

SAMPLE ASSESSMENT REPORT

**ROY G. PERRY COLLEGE OF ENGINEERING
ELECTRICAL AND COMPUTER ENGINEERING
DEPARTMENT
PRAIRIE VIEW A&M UNIVERSITY**

ASSESSMENT REPORT COVER PAGE

**ELEG 4325 COMPUTER INTERFACING AND
COMMUNICATIONS**

FALL 2021 SEMESTER

NAME OF INSTRUCTOR: Dr. Suxia Cui

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 - 5.1 Assignments assessing students' ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor. (Outcome "2")

Detailed Course Syllabus
(Distributed to Students at the beginning of the Semester)
ABET Outcomes measured using course should be
explicitly listed in the syllabus

Course Description in ABET Format

Please use the following format for the course syllabi (2 pages maximum in Times New Roman 12 point font)

1. **Course number and name:** ELEG 4325 COMPUTER INTERFACING AND COMMUNICATIONS

2. **Credits and contact hours:** 3 credit hours; 3 contact hours

3. **Instructor's or course coordinator's name:** Dr. Suxia Cui

4. **Text book:** Title: Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C,
 Author: Yifeng Zhu
 Publisher, Year & Edition: 3rd Edition, 2017, E-Man Press LLC
 - a. Other Supplemental material None

5. **Specific course information**
 - a. Brief description of the content of the course (catalog description) ELEG 4325 Embedded Systems Design. (3-0) Credit 3 semester hours. Introduce software design and hardware interfacing of embedded systems, microcontroller based parallel and serial communications, I/O programming, low power computing, data acquisition and communication, emphasis on student projects.
 - b. Prerequisites or Co-requisites Prerequisite: ELEG 3307 Microprocessor Systems Design and ELEG 3107 Microprocessor Systems Design Laboratory.
 - c. *Indicate whether a required, elective, or selected elective (as per definition provided) course in the program Required

6. **Specific goals for the course**
 - a. specific outcomes of instruction (e.g. The student will be able to explain the significance of current research about a particular topic.)

Students will be able to:

 - (1) Be able to write embedded system software.
 - (2) Be able to design embedded hardware.
 - (3) Be able to test and trouble shoot the system to solve engineering problems.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

This course addresses:

Outcome 2

An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety,

and welfare, as well as global, cultural, social, environmental, and economic factor.

7 Brief list of topics to be covered

See a Program Running (3.0 hours)
Data Representation (3.0 hours)
ARM Instruction Set Architecture (6.0 hours)
Programming Instruction Review (6.0 hours)
Interrupts (4.5 hours)
General Purpose I/O (GPIO) (3.0 hours)
General-purpose Timers (4.5 hours)
Stepper Motor Control (4.5 hours)
Liquid-crystal Display (LCD) (3.0 hours)
Analog-to-Digital Converter (ADC) (3.0 hours)
Digital-to-Analog Converter (DAC) (3.0 hours)

***Required** courses are required of all students in the program, **elective** courses (often referred to as open or free electives) are optional for students, and **selected elective** courses are those for which students must take one or more courses from a specified group

Additional Course Syllabus Information



**PRAIRIE VIEW
A&M UNIVERSITY**

SYLLABUS

ELEG 4325 Computer Interfacing and Communications Fall 2021

Instructor: Dr. Suxia Cui
Section # and CRN: 17837
Office Location: New EE Building 334
Office Phone: 936-261-9917
Email Address: sucui@pvamu.edu
Office Hours: MW 9:30-12:30 pm
Mode of Instruction: Face to Face

Course Location: New EE building 119
Class Days & Times: MW 8:00 – 9:20 am
Catalog Description: (3-0) Credit 3 semester hours. Introduce software design and hardware interfacing of embedded systems, microcontroller based parallel and serial communications, I/O programming, low power computing, data acquisition and communication, emphasis on student projects.

Prerequisites: ELEG 3307 and ELEG 3107.
Co-requisites: N/A

Required Text(s): Yifeng Zhu, "Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C" 3rd edition, E-Man Press LLC, 2017. (ISBN-978-0-9826926-0).

**Recommended
Text(s):**

Student Learning Outcomes:

	Upon successful completion of this course, students will be able to:	Program Learning Outcome # Alignment	Core Curriculum Outcome Alignment
1	design, program, and test advanced microcontroller-based systems for general purpose and/or special-purpose applications		Outcome 2 An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor

Major Course Requirements

Method of Determining Final Course Grade

Course Grade Requirement	Value	Total
1) Participation	5	5
2) Homework	20	20
3) Midterm Exam	20	20
4) Midterm Project	10	10
4) Laboratories	25	25
5) Final Project	20	20
Total:	100	100

Grading Criteria and Conversion:

A = 90 or more

B = 80-89

C = 70-79

D = 60-69

F = Less than 60

Detailed Description of Major Assignments:

Assignment Title or Grade Requirement	Description
1. Midterm Exam	Answer midterm exam questions and turn in on time.
2. Final Project	Design system, demonstrate the system and turn in report on time.

Course Procedures or Additional Instructor Policies

Taskstream

Taskstream is a tool that Prairie View A&M University uses for assessment purposes. One of your assignments may be required to be submitted as an "artifact," an item of coursework that serves as evidence that course objectives are met. If applicable, more information will be provided during the semester by your department. For general information, you can visit Taskstream via the link in eCourses.

