Electronics and Computer Engineering Technology BS

Develop Knowledge And Skills

Goal Description:

1. Students will develop knowledge and understanding of key concepts and skills relevant to Electronics and Computer Engineering Technology as well as Engineering technology Electronics areas.
2. Students will develop knowledge and understanding of key concepts and skills relevant to design, systems, implementation, and application engineering technology.
3. Students will develop their technical writing, presentation, and teamwork skills by working on group projects as part of the course requirement.

Providing Department: Electronics and Computer Engineering Technology BS

RELATED ITEMS/ELEMENTS

RELATED ITEM LEVEL 1

Development Of Students' Knowledge And Skill

Learning Objective Description:

1. The students will be able to conduct standard tests and measurements; analyze and interpret experiments; apply experimental results to improve processes; and design the system (Goal 1 and 2).
2. The students will be able to function effectively as a member or leader on a technical team to develop, test and troubleshoot circuits and systems (Goal 1 and 3).
3. The students will be able to apply written, oral and graphical communication; also, will be able to identify and use appropriate technical/ non-technical literature in the ECET areas (Goal 3).

RELATED ITEM LEVEL 2

ETEE 2320 Circuits and Systems

Indicator Description:

The students enrolled in Spring 2021 were evaluated based on the following rubric:

Mid-term Exam	**20%**
Final Exam	**20%**
Laboratory Experiments	**15%**
Homework Assignments	**15%**
Attendance, Observed performance & Attitude	**10%**
Class Design Project and Presentation	**10%**
Quizzes (5-8 quizzes)	**10%**
Total	**100%**

There were 18 students in ETEE 2320 Circuits and Systems class during Spring 2021 semester. The student work included the following: one midterm exam, one final exam, eight quizzes (including take home and in-class pop quizzes), six homework's and 11 lab projects with technical reports. Students also gained their 10% of class grading based on their attendance, class participation and attitude.

The tests included fundamentals of AC circuit theory, applications of inductors (Ls), capacitors (Cs), and series and parallel combination of RLC circuit parameters, resonance, AC passive filters, frequency response, voltage, Current, Power relations, series and parallel AC circuits, ideal transformer, single phase and three-phase transformers, single phase and three phase electrical power circuits applied to industrial environments, using (j) complex parameter and complex analysis of AC circuits, real power, reactive power, and apparent power relations, power factor correction in industrial environments, efficiency concept, electrical measurements, and AC circuit troubleshooting.

Extensive labs on oscilloscope use were introduced. 11 Lab projects were required for each student and students could make up the missed labs with reported justifications. The lab projects aimed to gain extensive amount of hands-on skills and experience on the introduction of AC electrical circuits, safety, wiring, measurements, testing, and the troubleshooting open circuit and short circuit phenomena.

Extensive use of NI MultiSIM software was provided. After the first homework assignment, all other assignments included at least one design question on AC circuit analysis with NI MultiSIM digital software tool.

Criterion Description:

As suggested by the course Instructor and agreed by other ETEC faculty most students (70%) should be able to get a grade of C (70% or higher with a curve in the class as needed) or higher. The final project with a 10% course grade was required by each student and presented in the class. Similarly, the lab projects included knowledge and skills of AC circuits theory and students were provided extensive hands-on and minds-on experience on many practical AC electrical circuits and systems.

Findings Description:

There were 27 students initially enrolled and attended first two weeks in ETEE 2320 class and 3 students dropped the class in the beginning of the semester. Therefore, there were total 24 students continued the attend the class after the first week of classes in spring 2023. Compared with previous semesters, instructor observed an attendance issue in most of the students during spring 2023. Following is a summary of our findings in relation to the learning objectives.

Summarized Students' Course Achievements of Program Outcomes Form
Course Name: ETEE 2320 Circuits and Systems, Spring 2023 **Instructor**: Dr. Reg Pecen

