Electronics and Computer Engineering Technology BS

Develop Knowledge And Skills

Goal Description:

1. Graduates will apply principles of science, technology, engineering, and mathematics to solve real-world problems.
2. Graduates will apply their theoretical knowledge to design, build, test, analyze, and improve broadly defined engineering problems appropriate to electronics and computer engineering technology (ECET) disciplines.
3. Graduates will effectively use communication and project management skills in oral, written, visual, and graphic modes within interpersonal and team environments in the ECET disciplines.
4. Graduates will grow professionally practicing life-long learning through self-study, continuing education, participation in technical societies, and/or pursuit of professional certification.
5. Graduates will evaluate the social and ethical implications of their work and will comply with all codes and regulations governing their work.

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. Apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly defined engineering problems appropriate to the ECET discipline.
2. Design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the ECET discipline.
3. Apply written, oral, and graphical communication in broadly defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. Conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.
5. Function effectively as a member as well as a leader on technical teams.

RELATED ITEM LEVEL 2

ETEE 2320 Circuits and Systems

Indicator Description:

The students enrolled in Fall 2023 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 24 students in ETEE 2320 Circuits and Systems class during Fall 2023 semester. The student work included the following: one midterm exam, one final exam, eight quizzes (including take home and in-class pop quizzes), seven homework's and 12 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. 12 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:

ETEE 2320 Circuits and Systems

There were 24 students in ETEE 2320 class in Fall 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, Fall 2023 **Instructor**: Dr. Reg Pecen

Directly supported Goals and learning objectives	***SLO1.*** **Apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly defined engineering problems appropriate to the ECET discipline (SLO 1)** ·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.
	SLO2. Design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the ECET discipline (SLO2).
	SLO3. Apply written, oral, and graphical communication in broadly defined technical and non-technical environments; and an ability to identify and use appropriate technical literature (SLO3).
	SLO4. **Conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes (SLO4)** •Students completed 11 labs as individual on 24 lab stations. •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.
	SLO5. **Function effectively as a member as well as a leader on technical teams (SLO5).** ·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. ·13 student groups worked on 13 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 Fall 2023, 1 student earned D, 1 student failed.

SLO 1	**Average (M_s):** Mid-Term: 56.3% Quizzes: 84.8% Final Exam: 70.6%	**Standard deviation (σ_s):** Mid-Term: 16.0 Quizzes: 5.4 Final Exam: 16.5
SLO 2	**Average (M_s):** Project Proposal: 78.0% Project Report: 72.8% Project Presentations: 89.4%	**Standard deviation (σ_s):** Project Proposal: 10.0 Project Report: 8.9 Project Presentations: 8.7
SLO 3	**Average (M_s):** Project Report & Project Presentations: 75.4%	**Standard deviation (σ_s):** Project Report & Project Presentations: 9.7
SLO 4	**Average (M_s):** Lab Work: 90.8%	**Standard deviation (σ_s):** Lab Work: 4.0
SLO 5	**Average (M_s):** Team Work/Total Project: 97.3%	**Standard deviation (σ_s):** Team Work/Total Project: 15.8
Total Grading	**Average (M_s):** Final Grade: 76.4%	**Standard deviation (σ_s):** Final Grade: 9.6

A breakdown for the course assessment numbers is shown below:

ETEE 2320	Fall 2023
Above Average/Excellent (80%+)	37.5% (8)
Met Expectation (70%+)	33.3% (8)
Needs Work/Developing (60%+)	25% (6)
Below Par (Less than 60%)	4.2% (2)
Total	24 students (100%)

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 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 Fall 2023.

1. Increase student success rate in major courses to a minimum of 70% or C.
2. Students shall appropriately cite and quote scientific papers, use standard publications format such as IEEE, demonstrate proper written and oral presentation mechanics.
3. Junior and senior students in major courses should complete a final class project to design, implement, troubleshoot, and demonstrate a model or prototype. \
4. Monitoring attendance more rigorously for upper-level courses.
5. Face-to-Face office hours/meetings with underperforming students.
6. Tutoring sessions with TA or instructor as time allowed.
7. Consider extra credit opportunities for NI MultiSim Simulation as well as PCB Soldering work that can be added to class project that will be presented and demonstrated in the last day of the class. port to regional conferences and encourage students to go and present if accepted.

- The overall class average was 83.1%. 91.7% of all enrolled students got C or better which met the course expectation of C or better.
- All students showed reasonable learning and hands-on skills for 11 lab projects with 90.8% average lab grade. This number is higher than the target number of 70%.
- The success rate on the class design project is 97.3% 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, 6 students earned a grade of C, and 1 student earned D, and 1 student failed.

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 or instructor as time allowed
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 2024 were evaluated based on the following rubric:

Mid-term Test	**20%**
Final Exam	**20%**
Laboratory Experiments	**30%**
Homework Assignments (Best Two out of Five)	**10%**
Attendance	**5%**
Final Project	**15%**
Total	**100%**

Each student submitted five HW's based on the lectures given on Number systems, Gates, Boolean Algebra, De-Morgan's, Logic Minimization, Flip-Flops etc. Best three among five HW were considered for the grade calculation (10%) 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. The students had to attend 13 LABS (30%) and did troubleshoot problems associated with different aspects of this course. For example, one lab was on 4-bit adder, another was on shift register. Each student was assigned in a group of two and worked on final project (15%). Students had to build prototype for their final project and demonstrate to the peers alongside PowerPoint slides. They needed to submit a technical report in IEEE conference format on their project. 5% grade was assigned for attendance, respecting deadline, and attitude.