Semester Calendar

Week	Description
Week One: Topic Description Readings: Assignment (s):	Course Introduction & Review Pre-requisite Review Pre-requisite Class Materials ELEG 3073 Pre-test Pre-survey
Week Two: Topic Description Readings: Assignment (s):	Chap 1 – See a Program Running Textbook Chapter 1 and Slides Instructor Handouts Homework 1
Week Three: Topic Description Readings: Assignment (s):	Chap 2 – Data Representation Textbook Chapter 2 and Slides Instructor Handouts Homework 2
Week Four: Topic Description Readings: Assignment (s):	Chap 3 – ARM Instruction Set Architecture Textbook Chapter 3 and Slides Instructor Handouts Homework 3
Week Five: Topic Description Readings: Assignment (s):	Chap 4, 5, &6 – Programming Instruction Review Textbook Chapter 4-6 and Slides Instructor Handouts Homework 4
Week Six: Topic Description Readings: Assignment (s):	Chap 11 – Interrupts Textbook Chapter 11 Slides Instructor Handouts Homework 5
Week Seven: Topic Description Readings: Assignment (s):	Chap 14 – General Purpose I/O (GPIO) Textbook Chapter 14 and Slides Instructor Handouts
Week Eight: Topic Description Readings: Assignment (s):	Review and Midterm Exam Review Questions Midterm Exam
Week Nine: Topic Description Readings:	Chap 15 – General-purpose Timers Textbook Chapter 15 and Slides Instructor Handouts

Assignment (s):	Lab 1 Report
Week Ten:	Chap 16 – Stepper Motor Control
Topic Description	
Readings:	Textbook Chapter 16 and Slides Instructor Handouts
Assignment (s):	Lab 4 Report
Week Eleven:	Chap 17 – Liquid-crystal Display (LCD)
Topic Description	
Readings:	Textbook Chapter 17 and Slides Instructor Handouts
Assignment (s):	Lab 2 Report
Week Twelve:	Chap 20 – Analog-to-Digital Converter (ADC)
Topic Description	
Readings:	Textbook Chapter 20 and Slides Instructor Handouts
Assignment (s):	Lab 3 Report
Week Thirteen:	Chap 21 – Digital-to-Analog Converter (DAC)
Topic Description	
Readings:	Textbook Chapter 21 and Slides Instructor Handouts
Assignment (s):	Lab 5 Report
Week Fourteen:	Final Project Presentation
Topic Description	
Readings:	
Assignment (s):	Final Project Demonstration and Presentation Video
Week Fifteen:	Review and Summarize
Topic Description	
Readings:	
Assignment (s):	Post Survey Final Exam (Optional)

Student Support and Success

John B. Coleman Library

The John B. Coleman Library's mission is to enhance the scholarly pursuit of knowledge, to foster intellectual curiosity, and to promote life-long learning and research through our innovative services, resources, and cultural programs, which support the Prairie View A&M University's global mission of teaching, service, and research. It maintains library collections and access both on campus, online, and through local agreements to further the educational goals of students and faculty. Website: <https://www.pvamu.edu/library/>; Phone: 936-261-1500

Academic Advising Services

Academic Advising Services offers students a variety of services that contributes to student success and leads towards graduation. We assist students with understanding university policies and procedures that affect academic progress. We support the early alert program to help students get connected to success early in the semester. We help refer students to the appropriate academic support services when they are unsure of the best resource for their needs. Faculty advisors support some students in their respective colleges. Your faculty advisor can be identified in PantherTracks. Advisors with Academic Advising Services are available to all students. We are located across campus. Find your advisor's location by academic major at www.pvamu.edu/advising. Phone: 936-261-5911

The University Tutoring Center

The University Tutoring Center (UTC) offers free tutoring and academic support to all registered PVAMU students. The mission of the UTC is to help provide a solid academic foundation that enables students to become confident, capable, independent learners. Competent and caring staff and peer tutors guide students in identifying, acquiring, and enhancing the knowledge, skills, and attitudes needed to reach their desired goals. Tutoring and academic support are offered face-to-face in the UTC, in virtual face-to-face sessions (<https://www.pvamu.edu/student-success/sass/university-tutoring-center/>), and through online sessions (<https://www.pvamu.edu/pvplace/>). Other support services available for students include Supplemental Instruction, Study Break, Academic Success Workshops, and Algebra Study Jam. Location: J. B. Coleman Library, Rm. 307; Phone: 936-261-1561; Email: pvtutoring@pvamu.edu; Website: <https://www.pvamu.edu/student-success/sass/university-tutoring-center/>

Writing Center

The Writing Center provides well-trained peer tutors to assist students with writing assignments at any stage of the writing process. Tutors help students with various writing tasks from understanding assignments, brainstorming, drafting, revising, editing, researching, and integrating sources. Students have free access to Grammarly online writing assistance. Grammarly is an automated proofreading and plagiarism detection tool. Students must register for Grammarly by using their student email address. In addition, students have access to face-to-face and virtual tutoring services either asynchronously via email or synchronously via Zoom. Location: J. B. Coleman Library, Rm. 209; Phone: 936-261-3724; Website: <https://www.pvamu.edu/student-success/writing-center/>; Grammarly Registration: <https://www.grammarly.com/enterprise/signup>

Academic Early Alert

Academic Early Alert is a proactive system of communication and collaboration between faculty, academic advisors, and PVAMU students that is designed to support student success by promptly identifying issues and allowing for intervention. Academic Early Alerts help students by providing a central location to schedule advising appointments, view advisor contact information, and request assistance. Students who recognize that they have a problem that is negatively affecting their academic performance or ability to continue school may self-refer an Academic Early Alert. To do so, students will log in to PV Place and click on Academic Early Alert on the left sidebar. Phone: 936-261-5902; Website: <https://www.pvamu.edu/student-success/early-alert/>

Student Counseling Services

The Student Counseling Services unit offers a range of services and programs to assist students in maximizing their potential for success: short-term individual, couples, and group counseling, as well as crisis intervention, outreach, consultation, and referral services. The staff is licensed by the State of Texas and assists students who are dealing with academic skills concerns, situational crises, adjustment problems, and emotional difficulties. Information shared with the staff is treated confidentially and in

accordance with Texas State Law. Location: Hobart Taylor, 2nd floor; Phone: 936-261-3564; Website: <https://www.pvamu.edu/healthservices/student-counseling-services/>

Office of Testing Services

Testing Services serves to create opportunities by offering a suite of exams that aid in the students' academic and professional success. Currently, we administer entrance (HESI A2), college readiness (TSI assessment), Prior Learning (CLEP, DSST), and proctored exams. Location: Wilhelmina Delco, 3rd Floor, Rm. 305; Phone: 936-261-3627; Email: aetesting@pvamu.edu; Website: www.pvamu.edu/testing