Directly supported Goals and learning objectives	***PO1.*** *Possess problem solving skills involving analysis, design, and simulation, laboratory experimentation with applications to electrical and electronic components, circuits, and systems.* ·Intro to AC, current I and voltage V, Phase shift, oscilloscope use, ·Capacitors ·RC Circuits Analysis using Complex Variables, TI-84 or better use/digital tools ·Inductors ·RL Circuits Analysis ·R, L, C Elements, Circuits, Impedance Concept, real-power P, reactive -power Q, apparent-power S relations, measurement. ·Transformers – Ideal Trf, Single and 3-Phase Transformers. ·Time Response of Reactive Circuits.
	PO4. *Students will have an ability to design and carry out experiments and tests, analyze and interpret data, and make iterative improvements by using safe and technically correct laboratory methods.* • Students completed 11 labs as individual on 24 lab stations although there were few groups made due to the equipment failures in 2-3 lab project activities. • Lab experiments included: The oscilloscope and Sin Wave Measurements, Capacitors, Inductors, Charge and Discharge of Caps, Inductor operation, Series and Parallel RLC circuits, RC and RL Response, RLC Circuit Response, Series and Parallel Resonance, Passive Filter Circuit Design including low pass, high pass, band pass, and band stop filters and operation, Transformers (Trf), Trf operation.

	PO8. *Students will collaborate with each other in laboratory and classroom settings to work effectively in teams.* ·All students submitted technical lab reports with typed conclusion section. For each lab (11 of them), every student submitted a lab report to summarize what they have learnt and how the circuit theory and experiments complement to each other. ·12 student groups worked on 12 separate class design projects that included phases of design, breadboarding, testing, operating, troubleshooting, and soldering (extra credit only). All student groups submitted technical project reports that included a problem definition, objectives, technical methodology, breadboarding, PCB soldering (optional for extra credit), simulation and results with tables and graphics as needed. ·Each project group (of two students) required to present formally in front of their peer students for 10 minutes on their applied research project implementation, problems faced, how they resolved, demonstration of their circuit, and finally answering questions from other students. Students also evaluated each project except their own and instructor used them for his final project grade calculations.

Total number of students assessed (N_s): 24 during Spring 2023, 1 student failed, 2 students earned D.		
Outcome 1	**Average (M_s):** Mid-Term: 60.4% Quizzes: 79.0% Final Exam: 66.6%	**Standard deviation (s_s):** Mid-Term: 17.49 Quizzes: 16.70 Final Exam: 19.90
Outcome 2	**Average (M_s):** Applied Research Project: 95.33%	**Standard deviation (s_s):** 8.03
Outcome 3	**Average (M_s):** Lab Projects: 84.09%	**Standard deviation (s_s):** 18.13
Total Grading	**Average (M_s):** Final Grade: 66.61%	**Standard deviation (s_s):** 12.95

The overall class average was 74.65. 87.5% of all enrolled students got C or better and that means 87.5% of all enrolled students have met the expectation of C or better. The class goal is met. However, before curving, the percentage drops to 66.61%, which is touch below the expectation.

All students showed reasonable learning and hands-on skills for 11 lab projects with 84.09% average lab grade. This number is higher than the target number of 70%. Three students who earned one F and two D grades showed very low lab attendance and lab grade too.

One of the reasons for 3.39 % lower rate than overall 70% class success rate is attendance issue of few students. 8 students (33.33 % of the whole class) who continuously showed attendance problems.

The success rate on the class design project is 95.33% which is much higher than the overall class goal of 70% success rate. 8 out of 24 students earned a grade of A, 8 students earned a grade of B, 5 students earned a grade of C, 2 students earned a grade of D, and 1 student failed the class due to attendance and lack of work problems.

A breakdown for the course assessment numbers are shown below:

Above Average/Excellent (80%+)	50.00%
Met Expectation (70%+)	37.50%
Needs Work/Developing (60%+)	8.33%
Below Par (Less than 60%)	4.17%
Total	24 students (100%)

This semester classes are held all face to face with hands-on lab experiences and COVID was not a problem during Spring 2023. Unfortunately, students continue to experience attendance problems due to multiple reasons. Most common reason was work hours and family emergencies of few students that caused them to miss the classes. One of the other challenges is familiarity with Complex Calculator such as TI-84 or better. It took few weeks to be able to teach TI-84 use for complex variables and complex calculations. Two students did not have TI-84 or better calculator. Students appreciated efforts on face-to-face education and office hours. The laboratory projects were all completed as face to face in Pirkle 140 and 142 electronics labs in both Fall 2022 and Spring 2023.

Students were required to rent or buy e-copy of textbook as we had confirmed with university bookstore for low-cost rental or purchase of e-book version of the textbook. Having a cost-effective e-textbook has improved the student success. Instructor (Dr. Pecen) also arranged two additional tutorial sessions that helped student success rate during spring 2023.

RELATED ITEM LEVEL 3

ETEE 2320 Circuits and Systems

Action Description:

1. Monitoring attendance more rigorously for upper-level courses.
2. Face-to-Face office hours/meetings with underperforming students
3. Tutoring sessions with TA
4. Submit the 4-page technical report to regional conferences and encourage students to go and present if accepted.

