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 B (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 24 students originally enrolled in ETEE 2320 class and due to Covid related challenges 1 student dropped the class in the beginning of the semester. Therefore, there were total 23 students continued the attend the class after the first week of classes in spring 2022. . However, family matters and Covid related issues again caused three other students not to be able to attend classes even they did not drop the class. There was another student decided not to attend the class after 10^{th} week of the semester. 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 2022 **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, I and V, Phase shift, Scope 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, P, Q, S Power 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 teamed up as 2 members in a group and there was a total of 9 groups with 9 different lab projects. • 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 and Operation, Transformers, 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 (12 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. •All students needed to submit a 4-page report on their final class project in IEEE conference. •Each group required to present in front of their peer for 8 minutes on their applied research project implementation, problems faced, how they resolved and finally a demonstration of their circuit (if any).	
Total number of students assessed (N_S): 23 during Spring 2022, 4 students failed, 3 students earned D.		
Outcome 1	Average (M_S): Mid-Term: 57.0% Quizzes: 74.39% Final Exam: 56.2%	Standard deviation (σ_S): Mid-Term: 19.17 Quizzes: 15.07Final Exam: 17.83
Outcome 2	Average (M_S): Applied Research Project: 87.30%	Standard deviation (σ_S): 23.85
Outcome 3	Average (M_S): Lab Projects: 69.5%	Standard deviation (σ_S): 20.46
Total Grading	Average (M_S): Final Grade: 63.07%	Standard deviation (σ_S): 13.93

- The overall class average was 63.07, 50% of all enrolled students got B or better and thus they have not met the expectation of min 70% as whole class grade.
- All students showed reasonable learning and hands-on skills for 12 lab projects with 69.5% . This number is very close to target number of 70%. One of the reasons for lower rate is attendance issue of few students. Except three students who continuously showed attendance problems, 86.91% of regularly attending students showed satisfactory attendance progress in the class. The class design included a success rate of 86.91. 4 out of 23 students earned a grade of A, 6 students earned a grade of B, 6 students earned a grade of C, 3 students earned a grade of D, and 4 students failed the class due to attendance and lack of work problems.
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A breakdown for the course assessment numbers are shown below:

Above average/ Excellent (90%+)	17.4%
Met Expectation (80%+)	50.0%
Needs Work (70%+)	33.33%
Fall below expectation (60%+)	5.56%
Total	23 students (100%)

This semester classes are held all face to face with hands-on lab experiences. Unfortunately, students continue to experience attendance problems due to multiple reasons. Most common reason was Covid for students, either a family member or just being exposed to Covid patient. .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. Few 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 and Spring 2022.

Students will be required to rent or buy e-copy of textbook as we have just confirmed with university bookstore for low-cost rental or purchase of e-book version of the textbook. Many students did not have expensive textbook and this was another obstacle for student success. We expect a better success with requirement of e-book version of textbook.

RELATED ITEM LEVEL 3

ETEE 2320 Circuits and Systems

Action Description:

- Include steps taken to improve assessment process
- Act on necessary improvement in labs, equipment needs, and course offerings per student assessment reports, IAB recommendations, and exit surveys.

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 2022, one student dropped midway, and 19 completed the course. following is a summary of our findings in relation to the learning objectives.

<table>
<tr><td colspan="3">Summarized Students' Course Achievements of Program Outcomes Form</td></tr>
<tr><td colspan="3">Course Name: ETEE 3345 Digital Electronics, Spring 2022
Instructor: Dr. Iftekhar Ibne Basith</td></tr>
<tr><td rowspan="3">Directly supported Goals and learning objectives:</td><td colspan="2">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 colspan="2">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 Generatoretc.</td></tr>
<tr><td colspan="2">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 2022</td></tr>
<tr><td>Outcome 1</td><td>Average (M_s):
Mid-Term: 60.1%
Final Exam: 55.26%</td><td>Standard deviation (σ_S):
Mid-Term: 3.71
Final Exam: 2.53</td></tr>
<tr><td>Outcome 2</td><td>Average (M_s):
Final Project: 92.83%</td><td>Standard deviation (σ_S):
1.00</td></tr>
<tr><td>Outcome 3</td><td>Average (M_s):
LABS: 79.67%</td><td>Standard deviation (σ_S):
1.98</td></tr>
<tr><td>Total Grading (after curve)</td><td>Average (M_s):
Final Grade: 85.58%</td><td>Standard deviation (σ_S):
7.62</td></tr>
</table>

The whole course grade breakdown (out of 100)	
Above average/ Excellent (90%+)	42.1% (8)
Met Expectation (80%+)	42.1% (8)
Needs Work/ Developing (70%+)	15.8% (3)
Below Par (60%+)	0% (0)
Total	100% (19)

As a whole class, 84.2% of enrolled students got 80 or higher which meet the primary expectation. 3 out of total 19 students got less than 80%, which is 15.8% and rooms for improvement is there. We also feel there is scope for improvement on the theory side, where students failed to perform as expected (57.68% average).

RELATED ITEM LEVEL 3

ETEE 3345 Digital Electronics

Action Description:

- Include steps taken to improve assessment process
- Act on necessary improvement in labs, equipment needs, and course offerings per student assessment reports, IAB recommendations, and exit surveys.

Update to Previous Cycle's Plan for Continuous Improvement Item

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

Closing Summary

There was minor title change request on one of the courses ETEE 4351 Automation & Control Systems (that was supposed to be Automation and PLCs) was not reflected to the new catalog and this will be fixed in the next curriculum cycle. There was also minor course prefix change from ETEC 3376 Microcontroller Applications to ETEE 3376 and this was also not reflected to the new catalog, thus this update will be completed in next curriculum cycle. There is also a new course proposal titled ETEE 4375 Digital VLSI Design & FPGA that was approved by the University Curriculum Committee (UCC) in April 2021, and it is expected to be added to the catalog next year. This new class will offer students depth in knowledge and provide skills in the advanced digital design fields.