Office of Diagnostic Testing and Disability Services

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, contact the Office of Disability Services. As a federally-mandated educational support unit, the Office of Disability Services serves as the repository for confidential disability files for faculty, staff, and students. For persons with a disability, the Office develops individualized ADA letters of request for accommodations. Other services include learning style inventories, awareness workshops, accessibility pathways, webinars, computer laboratory with adapted hard and software, adapted furniture, proctoring non-standardized test administrations, ASL interpreters, ALDs, digital recorders, Livescribe, and a comprehensive referral network across campus and the broader community. Location: Hobart Taylor, Rm. 1D128; Phone: 936-261-3583; Website: <https://www.pvamu.edu/disabilityservices/>

Center for Instructional Innovation and Technology Services (CIITS)

Distance Learning, also referred to as Distance Education, is the employment of alternative instructional delivery methods to extend programs and services to persons unable to attend college in the traditional manner. The Center for Instructional Innovation and Technology Services (CIITS) supports student learning through online, hybrid, web-assist, and 2-way video course delivery. For more details and contact information, visit:

<https://www.pvamu.edu/dlearning/distance-learning-2-2/students-2/>; Phone: 936-261-3283

Veteran Affairs

Veterans Services works with student veterans, current military and military dependents to support their transition to the college environment and continued persistence to graduation. The Office coordinates and certifies benefits for both the G.I. Bill and the Texas Hazlewood Act. Location: Evans Hall, Rm. 102; Phone: 936-261-3563; Website: <https://www.pvamu.edu/sa/departments/veteranaffairs/>

Office for Student Engagement

The Office for Student Engagement delivers comprehensive programs and services designed to meet the co-curricular needs of students. The Office implements inclusive and accessible programs and services that enhance student development through exposure to and participation in diverse and relevant social, cultural, intellectual, recreational, community service, leadership development, and campus governance. Location: Memorial Student Center, Rm. 221; Phone: 936-261-1340; Website: <https://www.pvamu.edu/studentengagement/>

Career Services

Career Services supports students through professional development, career readiness, and placement and employment assistance. The Office provides one-on-one career coaching, interview preparation, resume and letter writing, and career exploration workshops and seminars. Services are provided for students at the Northwest Houston Center and College of Nursing in the Medical Center twice a month or on a requested basis. Distance Learning students are encouraged to visit the Career Services website for information regarding services provided. Location: Anderson Hall, 2nd floor; Phone: 936-261-3570; Website: <https://www.pvamu.edu/careerservices/>

University Rules and Procedures

Academic Misconduct

Academic dishonesty is defined as any form of cheating or dishonesty that has the effect or intent of interfering with any academic exercise or fair evaluation of a student's performance. The college faculty

can provide additional information, particularly related to a specific course, laboratory, or assignment.

You are expected to practice academic honesty in every aspect of this course and all other courses. Make sure you are familiar with the *University Administrative Guidelines on Academic Integrity*, which can be found on the [Academic Integrity webpage](#). Students who engage in academic misconduct are subject to university disciplinary procedures. As listed in the *University Administrative Guidelines on Academic Integrity*, the University Online Catalog, and the Student Code of Conduct, the following are examples of prohibited conduct. This list is not designed to be all-inclusive or exhaustive. In addition to academic sanctions, any student found to have committed academic misconduct that is also a violation of criminal law may also be subject to disciplinary review and action by the Office of Student Conduct (as outlined in the Student Code of Conduct).

Forms of Academic Dishonesty:

1. Cheating: Deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not learned, giving or receiving aid unauthorized by the instructor on assignments or examinations. Examples: unauthorized use of notes for a test; using a "cheat sheet" on a quiz or exam; any alteration made on a graded test or exam which is then resubmitted to the teacher;
2. Plagiarism: Careless or deliberate use of the work or the ideas of another; representation of another's work, words, ideas, or data as your own without permission or appropriate acknowledgment. Examples: copying another's paper or answers, failure to identify information or essays from the internet and submitting or representing it as your own; submitting an assignment which has been partially or wholly done by another and claiming it as yours; not properly acknowledging a source which has been summarized or paraphrased in your work; failure to acknowledge the use of another's words with quotation marks;
3. Collusion: When more than one student or person contributes to a piece of work that is submitted as the work of an individual;
4. Conspiracy: Agreeing with one or more persons to commit an act of academic/scholastic dishonesty; and
5. Multiple Submission: Submission of work from one course to satisfy a requirement in another course without explicit permission. Example: using a paper prepared and graded for credit in one course to fulfill a requirement and receive credit in a different course.

Nonacademic Misconduct

The university respects the rights of instructors to teach and students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with either (1) the instructor's ability to conduct the class, (2) the inability of other students to profit from the instructional program, or (3) campus behavior that interferes with the rights of others will not be tolerated. An individual engaging in such disruptive behavior may be subject to disciplinary action. The Office of Student Conduct will adjudicate such incidents under nonacademic procedures.

Sexual Misconduct

Sexual harassment of students and employees at Prairie View A&M University is unacceptable and will not be tolerated. Any member of the university community violating the university's sexual harassment policy will be subject to disciplinary action. In accordance with the Texas A&M University System guidelines, your instructor is obligated to report to the Office of Title IX Compliance (titleixteam@pvamu.edu) any instance of sexual misconduct involving a student, which includes sexual assault, stalking, dating violence, domestic violence, and sexual harassment, about which the instructor becomes aware during this course through writing, discussion, or personal disclosure. The faculty and staff of PVAMU actively strive to provide a learning, working, and living environment that promotes respect that is free from sexual misconduct, discrimination, and all forms of violence. If students, faculty, or staff would like assistance or have questions, they may contact the Title IX Coordinator at 936-261-

2144 or titleixteam@pvamu.edu. More information can be found at www.pvamu.edu/titleix, including confidential resources available on campus.

Pregnancy, Pregnancy-related, and Parenting Accommodations

Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related conditions, or parenting (reasonably immediate postpartum period) are encouraged to contact Student Disability Services or the Dean of Students' Office for additional information and to request accommodations.

