, articles for publication, and other writing projects. Faculty members are encouraged to refer students to the Writing Center for general development of writing skills. Engineering technology students make use of Writing Center services in the preparation of laboratory reports.

Beginning with the writer's initial ideas, tutors help with brainstorming, prewriting, drafting, and revising. By offering the writer workable strategies, the tutor moves the student toward self-sufficiency. In addition to one-on-one tutorial help, the center regularly offers handouts, called mini-courses, tailored to specific writing needs. The center's Web site, http://www.wcu.edu/writingcenter/, provides hours, online resources, staff information and helpful links.

Barbara Hardie**,** Director, 161 Hunter Library, 828-227-7197,bhardie@email.wcu.edu

e. The Honors College

The Honors College at Western Carolina University was the first residential honors program in North Carolina. Comprised of over 700 students, the Honors College is very active in University life. Honors College students take part in many campus activities, forums, and community service. They also enjoy many benefits--priority registration, living at Reynolds dorm, and smaller class sizes. Dr. Brian Railsback, Dean of the Honors College, (828) 227-7383.

Faculty Workload

Faculty workload in the Kimmel School is normally six courses per year, plus engagement and scholarship and other duties as assigned.

Tables

{{The tables that follow are simply a guide and are not required in the Self-Study Report. All are optional. The institution is encouraged to employ any means it chooses to represent itself to ABET and the visiting evaluation team.}}

Table D–2 provides the programs offered by the Educational Unit. The educational unit is the Department of Engineering and Technology. Table D–3 provides the degrees awarded and the transcript designations. Table D–4 provides the support expenditures of the Engineering and Technology department and the ECET program. Table D–5 provides the number of ECET students and ECET personnel. Table D–6 provides student enrollment in the ECET program by year and by part and full time. Table D–6 also provides the number of graduates for each of the last 5 academic years. A count of part-time graduates and full-time graduates is not available, because students tend to change their part/full time status over their course of study.

Table D-2. Programs Offered by the Educational Unit

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Engineering Technology – Applied Systems Technology	X				4	Dr. Robert Anderson	Engineering and Technology	X			
Engineering Technology – Engineering Technical Operations			X	Evening	4 after completing entrance requirements	Dr. William McDaniel	Engineering and Technology				X
Electrical and Computer Engineering Technology	X				4	Dr. Robert Adams	Engineering and Technology	X			
Electrical Engineering	X				4	Dr. Yeqin Huang	Engineering and Technology				X
Technology – M. S.			X	Evening, on and off campus	2	Dr. James Zhang	Engineering and Technology				X

[1] Give program title as shown on a graduate's transcript

[2] Indicate all modes in which the program is offered. If separate accreditation is requested for an alternative mode, list on a separate line. Describe "Other" by footnote.

[3] Only those programs being submitted at this time for reaccredidation (now accredited) or initial accreditation (not now accredited) should be checked in this column.

[4] Programs not submitted for evaluation at this time should be checked in this column.

Table D-3. Degrees Awarded and Transcript Designations by Educational Unit

Program Title[1]	Modes Offered[2]				Name of Degree Awarded[3]	Designation on Transcript[4]
	Day	Co-op	Off Campus	Alternative Mode		
Engineering Technology – Applied Systems Technology Concentration	x				Engineering Technology – Applied Systems Technology Concentration	Engineering Technology – Applied Systems Technology Concentration
Engineering Technology – Engineering Technical Operations Concentration			x	Evening	Engineering Technology – Engineering Technical Operations Concentration	Engineering Technology – Engineering Technical Operations Concentration
Electrical and Computer Engineering Technology	x				Electrical and Computer Engineering Technology	Electrical and Computer Engineering Technology
Electrical Engineering	x				Electrical Engineering	Electrical Engineering
Technology – M. S.			x	Evening, on and off campus	Technology – M. S.	Technology – M. S.

[1] Complete the table for all programs, as follows:
[2] Give the program title as officially published in catalog.
[3] List degree awarded for each mode offered. If different degrees are awarded, list on separate lines.
[4] Indicate how the program is listed on transcript for each mode offered. If different designations are used, list on separate lines.

Table D-4. Support Expenditures

Department of Engineering and Technology

Fiscal Year	2006-07	2007-08	2008-09
Expenditure Category			
Operations (not including staff)		72,274	60,000
Travel[5]		10,566	12,000
Equipment[6]			
(a) Institutional Funds		0	15,000
(b) Grants and Gifts[7]	280,129	937,526	50,000
Graduate Teaching Assistants	n/a	n/a	n/a
Part-time Assistance (other than teaching)	n/a	n/a	n/a
Faculty Salaries[9]	13.5	17	18

Electrical and Computer Engineering Technology Program

Fiscal Year	2006-07	2007-08	2008-09
Expenditure Category			
Operations (not including staff)		8997	11,450
Travel[5]		642	4,000
Equipment[6]			
(a) Institutional Funds		5000	5000
(b) Grants and Gifts[7]	7,634	7,455	0
Graduate Teaching Assistants	n/a	n/a	n/a
Part-time Assistance (other than teaching)	n/a	n/a	n/a
Faculty Salaries[9]	4	5	5

[5] Does not include Chancellors Travel Awards
[6] Major equipment.
[7] Including special (not part of institution's annual appropriation) non-recurring equipment purchase programs.
[9] These are the numbers of full time faculty, as the Provosts Office handles all salaries.

Table D-5. Personnel and Students of the Instructional Unit

Electrical and Computer Engineering Technology Program

Year[1]: 2007 - 8

	HEAD COUNT		FTE[2]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	1		1	
Faculty (tenure-track)	1		1	
Other Faculty (excluding student Assistants)	3		3	
Student Teaching Assistants				
Student Research Assistants				
Technicians/Specialists	½		½	0.1
Office/Clerical Employees				
Others[5] [JD]	¼		¼	0.05
Undergraduate Student enrollment[6]	65	1	65.5	13
Graduate Student enrollment				

Report data for the program unit(s) and for each program being evaluated.

1 Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.

2 For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc. For faculty members, 1 FTE equals what your institution defines as a full-time load.

3 Divide FTE in each category by total FTE Faculty. Do not include administrative FTE.

4 Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.