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 70% of the students will perform at an acceptable level. As suggested by the course Instructor Dr. Basith, most students (70%) should be able to get a grade of C (70%) or higher.

Findings Description:

There were 25 total students enrolled for Spring 2024. 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 2024 **Instructor**: Dr. Iftekhar Ibne Basith

Directly supported Goals and learning objectives:	1. Apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly defined engineering problems appropriate to the ECET discipline: ·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.
	2. Design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the ECET discipline appropriate to the ECET discipline: . Students are required to build, test and troubleshoot a prototype. . Some examples: build a media device capable of playing and streaming movies, tv shows, and games; Arduino Flex Sensor Controlled Robot Hand; Elevator with digital floor indicator etc.
	3. Apply written, oral, and graphical communication in broadly defined technical and non-technical environments; and an ability to identify and use appropriate 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 is required to upload a LAB report to summarize what they have learnt on corresponding day and how theory and experiments complement each other.

	4. Conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes: ·Students used FESTO LabVolt system to finish 13 labs.
	5. 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. ·Students evaluated other groups and their own team member.

Total number of students assessed (N_s): 25 during Spring 2024		
Exams	Average (M_s): Mid-Term: 45.35% Final Exam: 57.35%	Standard deviation (σ_s): Mid-Term: 3.66 Final Exam: 3.54
Class Project	Average (M_s): Final Project: 93.72%	Standard deviation (σ_s): 0.75
LABS	Average (M_s): LABS: 70.66%	Standard deviation (σ_s): 3.71
HW (Best Three)	Average (M_s): HW: 88.2%	Standard deviation (σ_s): 1.52
Total Grading (BEFORE curve)	Average (M_s): Final Grade: 69.21%	Standard deviation (σ_s): 9.95
Total Grading (AFTER curve)	Average (M_s): Final Grade: 75.50%	Standard deviation (σ_s): 9.95

The whole course grade breakdown (out of 100)		
	After CURVE & BONUS	Before CURVE & BONUS
Above average/ Excellent (80%+)	12% (3)	40% (10)
Met Expectation (70%+)	36% (9)	32% (8)
Needs Work/ Developing (60%+)	28% (7)	28% (7)
Below Par (Less Than 60%)	24% (6)	0% (0)
Total	100% (25)	100% (25)

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

- 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.

Update of Progress to the Previous Cycle's PCI:

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.
Update: In Fall 2024, ETEC will offer 3 sections of ETEC 4099 Engineering Innovation (name change to Senior Design I and course number update to ETEC 4199 will be effective next academic cycle). In Spring 2025, ETEC will offer 3 sections of ETEC 4399 Senior Design I (name change to Senior Design II will be effective next academic cycle)

- 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.

Update: Still work-in-progress.

- 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.

Update: ETEE 4369 – PCB Design was offered in Fall 2023, but class never made.

- We are exploring the Accreditor for Technology, Management and Applied Engineering (ATMAE) accreditation for Engineering technology – Electronics Concentration (ETEE) for upcoming year.

Update: Engineering Technology concentration on Electronics (ETEE) is unofficially ATMAE accredited. We had a site visit in March 2024, and the official announcement will be in October 2024 during ATMAE Annual conference in Las Vegas, NV.

- We are also reviewing the National Center for Construction Education and Research (NCCER) books for possible certificate/certification for ECET/ETEE students.

Update: Still work-in-progress, faculty are still reviewing the NCEER textbooks.

- 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.

Update:

- One new robotic arm is delivered and installed as of August 2024.
- Additional electrical power trainers with multiple power modules in the approximate amount of$27,000 were purchased in fall 2023 and installed. The equipment improved lab opportunities in ETEE 3360 Electrical Power and Machinery class.
- There are also additional 12 NI LabVIEW myDAQ modules were purchased to provide unique experience to students in ETEE 4352 Instrumentation and Interfacing class.
- Small laboratory components for ETEE 2320 Circuits and Systems course including transformers, resistors, capacitors, LEDs, etc. were purchased.

New Plan for Continuous Improvement Item

Closing Summary:

- Electronics and Computer Engineering Technology (ECET) have applied for ABET accreditation. Initial readiness review was approved in January, and Self-study report was filed July 1st, 2024. We will have an ABET team visit in October 6-8, 2024.
- As per ATMAE recommendation, we may hire a fulltime instructional technician for ECET labs.
- We continue to add IAB members for ECET from related fields. As of now, we have 15 IAB members.
- As part of ABET accreditation, we have revised and continue to update our PEOs (Program Educational Objectives) and SLOs (Student Learning Outcomes).
- A new proposal is being submitted for the potential name change of Engineering Technology concentration in Electronics to Mechatronics concentration.
- There is a need for Festo Smart Sensor training modules and each cost about $9,500. We will work on potential sources to fund at least 5 modules of Festo Sensor Workbenches in near future.
- There is need for at least one more Robotic Arm, and last one cost us around $38K.