Non-Discrimination Statement

Prairie View A&M University does not discriminate on the basis of race, color, sex, religion, national origin, age, disability, genetic information, veteran status, sexual orientation, or gender identity in its programs and activities. The University is committed to supporting students and complying with The Texas A&M University System non-discrimination policy. It seeks to establish an environment that is free of bias, discrimination, and harassment. If you experience an incident of discrimination or harassment, we encourage you to report it. If you would like to speak with someone who may be able to afford you privacy or confidentiality, there are individuals who can meet with you. The Director of Equal Opportunity & Diversity has been designated to handle inquiries regarding the non-discrimination policies and can be reached at Harrington Science Building, Suite 109 or by phone at 936-261-1744 or 1792.

Class Attendance Policy (See the University Online Catalog for Full Attendance Policy)

Prairie View A&M University requires regular class attendance. Attending all classes supports the full academic development of each learner, whether classes are taught with the instructor physically present or via distance learning technologies such as interactive video and/or the internet. Excessive absenteeism, whether excused or unexcused, may result in a student's course grade being reduced or in the assignment of a grade of "F." Absences are accumulated beginning with the first day of class during regular semesters and summer terms. Each faculty member will include the University's attendance policy in each course syllabus.

Student Academic Appeals Process

Authority and responsibility for assigning grades to students rest with the faculty. However, in those instances where students believe that miscommunication, errors, or unfairness of any kind may have adversely affected the instructor's assessment of their academic performance, the student has a right to appeal by the procedure listed in the University Online Catalog and by doing so within thirty days of receiving the grade or experiencing any other problematic academic event that prompted the complaint.

Technical Considerations

Minimum Recommended Hardware and Software:

- Intel PC or Laptop with Windows 10 or later version; Mac with OS High Sierra*
- Smartphone or iPad/Tablet with Wi-Fi*
- High-speed Internet access
- 8 GB Memory
- Hard drive with 320 GB storage space
- 15" monitor, 800x600, color or 16 bit
- Sound card w/speakers
- Microphone and recording software
- Keyboard & mouse
- Most current version of Google Chrome, Safari, or Firefox

Note: Be sure to enable Java & pop-ups in the Web browser preferences

* Smartphones, Google Chrome books, and Android tablets may not be supported. iPads are the only tablets supported.

Participants should have a basic proficiency of the following computer skills:

- Sending and receiving email

- A working knowledge of the Internet
- Microsoft Word (or a program convertible to Word)
- Acrobat PDF Reader
- Windows or Mac OS
- Video conferencing software

Netiquette (online etiquette)

Students are expected to participate in all discussions and virtual classroom chats as directed. Students are to be respectful and courteous to others on discussion boards. Foul or abusive language will not be tolerated. Do not use ALL CAPS for communicating to others AS IT CAN BE INTERPRETED AS YELLING. Avoid slang terms such as "wassup?" and texting abbreviations such as "u" instead of "you." Limit and possibly avoid the use of emoticons. Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post, and the message might be taken seriously or sound offensive.

Video Conferencing Etiquette

When using Zoom, WebEx, or other video conferencing tools, confirm the visible area is tidy, clear of background clutter, inappropriate or offensive posters, and other distractions. Ensure you dress appropriately and avoid using high traffic or noisy areas. Stay muted when you are not speaking and avoid eating/drinking during the session. Before the class session begins, test audio, video, and lighting to alleviate technology issues.

Technical Support

Students should go to <https://mypassword.pvamu.edu/> if they have password issues. The page will provide instructions for resetting passwords and contact information if login issues persist. For other technical questions regarding eCourses, call the Center for Instructional Innovation and Technology Services at 936-261-3283 or email ciits@pvamu.edu.

Communication Expectations and Standards

Emails or discussion postings will receive a response from the instructor, usually in less than 48 hours. Urgent emails should be marked as such. Check regularly for responses.

Discussion Requirement

Online courses often require minimal to no face-to-face meetings. However, conversations about the readings, lectures, materials, and other aspects of the course can occur in a seminar fashion. The use of the discussion board will accomplish this. The instructor will determine the exact use of discussion boards.

It is strongly suggested that students type their discussion postings in a word processing application such as Word and save it to their PC or a removable drive before posting to the discussion board. This is important for two reasons: 1) If for some reason your discussion responses are lost in your online course, you will have another copy; 2) Grammatical errors can be greatly minimized by the use of the spell-and-grammar check functions in word processing applications. Once the post(s) have been typed and corrected in the word processing application, copy and paste to the discussion board.

COVID-19 Campus Safety Measures

To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, PVAMU has adopted policies and practices to limit virus transmission.

- **Self-monitoring** - Students should follow CDC recommendations for self-monitoring. Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely and should not participate in face-to-face instruction.
- **Face Coverings** - Face coverings (cloth face covering, surgical mask, etc.) are recommended in classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study

spaces, libraries, academic resource, and support offices, and outdoor spaces where 6 feet of physical distancing is challenging to maintain reliably.

- **Physical Distancing** - Physical distancing should be maintained between students, instructors, and others in course and course-related activities where possible.
- **Personal Illness and Quarantine** - Students required to quarantine are to participate in courses and course-related activities remotely and must not attend face-to-face course activities. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities. Students experiencing personal injury or illness that is too severe for the student to attend class qualify for an excused absence. To receive an excused absence, students must provide appropriate documentation to the Office for Student Conduct, studentconduct@pvamu.edu.

End of Semester Course Assessment Report

This summary contains the following Information

1. Performance Statistics

- Total number of students in class
- The class average performance (**stated as %**) in each course outcome assessed in this class and the **two previous times course was assessed**.
- The acceptable class average for the class in each outcome area as set by your Department. **You cannot use any number of your choice**
- Percentage of students who scored below the expected average in each outcome.

2. Implementation Summary

- Brief summary of plans implemented during the semester based on last assessment report

3. Perceived Problems

- Instructor's **critical evaluation** of perceived problems that affected students' performance. **Realistic problems should be identified throughout the semester and summarized in this section of the report.**

4. New Plans for Addressing Problems

- Instructor's plans for addressing the perceived problems the next time the class is taught. **These should be specific enough for another instructor to implement. Most of these should be things that, you, the instructor can implement to help students to improve. Be creative.**

5. Overall Trend over last three assessment periods

- Instructors summary of overall performance trend for each outcome measured over the last three periods.