5 Specify any other category considered appropriate, or leave blank.

6 These numbers include freshman, sophomores, juniors, and seniors.

Table D-6. ECET Program Enrollment and Degree Data

{{This table should be completed for the Instructional Unit and for each program being evaluated}}

Academic Year	FT/PT Enrollment		Enrollment Year					Total Undergrad	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			Bachelor	Master	Doctor	Other
2007 – 8		FT	19	10	15	22		66	0	10	0	0	0
		PT							0		0	0	0
2006 – 7*		FT	20	14	11	12	2	59	0	10	0	0	0
		PT	0	0	0	1	0	1	0		0	0	0
2005 – 6		FT	8	17	12	24		61	0	19	0	0	0
		PT							0		0	0	0
2004 – 5		FT	13	11	13	19		56	0	16	0	0	0
		PT							0		0	0	0
2003 – 4		FT						33	0		0	0	0
		PT							0		0	0	0
2002 – 3	0	FT	0	0	0	0	0	0	0	0	0	0	0
	0	PT	0	0	0	0	0	0	0	0	0	0	0

* Source: WCU Office of Institutional Research & Planning

FT--full time

PT--part time

For 2007-8, enrollment is tabulated as follows:

1st year = less than 30 earned credit hours

2nd year = 30 to 59 earned credit hours

3rd year = 60 to 89 earned credit hours

4th year = more than 89 earned credit hours

Table D-7. Faculty Salary Data[1]

Academic Year ___2007 - 8____

Engineering and Technology Department

	Professor	Associate Professor	Assistant Professor	Instructor
Number				
High				
Mean				
Low				

Electrical and Computer Engineering Technology Program

	Professor	Associate Professor	Assistant Professor	Instructor
Number				
High				
Mean				
Low				

[1] To be provided at time of visit.

APPENDIX E – ECET ASSESSMENT PLAN

Assessment Plan for TAC of ABET
Electrical and Computer Engineering Technology
Department of Engineering & Technology
Kimmel School

Western Carolina University

(Updated – June 5, 2008)

Introduction

The TAC of ABET General Criteria for Accrediting Engineering Technology Programs lists nine criteria that must be met:

Criterion 1 Students
Criterion 2 Program Educational Objectives
Criterion 3 Program Outcomes
Criterion 4 Continuous Improvement
Criterion 5 Curriculum
Criterion 6 Faculty
Criterion 7 Facilities
Criterion 8 Support
Criterion 9 Program Criteria

The heart of the Assessment Plan includes criterions 2 through 4 and in the case of the ECET program, criterion 9. Criterions 1, and 5 through 8 very much reflect reportable data regarding program support and will be included in the Self-Study Questionnaire.

ECET Mission Statement

The mission of the Electrical and Computer Engineering Technology program is to provide students a scholarly community in which to study and prepare for a productive career. To fulfill this goal, the program contains a strong mathematics and sciences component which is integrated into the engineering technology aspect of the curriculum. The ECET program supports the University's mission as an economically-engaged university in responding to regional needs and opportunities with graduates capable of being immediately productive.

ECET Program Operational Philosophy

The program emphasizes the application of microcomputers to the solution of industrial problems relating to automation, instrumentation, and control, in systems involving robotics, data communications, networks, and/or automated testing. In all cases, microcomputer hardware and software are used for data acquisition, transfer, and analysis.

Appendix A displays a four-year course plan for the ECET program.

Part I – Applicable TAC of ABET Accreditation Criteria

Criterion 2. Program Educational Objectives

As defined by ABET, Program Educational Objectives are *broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.*

Each program must have in place:

a. published educational objectives that are consistent with the mission of the institution and applicable ABET criteria,
b. a documented process by which the program educational objectives are determined and periodically evaluated based on the needs of constituencies served by the program, and
c. an educational program, including a curriculum, that enables graduates to achieve the program educational objectives.

Criterion 3. Program Outcomes (a-k)

As defined by ABET, Program Outcomes are *narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program.*

Each program must demonstrate that graduates have:

a. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
c. an ability to conduct, analyze and interpret experiments, and apply experimental results to improve processes.
d. an ability to apply creativity in the design of systems, components, or processes appropriate to program educational objectives.

e. an ability to function effectively on teams.
f. an ability to identify, analyze and solve technical problems.
g. an ability to communicate effectively.
h. a recognition of the need for, and an ability to engage in lifelong learning.
i. an ability to understand professional, ethical and social responsibilities.
j. a respect for diversity and a knowledge of contemporary professional, societal and global issues.
k. a commitment to quality, timeliness, and continuous improvement.

Criterion 4. Continuous Improvement

The program must use a documented process incorporating relevant data to regularly assess its program educational objectives and program outcomes, and to evaluate the extent to which they are being met. The results of these evaluations of program educational objectives and program outcomes must be used to effect continuous improvement of the program through a documented plan.

Criterion 9. Program Criteria

Where applicable, each program must satisfy program criteria that amplify these general criteria and provide the specifics needed for a given discipline. A program must satisfy all program criteria applicable to the technical specialties implied in the program title.

Electrical/Electronics(s) Engineering Technology (EET) Program Criteria Outcomes

Graduates of baccalaureate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

a. the application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and microcomputers to the building, testing, operation, and maintenance of electrical/electronics(s) systems.
b. the applications of physics or chemistry to electrical/electronics(s) circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry.
c. the ability to analyze, design, and implement control systems, instrumentation systems, communications systems, computer systems, or power systems.
d. the ability to apply project management techniques to electrical/electronic(s) systems.
e. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of electrical/electronic(s) systems.

Computer Engineering Technology (CET) Program Criteria Outcomes

Graduates of baccalaureate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

a. the application of electric circuits, computer programming, associated software applications, analog and digital electronics, microcomputers, operating systems, and local area networks to the building, testing, operation, and maintenance of computer systems and associated software systems.
b. the applications of physics or chemistry to computer systems in a rigorous mathematical environment at or above the level of algebra and trigonometry.
c. the ability to analyze, design, and implement hardware and software computer systems.
d. the ability to apply project management techniques to computer systems.
e. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of computer systems and networks.

Part II – WCU ECET Program Objectives and Outcomes

Program Educational Objectives

1. Assume entry-level positions in system design, development, and implementation related to electrical and computer systems.
2. Apply current industrial practices and design procedures in support of electrical and computer systems.
3. Pursue appropriate career advancement, promotion and occupational mobility.
4. Pursue additional education and/or on-the-job training and certification.