RELATED ITEM LEVEL 2

ETEE 3345 Digital Electronics

Indicator Description:

The students enrolled in Spring 2020 were evaluated based on the following rubric:

Mid-term Test	**20%**
Final Exam	**20%**
Laboratory Experiments	**30%**
Homework Assignments (Best Two out of Three)	**5%**
Attendance	**5%**
Respecting Deadline, Maintaining your Group, Respecting Security Measures, Attitude	**5%**
Final Project	**15%**
Total	**100%**

Each student submitted three HW's based on the lectures given on Number systems, Gates, Boolean Algebra, De-Morgan's, Logic Minimization etc. The students had to sit for two exams – mid-term (20%) and Final (20%). Mid-term exam on number Systems, basic of digital electronics, logic minimization, De-Morgan's and gates; final exam on Latches, Counters, Shift Registers, different applications like MUX/DEMUX, Encoder/Decoder, Half/Full Adder etc. Each student was assigned in a group of two and worked on final project (15%). The students had to attend 7 LABS (30%), in rotation of two groups to maintain the social distancing. Each lab was done in two days with two groups. We also lost one week due to unprecedented cold in the area. Students did troubleshoot problems associated with different aspects of this course. For example, one lab was on 4-bit adder, another was on shift register. Bonus points were allocated for labs on counter, which we would have done in normal times (11 labs vs 7). This year due to more in-person opportunities, students were encouraged to built prototype for their final project and upload a video demonstration for the peers. They also had to make powerpoint slides and present in front of their peer. They needed to submit a technical report in IEEE conference format on their project. 5% grade was assigned for respecting deadline, maintaining security measures and showing up on assigned LAB day. Every student had to wear masks or face coverings, come in the LAB, use the sanitizing wipes installed in the LAB room, wipe down seats, table, all equipment's even before they start doing the lab. Once they are done, they needed to repeat this, so the station is sanitized and ready for the next person. Also, the rotation was necessary, and students if did not show up on their assigned lab day, it would have created space issue in the lab and compromise the social distancing.

Criterion Description:

This course is a study of the principles and applications of digital logic circuits including number systems; logic gates; counters; shift registers; sequential and combinational logic circuits; and laboratory experiences consist of experimental problems. The Engineering Technology programs generally assess the criterion description of at least 80% of the students will perform at an acceptable level of a score of four or higher. As suggested by the course Instructor Dr. Basith, most students (80%) should be able to get a grade of B (80%) or higher.

Findings Description:

There were 20 total students enrolled for Spring 2023, one student dropped midway, and 19 completed the course, 1 student failed. following is a summary of our findings in relation to the learning objectives.

Summarized Students' Course Achievements of Program Outcomes Form
Course Name: ETEE 3345 Digital Electronics, Spring 2023 **Instructor**: Dr. Iftekhar Ibne Basith

<table>
<tr><td rowspan="3">Directly supported Goals and learning objectives:</td><td>1. The students will be able to conduct standard tests and measurements; analyze and interpret experiments; apply experimental results to improve processes; and design the system:
·Different number systems and conversion between them.
·Logic Gates, Boolean algebra, sequential logic, minimization.
·Timing Diagram, multi-level gating.
·MUX/DEMUX, Half/Full Adder, Comparator, Encoder/Decoder.
·Shift registers: Serial In – Serial Out, Serial In – Parallel Out, Parallel In – Serial Out, Parallel In – Parallel Out.
·Counters, Ring counter, Johnson Counter, Asynchronous and Synchronous counters.
·Learning the theory in lectures and then build, troubleshoot, and test above concepts through FESTO LX new interface and FACET boards.</td></tr>
<tr><td>2. The students will be able to function effectively as a member or leader on a technical team:
·Students teamed up as 2 members in a group and there were 9 such groups. One student presented alone making the total group count to 10.
·Some examples are: Sun tracking Solar Panel, Self-monitoring Aquaponic System, Digital Function Generator etc.</td></tr>
<tr><td>3. The students will be able to apply written, oral and graphical communication; also, will be able to identify and use appropriate technical/ non-technical literature:
·All students needed to submit a 4-page report on their project in IEEE conference format.
·Each group required to present in front of their peer for 6-7 minutes on their project implementation, problems faced, and how they resolved.
·For each lab (13 of them), every student uploaded a LAB report to summarize what they have learnt on corresponding day and how theory and experiments complement each other.</td></tr>
<tr><td colspan="3">Total number of students assessed (N_s): 19 during Spring 2023</td></tr>
<tr><td>Outcome 1</td><td>Average (M_s):
Mid-Term: 63.03% (63.5%)
Final Exam: 54.41% (57.43%)</td><td>Standard deviation (σ_s):
Mid-Term: 3.55 (3.63)
Final Exam: 3.16 (1.89)</td></tr>
<tr><td>Outcome 2</td><td>Average (M_s):
Final Project: 79.42% (83.83%)</td><td>Standard deviation (σ_s):
3.66 (2.41)</td></tr>
</table>