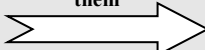
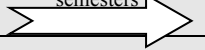
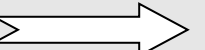
5. Were Expectations Met?

- Answer **YES** if the **class average was above the expected average** and the **stated percentage of students** scored at or above the expected average, else answer **NO**.

END OF SEMESTER COURSE OUTCOME ASSESSMENT REPORT
ELEG 4325-P01 COMPUTER INTERFACING AND COMMUNICATIONS
FALL 2021 SEMESTER

Report Prepared by: Dr. Suxia Cui

Report Date: Dec. 9, 2021

Semester	Analysis Type	Number of Students	Sub-Outcome 2.1 Ability to identify the specific needs to be met by defining/understanding the problem and developing plans for the project to satisfy the need				Sub-Outcome 2.2 Ability to Conduct a Review of the literature and perform preliminary design by generation of ideas and applying creativity				Sub-Outcome 2.3 Ability to perform detailed engineering design				Outcome 2 An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor.			
			Expected Class Average /	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average /	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average /	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average /	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average
Fall 2021	Direct	17	75	70	80	76	75	70	85	82	75	70	86	76	75	70	84	100
Fall 2020	Direct	13	75	70	85	100	75	70	91	100	75	70	88	85	75	70	90	100
Fall 2019	Direct	9	75	70	90	90	75	70	85	90	75	70	85	90	75	70	86	90
Implementation Summary	Items implemented from previous report or after meeting previous instructor		Students obtained report template and were able to follow the format to address the problem.				Students generally did well in Literature review.				Students were able to complete detail design, and successfully demonstrated to the class.				Students fulfilled the requirements of this outcome.			
Perceived Problems	Perceived problems are directly related to the PC and the sub items under them 		The procedure of how to develop the strategies to solve the engineering problem need to be enhanced.				Some groups didn't apply enough creativity in their design.				Some students were not participated enough on the design or report development.				More details in the reports are expected to illustrate the design strategies.			
Plans for Addressing Problems	Plans for address specific measures to address PC and their sub areas 		It is suggested that instructor can provide more guidance on problem solving strategies.				More time will be given to students on project design.				A cover page on team member contribution is suggested.				All of the plans suggested for the sub-outcomes will address the problems encountered for this outcome.			
Overall Trend over Periods	Ascertain if there were improvements over previous semesters 		The class average declines, but still higher than expected average.				Most students did very well in this sub-outcome.				Students performed well in this sub-outcome.				The class average is above expected average.			
Were Expectations Met?			YES				YES				YES				YES			

**Grade Sheet Showing
Student and Class Performance in Outcomes
The computed semester average in each outcome
as stated in the Assessment report are
highlighted in boldface**

Grade Sheet Showing Student and Class Performance in Course Outcomes
ELEG 4325 Computer Interfacing and Communications
FALL 2021 Semester

Students	Outcome 2			
	Outcome 2.1	Outcome 2.2	Outcome 2.3	Outcome 2
	3	5	6	14
	4	5	6	15
	4	5	6	15
	4	6	7	17
	4	5	6	15
	4	5	6	15
	3	5	6	14
	3	5	6	14
	4	6	7	17
	4	6	7	17
	5	4	5	14
	3	5	6	14
	4	5	6	15
	5	4	5	14
	5	4	5	14
	4	6	7	17
	4	5	5	14
Points Assigned	5	6	7	18
Average	4	5.1	6	15.2
Normalized Average	80	85	86	84
Expected Average	75	75	75	75
%Students above expected average	76	82	76	100

**OUTCOME SPECIFIC ASSIGNMENTS
USED TO ASSESS OUTCOMES**

**(Provide at least two assignments used to specifically
measure each outcome and justify the suitability of the
assignments for the outcome being measured)**

ASSIGNMENTS FOR OUTCOME 2

An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor.

**ELEG 4325 Computer Interfacing and Communications
FALL 2021**

**ASSIGNMENT STATEMENT/QUESTIONS
GRADING SCHEME FOR ASSIGNMENT**

**ELECTRICAL AND COMPUTER ENGINEERING
DEPARTMENT
OUTCOMES SPECIFIC ASSIGNMENT COVER SHEET
ELEG 4325 COMPUTER INTERFACING AND
COMMUNICATIONS
FALL 2021
Instructor: Dr. Suxia Cui**

Title of Assignment

Final Project

Outcome Measured Using this Assignment

Outcome 2

An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor

Check the engineering design characteristics related to this assignment

x	Involves identifying the specific needs to be met by defining/understanding the problem and developing plans for the project to satisfy the need
x	Involves conducting a review of the literature and performing preliminary design by generating alternative ideas/solutions and applying creativity
x	Involves performing detailed engineering design leading to specification and fabrication/selection of components for system being designed.
	Involves consideration of one or more of the following (Please check those involved in this assignment.)
	☐ Public health
	x Safety and welfare
	☐ Global factors
	☐ Cultural factors
	x Social factors
	☐ Environmental factors
x	x Economic factors
x	Involves fabrication and testing of model or prototype

Brief justification of the suitability of assignment for the outcome

Student will design an embedded system to be able to solve an engineering problem.

ELEG 4325 COMPUTER INTERFACING AND COMMUNICATIONS FALL 2021

ASSIGNMENT STATEMENT/QUESTIONS

ELEG 4325 Computer Interfacing and Communications Final Project

PRAIRIE VIEW A&M UNIVERSITY COLLEGE OF ENGINEERING DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

In this mandatory project, students can work as a group of maximum 3 students to design an embedded system. The system has to be based on ARM microcontroller, and must be able to meet one real life application need, and involve both hardware and software consideration. The project also needs to integrate the idea of MakerSpace. The project is due on Tuesday of week 14, and by week 12, each group needs to send instructor the names of your group members and the scope of project, and get approved by instructor. Each group needs to turn in one group written report of at least three pages (not including cover page) long with single space and 12 fonts. The following format should be observed for preparation of your written reports.