Program Outcomes with Performance Criteria

1. Analyze and interpret experimental data and apply it in a practical manner in the design and development of electrical and computer systems.
   a. Demonstrate proper use of laboratory equipment.
   b. Build and test circuits and/or systems.
   c. Analyze and interpret experimental data in laboratory settings.
   d. Record and present experimental data in appropriate formats.
   e. Apply appropriate design concepts to electrical and computer systems.

2. Apply current technical information, circuit simulation software, and appropriate mathematics to identify, analyze, and solve technical problems associated with electrical and computer systems.
   a. Solve electrical circuits problems fundamental to electrical and computer systems.
   b. Demonstrate the application of appropriate software to solve technical problems.
   c. Demonstrate the application of mathematics in solving technical problems.
   d. Solve technical problems given a set of specifications.
   e. Solve open-ended technical problems.

f. Resource applicable technical information.

3. Apply project management fundamentals with a commitment to quality, timeliness and continuous improvement in electrical and computer systems design and development.
   a. Demonstrate fundamental project management techniques.
   b. Discuss the basic principles of quality assurance and continuous improvement.
   c. Demonstrate appropriate team skills.

4. Communicate technical information clearly and concisely.
   a. Present oral reports.
   b. Produce written technical reports.

5. Exhibit knowledge necessary for career advancement in engineering/technical professions.
   a. Discuss the need and nature of lifelong learning.
   b. Discuss professional, ethical and social issues related to the workplace.
   c. Recognize and describe several challenges when working in a diverse team environment.
   d. Describe several issues related to technology and society that are of a global nature.

Part III – WCU ECET Program Assessment Maps

There are two sets of outcomes for the ECET program which must be considered. The first set of outcomes is the Program Outcomes with Performance Criteria which are integral to the assessment process. It is the Performance Criteria which will be assessed, thereby reflecting the fulfillment of the ECET Program Outcomes.

In addition to developing ECET Program Outcomes and Program Educational Objectives, TAC of ABET requires evidence showing the relationship between the program outcomes and program objectives. ABET also requires evidence to show how the ECET Program Outcomes encompass and relate to the outcome requirements of Criterion 3 (a-k).

Table 1 shows a mapping of ECET Program Outcomes Performance Criteria and Program Educational Objectives to TAC of ABET Criterion 3 (a-k).

Table 1. Program Objectives & Program Outcomes Mapped to ABET (a-k) (page 1 of 2)

Program Educational Objectives	Program Outcomes Performance Criteria	ABET Criterion 3 Outcome
1, 2	1a. Demonstrate proper use of laboratory equipment.	
1, 2	1b. Build and test circuits and/or systems.	
1, 2	1e. Apply appropriate design concepts to electrical and computer systems.	
1, 2	2a. Solve electrical circuits problems fundamental to electrical and computer systems.	
1, 2	2b. Demonstrate the application of appropriate software to solve technical problems.	
1, 2	2c. Demonstrate the application of mathematics in solving technical problems.	**a**
1, 2	2d. Solve technical problems given a set of specifications.	
1, 2, 3	2e. Solve open-ended technical problems.	
1, 2, 4	2f. Resource applicable technical information.	
2, 3	3a. Demonstrate fundamental project management techniques.	
2, 3	3b. Discuss the basic principles of quality assurance and continuous improvement.	
1, 2	1e. Apply appropriate design concepts to electrical and computer systems.	
1, 2, 3	2e. Solve open-ended technical problems.	**b**
1, 2, 4	2f. Resource applicable technical information.	
3, 4	5a. Discuss the need and nature of lifelong learning.	
1, 2	1a. Demonstrate proper use of laboratory equipment.	
1, 2	1b. Build and test circuits and/or systems.	
1, 2	1c. Analyze and interpret experimental data in laboratory settings.	**c**
1, 2	1d. Record and present experimental data in appropriate formats.	
2, 3	3b. Discuss the basic principles of quality assurance and continuous improvement.	
1, 2	1e. Apply appropriate design concepts to electrical and computer systems.	
1, 2	2b. Demonstrate the application of appropriate software to solve technical problems.	
1, 2	2c. Demonstrate the application of mathematics in solving technical problems.	**d**
1, 2, 3	2e. Solve open-ended technical problems.	
1, 2, 4	2f. Resource applicable technical information.	
2, 3	3a. Demonstrate fundamental project management techniques.	
2, 3	3c. Demonstrate appropriate team skills.	
3, 4	5b. Discuss professional, ethical and social issues related to the workplace.	**e**
3, 4	5c. Recognize and describe several challenges when working in a diverse team environment.	

Table 1. Program Objectives & Program Outcomes Mapped to ABET (a-k) (page 2 of 2)

Program Educational Objectives	Program Outcomes Performance Criteria	ABET Criterion 3 Outcome
1, 2	2a. Solve electrical circuits problems fundamental to electrical and computer systems.	
1, 2	2b. Demonstrate the application of appropriate software to solve technical problems.	
1, 2	2c. Demonstrate the application of mathematics in solving technical problems.	**f**
1, 2	2d. Solve technical problems given a set of specifications.	
1, 2, 3	2e. Solve open-ended technical problems.	
1, 2, 4	2f. Resource applicable technical information.	
1, 2	1d. Record and present experimental data in appropriate formats.	
1, 3, 4	4a. Present oral reports.	**g**
1, 3, 4	4b. Produce written technical reports.	
3, 4	5a. Discuss the need and nature of lifelong learning.	
3, 4	5d. Describe several issues related to technology and society that are of a global nature.	**h**
3, 4	5b. Discuss professional, ethical and social issues related to the workplace.	
3, 4	5d. Describe several issues related to technology and society that are of a global nature.	**i**
3, 4	5b. Discuss professional, ethical and social issues related to the workplace.	
3, 4	5c. Recognize and describe several challenges when working in a diverse team environment.	**j**
3, 4	5d. Describe several issues related to technology and society that are of a global nature.	
2, 3	3a. Demonstrate fundamental project management techniques.	
2, 3	3b. Discuss the basic principles of quality assurance and continuous improvement.	**k**
3, 4	5d. Describe several issues related to technology and society that are of a global nature.	

Since the ECET program contains both EET and CET course content, a second set of outcomes representing both areas must be taken into consideration. The EET and CET Program Criteria Outcomes must be met through the curriculum, i.e., the required content must be included in courses within the program. Each course in the curriculum must be related to the EET and CET Program Criteria Outcomes. Course mapping to fulfill these requirements is shown in Table 2 and Table 3.