We are offering another course on Wireless and Data Communication in Fall 2021 as special topics. Our goal was to have this course designated with a specific course number and it is already included in the 2021-2022 curriculum as elective for the students.

Update of Progress to the Previous Cycle's PCI:

- We are providing details of actions taken to improve assessment process and meet the learning outcomes in respect to the goals specified.
- We will be more diligent in continuous assessment of the learning objective and goals in respect of other courses in ECET degree programs as well.
- The introduction and availability of cutting-edge equipment’s are here to ensure that our students are well-prepared for the fast-changing industry and dynamic marketplace.
- We will continue our efforts to meet and exceed the criterion description of 70% students scoring 70% or higher for ETEE 3345 while meeting and exceeding the criterion description of 70% students scoring 70% or higher for a sophomore level class, ETEE 2320. It is expected that future students will achieve at a similar level in both courses.
- The title change request on ETEE 4351 from Automation & Control Systems to be Automation and PLCs has been approved and reflected in new catalog.
- The minor course prefix change from ETEC 3376 Microcontroller Applications to ETEE 3376 is also approved and reflected in the new catalog, thus this update will be completed in next curriculum cycle.
- The new course titled ETEE 4375 Digital VLSI Design & FPGA is in catalog now as an elective and was offered in Fall 2021.
- The special topics course on Wireless and Data Communication that includes IoT, Network Masking and Security did not make in Fall 2021. Our goal is to have this course designated with a specific course number and include it in the 2023-2024 curriculum as elective for the students.
- As the ECET major program and the electronics concentration steadily grew (2020-2021), one of the major accomplishments during 2021-2022 was to add a new FTE to the department in the electronics area. Dr. Abdulhamid Zaidi joined us in Fall 2021 as Visiting Assistant Professor to meet our course load.
- As the need on service class of ETEE 1340 Introduction to Circuits increases due to growing new major of B.S. in Mechanical Engineering Technology, Mr. Eugene Ryman, a retired Electrical Engineer with graduate degree was hired as a pool faculty member. Mr. Ryman is now teaching multiple sections of ETEE 1340.

- ETEE 2320 Circuits and Systems and ETEE 3345 Digital Electronics classes were offered in Spring 2022, and a complete set of assessment criterion has been developed and added in this report for evaluation. The data from students have been summarized to meet the goals and learning objectives specified.
- Three new members joined our Industrial Advisory Board (IAB) team, all very qualified and represent diverse career field for Engineering Technology students. We had two IAB meetings held on October 22nd, 2021 (Fall) and April 1st, 2022 (Spring).
- As required by ABET-ETAC, we are collecting the exit surveys for the graduating seniors and the alumni surveys to improve our program to meet the industry need.
- The ECET curriculum now looks more solid and strong for an application for ABET accreditation. We are preparing the readiness report and expecting to submit by Fall 2022 or Spring 2023 the latest.

S. in ECET program requirements according to 2022-23 university catalog will be listed as shown below:

Bachelor of Science, Major in Electronics and Computer Engineering Technology		
Core Curriculum		
Component Area I (Communication)		6
Component Area II (Mathematics)		3
Component Area III (Life and Physical Science)		8
Component Area IV (Language, Philosophy, and Culture)		3
Component Area V (Creative Arts)		3
Component Area VI (U.S. History)		6
Component Area VII (Political Science/Government)		6
Component Area VIII (Social and Behavioral Sciences)		3
Component Area IX (Component Area Option)		4
Degree Specific Requirements		
PHYS 1301 & PHYS 1101	General Phy-Mechanics & Heat and General Physics Laboratory I	4

PHYS 1302 & PHYS 1102	Gen Phy-Snd,Lght, Elec, & Mag and General Physics Laboratory II	4
MATH 1410 or MATH 1314, and MATH 1316	Elementary Functions Pre-Calculus Algebra and Plane Trigonometry [1]	4
MATH 1420	Calculus I [2]	4
ENGL 3330	Intro to Technical Writing	3
MATH 3379	Statistical Mthods in Practice	3
Major Core		
ETEE 1340	Introduction to Circuits	3
ETDD 1361	Engineering Graphics	3
COSC 1436	Programming Fundamentals I	4
COSC 1437	Programming Fundamentals II	4
Major		
ETEC 1010	Engineering Foundations	1
ETEE 2320	Circuits and Systems	3
COSC 2327	Intro to Computer Networks	3
COSC 2329	Comp Organiz & Machine Lang	3
ETEE 3313	Industrial Robotics	3
COSC 3327	Computer Architecture	3
ETEC 3340 or ETEC 4340	Solar and Wind Energy Systems Alternative Energy Technology	3
ETEE 3345	Digital Electronics	3
ETEE 3350	Analog Electronics	3
ETEE 3360	Electrical Power & Machinery	3
ETEE 3373	Control Systems Technology	3
ETEE 3376	Microcontroller Applications	3
ETEE 4351	Automation & PLC	3
ETEE 4352	Instrumentation & Interfacing	3
ETEE 4355	Electronics and Digital Comm	3
Internship		3
ETEC 4391	Work Base Mentorship	3
ETEC 4399	Senior Design	3
Double Dips (3 SH MATH 1410 and 1 SH MATH 1420)		**-4**
Total Hours		**124**

New Plan for Continuous Improvement Item

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.