1. Cover Page: indicating title and all partners
2. Real life problem to be solved. (Involves identifying the specific needs to be met by defining/understanding the problem and developing plans for the project to satisfy the need.)
3. Overview background of ARM microcontroller. (Involves conducting a review of the literature and performing preliminary design by generating alternative ideas/solutions and applying creativity.)
4. System design and implementation. (Involves performing detailed engineering design leading to specification and fabrication/selection of components for system being designed.)
5. Design and discussion for MakerSpace.
6. Results and analysis. (Involves fabrication and testing of model or prototype.)
7. Discussion/Explanation of how the applications influence microcontroller/microprocessor industry
8. Conclusion
9. References

Each group is also required to provide a demonstration video with PowerPoint slides. The video should be less than 10 minutes. Submit the video as a YouTube link at the end of the report.

This assignment is to measure ABET outcome [2]: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor.

Your project will be evaluated as a group with the rubric:

- | | |
|---|--------------|
| 1. Cover Page: indicating title and all partners | (1.0 point) |
| 2. Real life problem to be solved (2.1) | (1.0 points) |
| 3. Overview/background of this microcontroller/microprocessor (2.2) | (1.0 points) |
| 4. System design and implementation (system diagram and flowchart) (2.3) | (3.0 points) |
| 5. Results and analysis (tables, graphs, figures) (2.3) | (2.0 points) |
| 6. Discussion/Explanation of how the applications influence microcontroller/microprocessor industry (2.3) | (2.0 points) |
| 7. MakerSpace design and discussion (2.1) | (4.0 points) |
| 8. Conclusion (2.2) | (2.0 points) |
| 9. References | (1.0 point) |
| 9. Quality of visual aid and presentation (2.2) | (3.0 points) |

TOTAL	(20 points)
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SAMPLE GRADING SCHEME AND GRADED FINAL REPORT FROM STUDENT GROUP

GRADING SCHEME FOR DESIGN CONTENT

	Points Assigned	Points Received	% for PC
1. Cover Page: indicating title and all partners	1	1	100
2. Real life problem to be solved, clearly identify objectives and design constraint with at least two considerations of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor. (Involves identifying the specific needs to be met by defining/understanding the problem and developing plans for the project to satisfy the need.) (2.1)	5	4	90
3. Plan the project (2.2)	6	6	100
a) Literature review	1	1	
b) Preliminary system design	3	3	
c) Functional design and flowchart	2	2	
4. Detailed system design with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor. (2.3)	7	7	100
a) Design, implementation, and testing	2	2	
b) Results and analysis	3	3	
c) Conclusion	2	2	
5. References	1	1	100
TOTAL	20	19	95

PRAIRIE VIEW A&M UNIVERSITY
ROY G. PERRY COLLEGE OF ENGINEERING



Distance Detection using ARM STM32 and HC-SR04 Sensor

ELEG 4253 Computer Interfacing and Communications

Final Project

Submitted by:
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Gabriel Maxwell
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Alyssa Reed

Instructor: Dr. Suxia Cui

Date of Submission:
November 30, 2021

Real-Life Problem:

According to the World Health Organization, the risk of catching COVID-19 is higher in crowded and inadequately ventilated areas. As of September 2021, Harris County is at a level one (severe) threat level. Level one signifies the spread of COVID-19 is uncontrolled; outbreaks are worsening. The 7-day average of new cases is 125.85 per 100,000. Figure 1 shows the sum of new cases reported in the past 7 days based on the population. Where the graph exceeds the 100 thresholds, it reflects red severity. Where it exceeds the 50 thresholds, it reflects orange severity. Where it exceeds the 10 thresholds, it reflects yellow severity. Harris county has been in the red and remained in the red as of the end of July 2021.

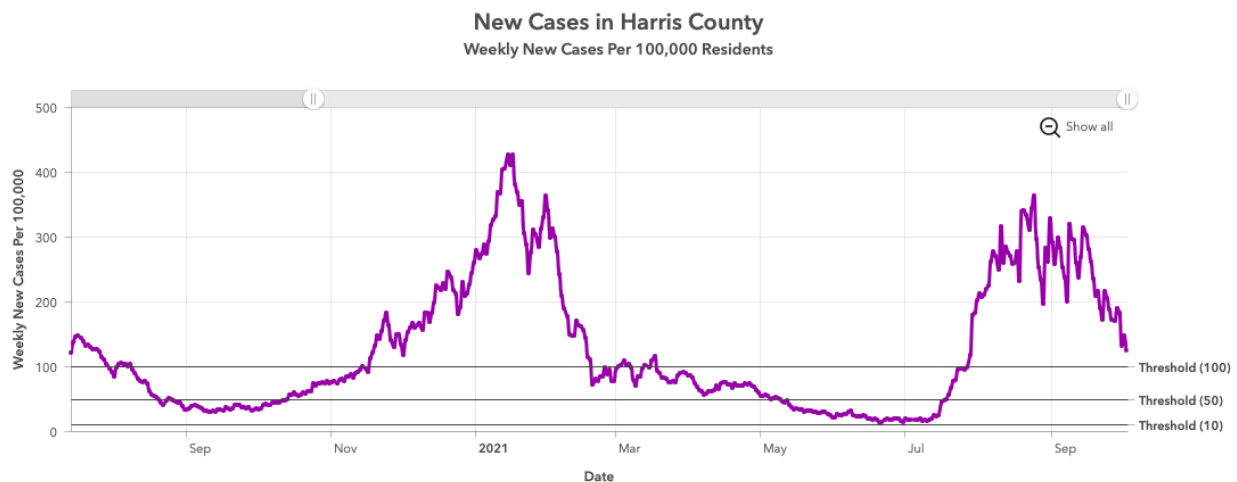


Figure 1

As a solution to this problem, our project creates a distance detection device that uses ARM's STM32L476VG microcontroller along with the HC-SR04, to enforce the social distancing rules that proven to slow down and stop the spread of COVID-19.

The ARM STM32L476

ARM stands for Acorn RISC machine or Advanced RISC machine. It is a family of CPUs that is based on reduced instruction set computer architecture. It is developed by Advanced RISC Machines, the ARM company. They make 32- and 64-bit processors. The device we use for the project is found in a family of ARM call the Cortex M Family. It is a 32-bit RISC Core microcontroller called the STM32L476. It comes with a built in USB programmer so that you may plug it directly into a PC and start developing software. It has low power consumption, a built in LCD screen, microphone, USB on the go port, and LED lights. It is famed for its many built in ports that allow for several functions from audio playback to guitar stringing. Figure 2 to the right shows the board used for this project.