Table 2. EET Program Criteria Outcomes Course Mapping

Demonstrate knowledge and hands-on competence appropriate to the goals of the program in:	ECET														TEL	
	211	231	242	290	321	331	332	341	431	452	461	464	478	479	312	345
a.1.the application of circuit analysis and design to the building, testing, operation, and maintenance of electrical/electronics(s) systems.	X	X	X		X	X		X				X				
a.2. the application of computer programming to the building, testing, operation, and maintenance of electrical/electronics(s) systems.			X				X		X	X	X	X				
a.3. the application of associated software to the building, testing, operation, and maintenance of electrical/electronics(s) systems.	X	X	X		X	X	X			X	X				X	X
a.4. the application of analog and digital electronics to the building, testing, operation, and maintenance of electrical/electronics(s) systems.		X	X	X	X	X	X			X		X			X	
a.5. the application of microcomputers to the building, testing, operation, and maintenance of electrical/electronics(s) systems.						X	X		X			X				
b. the applications of physics or chemistry to electrical/electronics(s) circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry.			X									X				
c.1. the ability to analyze, design, and implement *control systems.*										X			X	X		
c.2. the ability to analyze, design and implement *instrumentation systems.*							X		X			X	X	X		
c.3. the ability to analyze, design and implement *communications systems.*													X	X	X	X
d. the ability to apply project management techniques to electrical/electronics(s) systems.													X	X		
e. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of electrical/electronics(s) systems.								X		X	X				X	

Table 3. CET Program Criteria Outcomes Course Mapping

Demonstrate knowledge and hands-on competence appropriate to the goals of the program in:	ECET															TEL	
	211	231	242	290	321	331	332	341	431	452	461	464	478	479		312	345
a.1. the application of electric circuits to the building, testing, operation, and maintenance of computer systems and associated software systems.						X	X		X			X					X
a.2. the application of computer programming to the building, testing, operation, and maintenance of computer systems and associated software systems.							X		X		X	X					
a.3. the application of associated software applications to the building, testing, operation, and maintenance of computer systems and associated software systems.			X	X		X	X				X	X					X
a.4. the application of analog and digital electronics to the building, testing, operation and maintenance of computer systems and associated software systems.			X			X	X		X	X		X					
a.5. the application of microcomputers to the building, testing, operation, and maintenance of computer systems and associated software systems.				X		X	X		X			X					
a.6. the application of operating systems to the building, testing, operation, and maintenance of computer systems and associated software systems.				X			X		X								
a.7. the application of local area networks to the building, testing, operation, and maintenance of computer systems and associated software systems.				X													X
b. the applications of physics or chemistry to electrical/electronics(s) circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry.			X									X					
c. the ability to analyze, design, and implement hardware and software computer systems.				X			X		X			X	X	X			X
d. the ability to apply project management techniques to computer systems.													X	X			
e. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of computer systems and networks.								X		X	X						

To strengthen the relationships among the TAC of ABET (a-k) outcomes, the EET and CET Program Criteria Outcomes and the WCU ECET Program Outcomes with Performance Criteria, Course Learning Objectives have been developed for each course. These objectives reflect the intent of the outcomes and are embedded in the course material and listed in course outlines. The ECET Course Learning Objectives are listed in Appendix B. Sample assessment forms are displayed in Appendix E and are used to "track" components of the assessment process.

The ECET program assessment focuses primarily on the courses in the major. However, it is fair to say that all the courses in the curriculum, in some fashion, contribute to the career success of the graduate. To acknowledge this support from courses in the non-technical area, Appendix A includes a mapping of the curriculum to the WCU ECET program outcomes.

Part IV – ECET Assessment Planning

As defined by ABET, Assessment is *one or more processes that identify, collect, and prepare data to evaluate the achievement of program outcomes and program educational objectives.*

Table 4 provides time lines for the assessment of program educational objectives. An alumni survey and an employer survey will gather information to assess the effectiveness of program outcomes as related to program educational objectives.

Table 4. Time Lines for Assessment of Program Educational Objectives

Program Educational Objectives	Spring 2009	Spring 2011	Spring 2013
1. Assume entry-level positions in system design, development, and implementation related to electrical and computer systems.	X	X	X
2. Apply current industrial practices and design procedures in support of electrical and computer systems.	X	X	X
3. Pursue appropriate career advancement, promotion and occupational mobility.	X	X	X
4. Pursue additional education and/or on-the-job training and certification.	X	X	X

Table 5 displays time lines for the assessment of WCU ECET Program Outcomes. Performance Criteria are assessed on a three-year rotation.

Detailed Assessment Planning Matrices are displayed in Appendix C. These matrices display the targeted courses used for assessment of performance criteria, the nature of the assessment activity, and the assessment method to be used for the performance criteria. Each performance criteria is assessed at three different points in the curriculum.

Table 5. Time Lines for Assessment of WCU ECET Program Outcomes

WCU ECET Program Outcomes	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
PO1. Analyze and interpret experimental data and apply it in a practical manner in the design and development of electrical and computer systems.	**Five Performance Criteria**			**Five Performance Criteria**		
PO4. Communicate technical information clearly and concisely.	**Two Performance Criteria**			**Two Performance Criteria**		
PO2. Apply current technical information, circuit simulation software, and appropriate mathematics to identify, analyze, and solve technical problems associated with electrical and computer systems.		**Six Performance Criteria**			**Six Performance Criteria**	
PO3. Apply project management fundamentals with a commitment to quality, timeliness and continuous improvement in electrical and computer systems design and development.		**Three Performance Criteria**			**Three Performance Criteria**	
PO5. Exhibit knowledge necessary for career advancement in engineering/technical professions.			**Four Performance Criteria**			**Four Performance Criteria**

Part V – ECET Evaluation Planning and Implementation

As defined by ABET, Evaluation is *one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program outcomes or program educational objectives are being achieved, and results in decisions and actions to improve the program.*

Evaluation of the assessment data for the objectives and outcomes must include input from the program constituencies:

ECET Faculty
ECET Students
ECET Alumni
ECET Employers
ECET Advisory Board
Engineering & Technology Department Head

Data is gathered from graduating senior exit surveys, alumni surveys, employer surveys, and assessment of performance criteria and program educational objectives. Review of the data takes place annually involving faculty, advisory board, the ET Department Head and the Assessment Director. The results of the evaluation are summarized and fed back into the program to document the continuous improvement process.