Outcome 3	Average (M_s): LABS: 69.72% (71.33%)	Standard deviation (σ_s): 3.04 (2.31)
Total Grading (BEFORE curve)	Average (M_s): Final Grade: 69.13% (71.72%)	Standard deviation (σ_s): 12.67 (5.88)
Total Grading (AFTER curve)	Average (M_s): Final Grade: 85.58% (89.33%)	Standard deviation (σ_s): 14.92 (6.93)

The whole course grade breakdown (out of 100)		
	After CURVE & BONUS	Before CURVE & BONUS
Above average/ Excellent (80%+)	94.7% (18)	15.8% (3)
Met Expectation (70%+)	0% (0)	36.8% (7)
Needs Work/ Developing (60%+)	0% (0)	42.1% (8)
Below Par (Less Than 60%)	5.3% (1)	5.3% (1)
Total	100% (19)	100% (19)

RELATED ITEM LEVEL 3

ETEE 3345 Digital Electronics

Action Description:

1. Monitoring attendance more rigorously for upper-level courses.
2. Face-to-Face office hours/meetings with underperforming students
3. Tutoring sessions with TA
4. Submit the 4-page technical report to regional conferences and encourage students to go and present if accepted.

Update to Previous Cycle's Plan for Continuous Improvement Item

Previous Cycle's Plan For Continuous Improvement (Do Not Modify):

Closing Summary

- Due to CoVID impact and lack of school district visits, the enrollment numbers in the ECET program and ETEE concentration in the last two years indicate a decrease. One of the main goals for 2022-2023 academic year is to increase the recruiting efforts, visit local and regional school districts. Our goal is to increase the enrollment by at least 15%.
- Getting ready for ABET accreditation and submitting the initial readiness report by Fall 2022 or Spring 2023.
- Continue to recruit more Industry Advisory Board members from diverse career areas.
- Looking for donors from industry and advisory board to strengthen the existing laboratories.

Update of Progress to the Previous Cycle's PCI:

• The enrollment is stable and increasing slowly, not decreasing; however, efforts must be taken to increase the enrollment to pre-CoVID era.

• We recruited at least two new IAB members for ECET/ETEE advisory board and now have ten members in total.

• The ABET accreditation process is ongoing and readiness report is due by September 2023. ECET/ETEE faculty are working to prepare the report.

- We have purchased 10 new MyDAQ boards and 3 new PLC trainers for our automation and instrumentation labs.
- We have also purchased additional 10 sets of small electronic components which include wires, resistors, inductors, capacitors, switches, IC chips, 555-timers, buzzers, LEDs, and generic Op-Amps modules.

New Plan for Continuous Improvement Item

Closing Summary:

- We are updating our curriculum to have Senior Design I as 1 credit hours in Fall semesters where students will prepare and submit their capstone proposal. Then Senior Design II will be in following Spring semesters for prototyping, debugging, demonstration, and troubleshooting.
- We are looking to connect with CISCO for a potential wireless router and networking lab setup through their educational donation program. We are working with Computer Science department in this regard.
- Based on market analysis and IAB recommendation, we are planning to offer a special topic course titled “PCB Design” in Fall 2023. Based on student feedback and enrollment, we may add this course in our curriculum as elective in future.
- We are exploring the Accreditor for Technology, Management and Applied Engineering (ATMAE) accreditation for Engineering technology – Electronics Concentration (ETEE) for upcoming year.
- We are also reviewing the National Center for Construction Education and Research (NCCER) books for possible certificate/certification for ECET/ETEE students.
- We have submitted budget requests for at least one or two FANUC robotic arms, various EMS modules for power classes, 3-phase transformers, generators, and many other required lab resources. We are investigating funding opportunities to add additional electrical power and machinery lab modules that will cost about $50K for increased enrollment in ETEE 3360 Electrical Power and Machinery course due to fast-growing MET program enrollment.