Figure 2:STM32L476xx

System Design and Implementation

Our design consists of the following STM32L476 breadboard, the Ultrasonic Sensor HC-SR04, a buzzer, and LED, a 220-ohm resistor and a breadboard with wires, all of which were provided in the parts supplied. The major component was the sensor. The HC-SR04 sensor is a component that emits an ultrasound at 40 KHz which bounces back to the module once it reflects from an obstacle. It uses travel time and the speed of sound to calculate the distance between itself and an obstacle. Connection of this component to any kind of board requires a basic understanding of the HC-SR04 sensor pinout, which can be found below in figure 3.

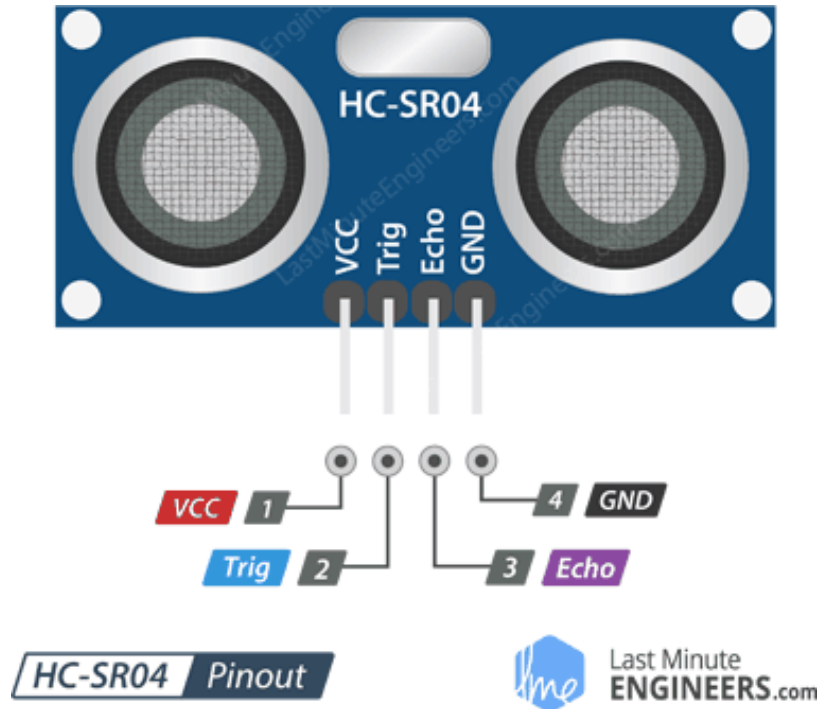


Figure 3: Ultrasonic Sensor Pinout

Pin 1 is the power supply. This is connected to the 5V pin on the STM board. The second one is Trigger pin. This is used to trigger the sound impulses. The echo pin is labeled as 3. It creates a pulse when the reflected signal is received. This pulse length is the same as the length of time it takes for the transmitted signal to be detected. The last connection is the GND which connects the ground of the STM board.

We used the STM32CubeMX software to set up and select our pin connection for the sensor. After generating the code, we of course had edits to make to meet our specific distance requirements. The two figures below depict the process. Figure 4 shows the layout out the pin selections and is where we identified and labeled the pins we would use for our code. Figure 5 shows the code and its changed pin labels in their respective parts of the program. You can see some of the key pin ports like Trigger and Echo identified.