Table 6 summarizes responsibility for assessment and evaluation activities. Detailed time lines for evaluation processes are presented in Appendix D.

Table 6. Assessment and Evaluation Activity Responsibilities

Assessment and Evaluation Activity	Responsibility
Data Collection and Evaluation; Determine Findings	ECET Faculty; Department Head; Assessment Director
Initiate Action Where Necessary	ECET Faculty
Review Program Outcomes, Performance Criteria and Program Educational Objectives	ECET Faculty; Advisory Board; Department Head; Assessment Director
Determine Targeted Courses, Assessment Activities & Methods	ECET Faculty; Department Head; Assessment Director
Develop/Review Assessment Methods	ECET Faculty; Advisory Board; Department Head; Assessment Director
Continuous Summary of Assessment/Evaluation Activities and Results	Department Head; Assessment Director

Appendix A

ECET Four-Year Course Plan

Mapping the Curriculum to Program Outcomes

Western Carolina University
Electrical and Computer Engineering Technology

Suggested Course Plan			
Fall Semester	**Hours**	**Spring Semester**	**Hours**
C1 ENGL 101 Composition I	3	C1 ENGL 102 Composition II	3
Perspective	3	C3 CMCH 201 Intro. Speech Comm.	3
C4 Health & Wellness	3	C2 MATH 146 Precalculus	4
First Year Seminar	3	Perspective	3
Perspective	3	Perspective	3
	15		16
Fall Semester		**Spring Semester**	
ECET 231 Circuit Analysis I	4	ECET 290 Computer Engineering Fundamentals	3
C5 PHYS 130 Physics I	4	ECET 242 Electronic Circuits	4
CS 140 ProbIem Solving/Programming	3	Perspective	3
Perspective	3	PHYS 131 Physics II	4
C5 Elective	3	MATH 170 Statistics	3
	17		17
Fall Semester		**Spring Semester**	
ECET 331 Digital Integrated Circuits	4	ECET 332 Microcontrollers	4
ECET 321 Circuit Analysis II	4	TEL 312 Electronic Communications	4
TEL 345 Introduction to LAN's	4	MATH 255 Calculus II	4
MATH 153 Calculus I	4	ECET 341 Advanced Circuit Analysis	3
	16		15
Fall Semester		**Spring Semester**	
ECET 431 Microprocessor Interfacing	4	ECET 461 Digital Signal Processing	3
ECET 452 Control Systems	4	ECET 464 Instrumentation	4
ECET 478 Senior Project Proposal	1	ECET 479 Senior Project	3
Technical Elective	4	Perspective	3
Elective	3	Technical Elective	3
	17		16

Western Carolina University
Electrical and Computer Engineering Technology

Mapping the Curriculum to the Program Outcomes

Semester	Course Number	Course Title	Program Outcomes				
			1	2	3	4	5
1st Semester (15 hours)	ENGL 101	Composition I ……				x	x
	Health & Wellness	Liberal Studies……				x	x
	First Year Seminar	Liberal Studies ……				x	x
	Perspective	Liberal Studies ……				x	x
	Perspective	Liberal Studies ……				x	x
2nd Semester (16 hours)	ENGL 102	Composition II ……				x	x
	CMCH 201	Introduction to Speech Communication ……				x	x
	MATH 146	Precalculus…….. ……	x	x			
	Perspective	Liberal Studies ……				x	x
	Perspective	Liberal Studies ……				x	x
3rd Semester (17 hours)	ECET 231	Circuit Analysis I ……..	x	x		x	
	CS 140	Problem Solving & Programming ……	x	x			
	PHY 130	Introductory Physics I ……	x	x		x	
	C5 Elective	CHEM 139 General Chemistry – Recommended ……..	x	x		x	
	Elective	Elective ……..	x	x			
4th Semester (17 hours)	ECET 290	Computer Engineering Fundamentals ……	x	x		x	
	ECET 242	Electronics Circuits ……	x	x	x	x	
	MATH 170	Statistics ……	x	x			
	PHYS 131	Introductory Physics II ……..	x	x		x	
	Perspective	Liberal Studies ……				x	x
5th Semester (16 hours)	ECET 331	Digital Integrated Circuits ……	x	x		x	
	ECET 321	Circuit Analysis II ……	x	x		x	
	TEL 345	Introduction to LANs ……	x	x	x	x	
	MATH 153	Calculus I ……..	x	x			
6th Semester (17 hours)	ECET 332	Microcontrollers ……	x	x		x	
	ECET 341	Advanced Circuit Analysis ……..	x	x			
	TEL 312	Electronic Communication Fundamentals (Recommended)	x	x		x	
	MATH 255	Calculus II ……	x	x			
7th Semester (17 hours)	ECET 431	Microprocessor Interfacing ……	x	x	x		
	ECET 452	Control Systems ……	x	x			
	ECT 478	Senior Project Proposal ……	x	x	x	x	x
	Technical Elective	Technical Elective ……	x	x		x	
	Technical Elective	Technical Elective ……	x	x		x	
	Elective	Elective ……..					
8th Semester (16 hours)	ECET 461	Digital Signal Processing ……..	x	x	x	x	
	ECET 464	Instrumentation ……	x	x		x	
	ECET 479	Senior Project ……	x	x	x	x	x
	Technical Elective	Technical Elective ……	x	x		x	
	Perspective	Liberal Studies ……..				x	x

Appendix B

ECET Course Learning Objectives

ECET Course Learning Objectives

Upon completion of this course, the student will be able to accomplish the following:

ECET 211 Electronic Drafting & Fabrication	1.Identify electronic components and component packages common to circuit fabrication. 2. Perform the various skills and methods of electronics project prototyping, such as breadboarding, point-to-point soldering, wire wrapping, and printed circuit board design and fabrication. 3. Create electronic prototypes using computer-based tools for schematic capture and layout of printed circuit boards. 4. Utilize laboratory instruments and equipment to build and test breadboarded and printed circuit boards.
ECET 231 Circuit Analysis	1. State the basic theories of electricity, passive electrical component behaviors, and DC and AC circuit phenomena. 2. Characterize the behavior of voltage and current sources, resistors, capacitors, and inductors. 3. Apply knowledge of theories, component behaviors and appropriate software to solve technical problems in DC and AC circuit analysis. 4. Utilize laboratory instruments and equipment to perform basic measurements for the analysis and assembly of electrical circuits. 5. Write effective technical laboratory reports.
ECET 242 Electronic Circuits	1. Utilize laboratory instruments and equipment to perform basic measurements for the analysis and assembly of electronic circuits. 2. Understand the physical phenomena of semiconductor devices including the p-n junction, barrier potential, saturation current and avalanche breakdown. 3. Describe the basic operation of semiconductor devices including diodes, transistors and operational amplifiers. 4. Glean relevant information from manufacturer data sheets of semiconductor devices and select appropriate devices for a particular set of design specifications. 5. Analyze, simulate, design, build and test diode circuits, DC transistor circuits, AC small signal models of transistor amplifiers and several basic operational amplifier circuits. 6. Write effective technical laboratory reports.

ECET 290 **Computer Engineering Fundamentals**	1. Identify and describe all components in digital computer systems. 2. Demonstrate operation of command line and graphical operating systems. 3. Master basic binary math computation and ASCII code translation. 4. Develop shell scripts to automate high level computer tasks. 5. Describe the difference between machine, assembly, high level, and graphical programming environments. 6. Create a computer system design which involves simple storage, communication, calculation, networking, and user interface requirements.
ECET 321 **Circuit Analysis II**	1. Apply knowledge of theories, component behaviors and appropriate software to solve technical problems in AC circuit analysis including Kirchhoff's current and voltage laws, using complex algebra and Fourier series. 2. Characterize the behavior of voltage and current sources, resistors, capacitors, inductors, and operational amplifiers in time domain and frequency domain. 3. Utilize laboratory instruments and equipment to perform basic measurements for the analysis and assembly of electrical circuits. 4. Analyze and design band pass, band reject, low pass, and high pass filters. 5. Write effective technical laboratory reports.
ECET 331 **Digital Circuits**	1. State the basic concepts of number systems, Boolean algebra, combinatorial and sequential logic circuits and their applications to digital systems. 2. Design, write, simulate and verify digital circuits using a HDL and supporting applications. 3. Design and construct digital circuit prototypes using discrete components. Port HDL-based designs to programmable logic devices and validate their behavior in a hardware environment. 4. Write effective technical laboratory reports.

ECET 332 Microcontrollers	1. Identify and operate the parts of a microcontroller and differentiate between microcontroller and microprocessor. 2. Write programs in assembler and use the development environment to solve basic problems using microcontrollers. 3. Identify assembler directives and opcodes and translate from machine code to assembler manually. 4. Identify communication devices and protocols used by microcontrollers. 5. Design microcontroller-based applications using flow charts and hardware block diagrams. 6. Utilize laboratory instruments and equipment to implement basic microcontroller-based computer systems.
ECET 341 Advanced Circuit Analysis	1. Perform circuit analysis based on the mathematical and physical forms of common waveforms found in systems along with the response of circuit components to such waveforms. 2. Deduce the transient response and steady state response of passive components. 3. Apply Laplace transforms to the analysis of electrical circuits.
ECET 431 Microprocessor Interfacing	1. Use external components to expand and interface to microcontrollers or microprocessors, to create automated mixed signal systems. 2. Create interrupt driven program solutions to problems, including RTOS. 3. Program in C language to solve problems using embedded controllers. 4. Design a complete embedded system for a problem of interest. 5. Utilize laboratory instruments and equipment to implement advanced microprocessor or microcontroller-based computer systems.
ECET 452 Control Systems	1. Understand fundamentals of control system theory and system parameters. 2. Apply Laplace transform techniques to the analysis of and design of a variety of continuous-time control systems. 3. Mathematically design proportional, integral, and derivative controllers given a set of system criteria. 4. Write computer programs for the simulation of control system performance. 5. Analyze, design, and test operational amplifier circuits used in control systems.

ECET 461 Digital Signal Processing	1. Understand linear time invariant systems and discrete time signals. 2. Apply transform methods such as DTFT, DFT, and ZT to the analysis of discrete time signals and systems. 3. Perform the analysis, design, and computer simulation of FIR and IIR digital filters. 4. Understand basic designs of digital filters and fluency in using Matlab. 5. Prepare a formal report of an experiment and present the findings orally.
ECET 464 Instrumentation	1. Characterize ideal and non-ideal sensors for computer instrumentation systems. 2. Analyze non-ideal op amp circuits for amplification and filtering. 3. Characterize non-ideal A/D converters. 4. Analyze optical components with regard to sensing transducer applications. 5. Develop test software using graphical programming environments. 6. Utilize laboratory instruments and equipment to implement advanced PC-based computer systems.
ECET 478 Senior Design Project Proposal	1. Define a systems level project incorporating appropriate research methods, prior course material, and an analysis of necessary resources. 2. Incorporate fundamental elements of project management, including milestones, time lines, resource allocation, budget analysis, and success criteria. 3. Prepare and present a formal oral report of design project proposal. 4. Prepare a written technical report of design project proposal. 5. Effectively collaborate with other class members or outside vendors.

ECET 479 **Senior Design Project**	1. Analyze, design, and implement proposed project. 2. Apply fundamental elements of project management, including milestones, time lines, resource allocation, budget analysis, and success criteria. 3. Effectively collaborate with other class members or outside vendors. 4. Prepare a written technical report of design project and results. 5. Prepare and present a formal oral report of design project and results.
TEL 312 **Electronic Communications Fundamentals**	1. Understand and apply basic communications concepts such as signal representation, spectral analysis, signal to noise ratio, modulation and demodulation. 2. Design and implement communication systems using mixers, local oscillators, filters and amplifiers. 3. Apply software tools to the design and simulation of communication systems. 4. Apply Fourier Series and Fourier Transforms for analysis of communication signals. 5. Utilize laboratory instruments and equipment to implement communication systems. 6. Prepare written formal reports of the design, analysis and implementation of communication systems. 7. Understand and discuss government regulations regarding the transmission of communication signals.
TEL 345 **Introduction to Local Area Networks**	1. Design and implement local area networks to specified operational criteria. 2. Apply software tools to the design and operation of computer-based networks. 3. Analyze various computer network data structures. 4. In a laboratory setting, utilize hubs, bridges, routers, and switches to implement local area networks. 5. Prepare written formal reports of the design, analysis and implementation of local area networks.

Appendix C

ECET Assessment Planning Matrices

(2007-2010)

Western Carolina University
Electrical and Computer Engineering Technology

Assessment Planning Matrices for 2007-08

Program Outcome 1: Analyze and interpret experimental data and apply it in a practical manner in the design and development of electrical and computer systems.

Performance Criteria	MAP a-k	Targeted Courses	Assessment Activity	Assessment Method	Assessment Frequency	Assessment Responsibility
1.a. Demonstrate proper use of laboratory equipment.	a, c	ECET 242 TEL 345 ECET 479	Laboratory Performance Exam Laboratory Experiment Equipment Use Demonstration	Performance Appraisal Rubric-Equipment Use Observation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
1.b. Build and test circuits and/or systems.	a, c	ECET 231 ECET 331 ECET 332	Voltage Divider Two-Bit Adder Interrupts	Rubric Rubric Rubric	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
1.c. Analyze and interpret experimental data in laboratory settings.	c	ECET 231 ECET 331 ECET 332	Lab Report- Analysis Section Lab Report- Analysis Section Lab Report- Analysis Section	Analysis Evaluation Analysis Evaluation Analysis Evaluation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
1.d. Record and present experimental data in appropriate formats.	c, g	ECET 231 ECET 331 ECET 332	Lab Report-Data Display/Format Lab Report-Data Display/Format Lab Report-Data Display/Format	Data Evaluation Data Evaluation Data Evaluation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
1.e. Apply appropriate design concepts to electrical and computer systems.	a, b, d	ECET 431 TEL 312 ECET 452	Design Project Systems Design Project Controller Design	Written Report Project Evaluation Design Evaluation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty

Program Outcome 4: Communicate technical information clearly and concisely.

Performance Criteria	MAP a-k	Targeted Courses	Assessment Activity	Assessment Method	Assessment Frequency	Assessment Responsibility
4.a. Present oral reports.	g	ECET 341 ECET 478 ECET 479	Problem Solutions Senior Project Proposal Senior Project	Oral Presentation Oral Presentation Oral Presentation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
4.b. Produce written technical reports.	g	ECET 341 ECET 478 ECET 479	Problem Solutions Senior Project Proposal Senior Project	Written Report Written Report Written Report	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty

Western Carolina University
Electrical and Computer Engineering Technology

Assessment Planning Matrices for 2008-09

Program Outcome 2: Apply current technical information, circuit simulation software, and appropriate mathematics to identify, analyze, and solve technical problems associated with electrical and computer systems.

Performance Criteria	MAP a-k	Targeted Courses	Assessment Activity	Assessment Method	Assessment Frequency	Assessment Responsibility
2.a. Solve electrical circuits problems fundamental to electrical and computer systems.	a, f	ECET 321 ECET 341 ECET 464	Problem Solutions Problem Solutions Design Project	Local Examination Local Examination Project Evaluation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
2.b. Demonstrate the application of appropriate software to solve technical problems.	a, d, f	ECET 321 ECET 461 TEL 312	Pspice Application Matlab Application Matlab Application	Application Evaluation Application Evaluation Application Evaluation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
2.c. Demonstrate the application of mathematics in solving technical problems.	a, d, f	ECET 341 ECET 461 TEL 312	Problem Solutions Transforms Application Transforms Application	Local Examination Local Examination Local Examination	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
2.d. Solve technical problems given a set of specifications.	a, f	ECET 331 ECET 431 ECET 464	Laboratory Project Laboratory Project Laboratory Project	Project Evaluation Project Evaluation Project Evaluation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
2.e. Solve open-ended technical problems.	a, b, d, f	ECET 452 ECET 479 TEL 345	Design Projects Design Projects Design Projects	Design Evaluation Design Evaluation Design Evaluation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
2.f. Resource applicable technical information.	a, b, d, f	ECET 331 ECET 332 ECET 461	Component Listing Component Listing Component Listing	Written Report Written Report Written Report	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty

Program Outcome 3: Apply project management fundamentals with a commitment to quality, timeliness and continuous improvement in electrical and computer systems design and development.

Performance Criteria	MAP a-k	Targeted Courses	Assessment Activity	Assessment Method	Assessment Frequency	Assessment Responsibility
3.a. Demonstrate fundamental project management techniques.	a, e, k	ECET 332 ECET 478 ECET 479	Develop Gantt Chart Develop Gantt Chart Develop Gantt Chart	Application Evaluation Application Evaluation Application Evaluation	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
3.b. Discuss the basic principles of quality assurance and continuous improvement.	a, e, k	ECET 464 ECET 478 ECET 479	Design Project Senior Project Proposal Senior Project	Written Report Written Report Written Report	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty
3.c. Demonstrate appropriate team skills.	e	ECET 479 TEL 312 TEL 345	Senior Project Team Project Team Project	Rubric-Teaming Rubric-Teaming Rubric-Teaming	3 Year Intervals 3 Year Intervals 3 Year Intervals	Course Faculty Course Faculty Course Faculty

Western Carolina University
Electrical and Computer Engineering Technology

Assessment Planning Matrices for 2009-10

Program Outcome 5: Exhibit knowledge necessary for career advancement in engineering/technical professions.

Performance Criteria	MAP a-k	Targeted Courses	Assessment Activity	Assessment Method	Assessment Frequency	Assessment Responsibility
5.a. Discuss the need and nature of lifelong learning.	h	ECET 290 ECET 478 TEL 345	Readings & Research Readings & Research Readings & Research	Written Report Written Report Written Report	3Year Intervals 3 Year Intervals 3Year Intervals	Course Faculty Course Faculty Course Faculty
5.b. Discuss professional, ethical and social issues related to the workplace.	e, i, j	ECET 290 ECET 478 ECET 479	Readings & Research Readings & Research Readings & Research	Written Report Oral Presentation Oral Presentation	3Year Intervals 3Year Intervals 3Year Intervals	Course Faculty Course Faculty Course Faculty
5.c. Recognize and describe several challenges when working in a diverse team environment.	e, j	ECET 290 ECET 478 ECET 479	Readings & Research Senior Project Proposal Senior Project	Written Report Oral Presentation Oral Presentation	3 Year Intervals 3Year Intervals 3Year Intervals	Course Faculty Course Faculty Course Faculty
5.d. Describe several issues related to technology and society that are of a global nature.	h, i, j, k	ECET 290 ECET 478 TEL 345	Readings & Research Senior Project Proposal Senior Project	Oral Presentation Written Report Written Report	3Year Intervals 3Year Intervals 3Year Intervals	Course Faculty Course Faculty Course Faculty

Appendix D

ECET Evaluation Processes

(As defined by ABET, Evaluation is *one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program outcomes or program educational objectives are being achieved, and results in decisions and actions to improve the program.)*

Evaluation Processes
Electrical and Computer Engineering Technology

Program Outcome 1: Analyze and interpret experimental data and apply it in a practical manner in the design and development of electrical and computer systems.

Program Outcome 4: Communicate technical information clearly and concisely.

Evaluation Activities	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Data Collection	x			x			x		
Data Evaluation		x			x			x	
Report Findings		x			x			x	
Initiate Action, if Necessary		x			x			x	
Review/Modify Performance Criteria		x			x			x	
Determine Targeted Courses			x			x			x
Determine Assessment Activities			x			x			x
Develop/Review Assessment Methods			x			x			x
Summarize Evaluation Information	x	x	x	x	x	x	x	x	x

Evaluation Processes
Electrical and Computer Engineering Technology

Program Outcome 2: Apply current technical information, circuit simulation software, and appropriate mathematics to identify, analyze, and solve technical problems associate with electrical and computer systems.

Program Outcome 3: Apply project management fundamentals with a commitment to quality, timeliness and continuous improvement in electrical and computer systems design and development.

Evaluation Activities	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Data Collection		x			x			x	
Data Evaluation			x			x			x
Report Findings			x			x			x
Initiate Action, if Necessary			x			x			x
Review/Modify Performance Criteria			x			x			x
Determine Targeted Courses	x			x			x		
Determine Assessment Activities	x			x			x		
Develop/Review Assessment Methods	x			x			x		
Summarize Evaluation Information	x	x	x	x	x	x	x	x	x

Evaluation Processes
Electrical and Computer Engineering Technology

Program Outcome 5: Exhibit knowledge necessary for career advancement in engineering/technical professions.

Evaluation Activities	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Data Collection			x			x			x
Data Evaluation	x			x			x		
Report Findings	x			x			x		
Initiate Action, if Necessary	x			x			x		
Review/Modify Performance Criteria	x			x			x		
Determine Targeted Courses		x			x			x	
Determine Assessment Activities		x			x			x	
Develop/Review Assessment Methods		x			x			x	
Summarize Evaluation Information	x	x	x	x	x	x	x	x	x

Evaluation Processes
Electrical and Computer Engineering Technology

Program Educational Objectives
Alumni Survey
Employer Survey

Evaluation Activities	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Data Collection	x		x		x		x		x
Data Evaluation	x		x		x		x		x
Report Findings	x		x		x		x		x
Initiate Action, if Necessary	x		x		x		x		x
Review/Modify PEOs, if Necessary		x		x		x		x	
Review/Modify Assessment Process		x		x		x		x	
Summarize Evaluation Information	x	x	x	x	x	x	x	x	x

Evaluation Processes
Electrical and Computer Engineering Technology

Graduating Senior Exit Survey

Evaluation Activities	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Data Collection	x	x	x	x	x	x	x	x	x
Data Evaluation	x	x	x	x	x	x	x	x	x
Report Findings	x		x		x		x		x
Initiate Action, if Necessary	x		x		x		x		x
Review/Modify Assessment Process		x		x		x		x	
Summarize Evaluation Information	x	x	x	x	x	x	x	x	x

Appendix E

ECET Program Outcomes Assessment Forms (Samples)

Guidelines
for
ECET/EE Program Outcomes Assessment Forms

Program Outcome (x)	*The Program Outcomes are listed in the Assessment Planning Matrices for 2007-08. Insert the Program Outcome number in place of the 'x'. Type in the Program Outcome here.*
Performance Criteria (xx):	*For either EE or ECET, insert the Performance Criteria number associated with the planned assessment and type in the performance criteria here.*
ABET Criterion (x):	*This refers to the a-k criterion associated with either TAC or EAC ABET accreditation. This can be found in the column titled MAP a-k on the 2007-08 Assessment Planning Matrices. There may be more than one a-k criterion. For example, you may see "a, c". List both letters in place of the 'x' and type both criterion here. The actual criterion can be found on page 3 of the assessment plans.*
Course Information:	*Include course number and title, semester and year.*
Course Learning Objective:	*Select the most appropriate Course Learning Objective for the Program Outcome and Performance Criteria. In the selection of the CLO, the performance criteria should be closely related to the CLO and in fact, the performance criteria may be one aspect of the CLO.*
Assessment Activity:	*Briefly describe the assessment activity, e.g., examination question, design project, data analysis, lab performance exam, problem solutions, etc. Many of these are listed on the Assessment Planning Matrices. Be sure to provide sufficient information so that this activity can be located within the course material.*
Assessment Method/Tool:	*Briefly state the nature of the assessment method, e.g., rubric, written report, oral report, analysis of data, etc. Many of these are listed on the Assessment Planning Matrices. A copy of the assessment tool should be submitted with the completed assessment form.*
Assessment Results:	*State the results of the assessment process; be specific with regard to data results. Indicate the number of students involved. Your assessment method should contain measurement criteria. This is the place to address the level of achievement for these criteria.*
Recommendation(s) or Conclusions:	*Based on the results, list your recommendations or conclusions regarding the assessment of the particular performance criteria.*

……

A copy of the assessment activity with assessment method/criteria to be attached to this form.

Western Carolina University
Electrical and Computer Engineering Technology
Assessment Results-Spring 2008
(Sample)

Program Outcome 4: Communicate technical information clearly and concisely.

Performance Criteria	MAP a-k	Course & Instructor	Assessment Activity	Assessment Method	Assessment Semester	Assessment Results
4.a. Present oral reports	g	Course #1		PO 4.a. Rubric		*From the data generated, indicate how many students were exceptional, proficient, marginal, or unsatisfactory.*
4.a. Present oral reports	g	Course #2		PO 4.a. Rubric		
4.a. Present oral reports	g	Course #3		PO 4.a. Rubric		

Program Outcome 4.a. Summary Statement of Assessment Results:

Summary of Results:

Course #1:
Recommendations:

Course #2:
Recommendations:

Course #3:
Recommendations:

APPENDIX F – ACRONYMS

ECET	**Electrical and Computer Engineering Technology**
EET	**Electrical Engineering Technology**
ET	**Engineering Technology**
IAC	**Industrial Advisory Committee**
IEEE	**Institute of Electrical and Electronics Engineering**
PEO	**Program Educational Objective**
PO	**Program Outcome**
TEL	**Telecommunications Engineering Technology**
WCU	**Western Carolina University**