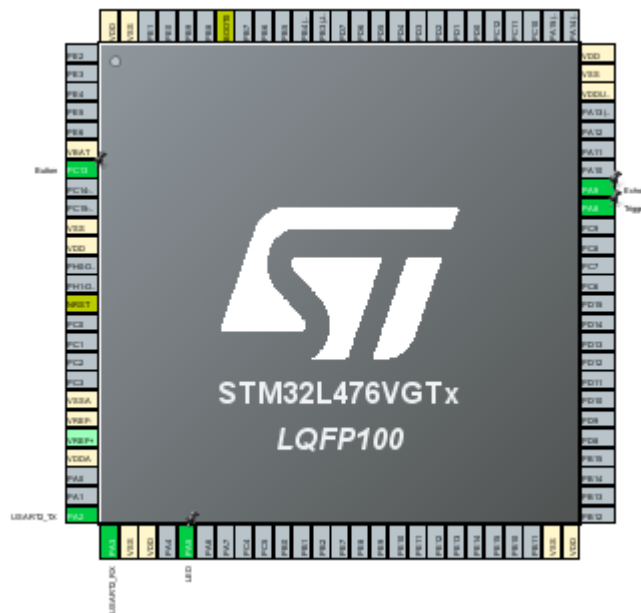


Figure 4: STMCube Diagram for STM32L476VGTx Model

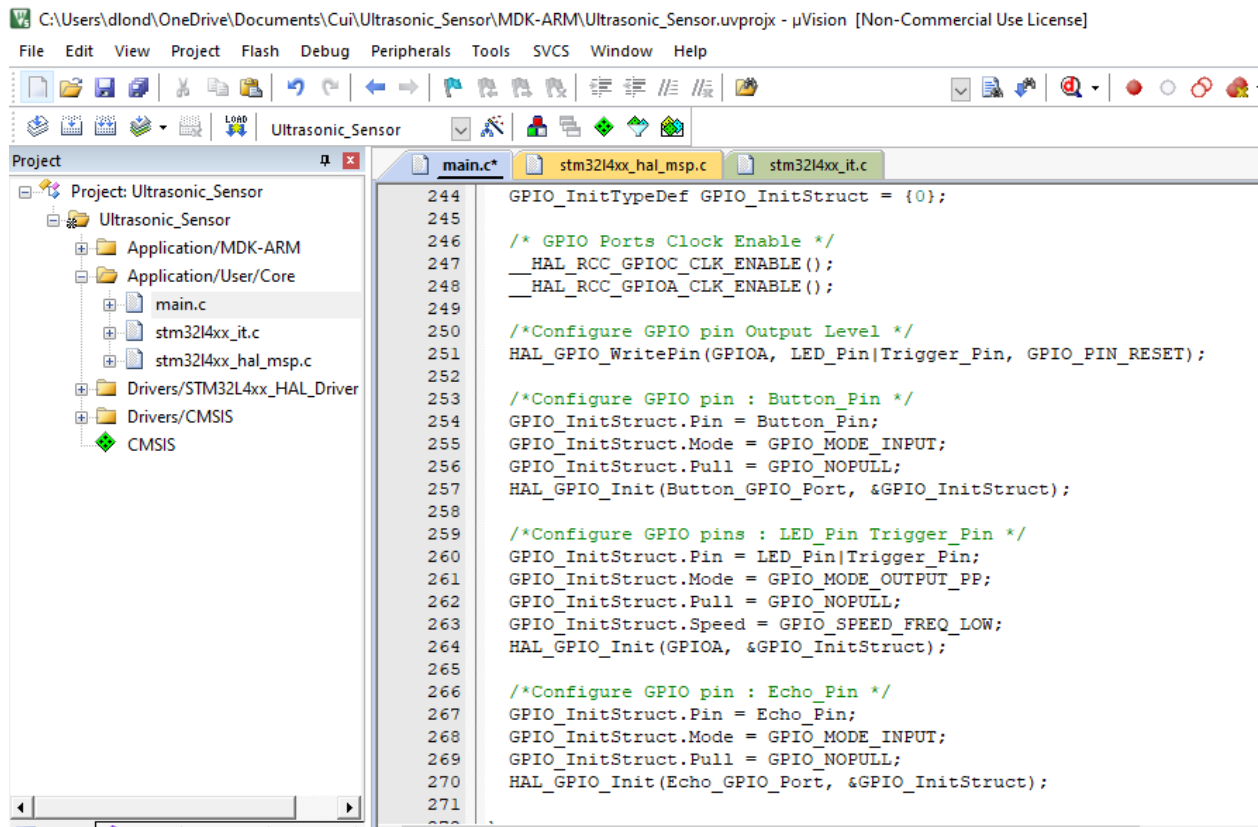
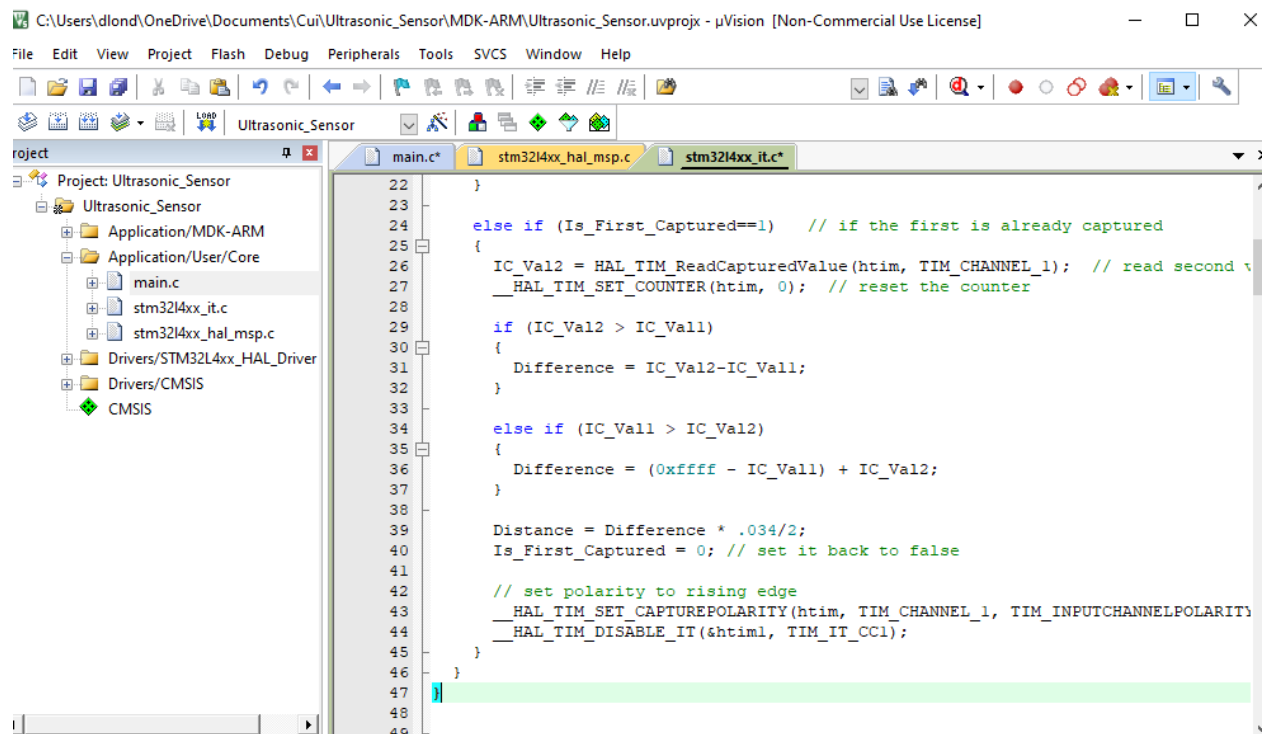


Figure 5: Ultrasonic Sensor Configuration

After setting up the board and CubeMX code was written for distance detection using our already built in LCD screen. This way our device not only alerts you when an object is too close but also tells how far away it is. The portion of the code for the distance reading is below in Figure 6.



The screenshot shows the µVision IDE interface. The left pane displays the project structure for 'Ultrasonic_Sensor', including folders for 'Application/MDK-ARM', 'Application/User/Core', and 'Drivers/STM32L4xx_HAL_Driver'. The main editor window shows the code in 'main.c'. The code is as follows:

```
22 }
23
24 else if (Is_First_Captured==1) // if the first is already captured
25 {
26     IC_Val2 = HAL_TIM_ReadCapturedValue(htim, TIM_CHANNEL_1); // read second v
27     __HAL_TIM_SET_COUNTER(htim, 0); // reset the counter
28
29     if (IC_Val2 > IC_Val1)
30     {
31         Difference = IC_Val2-IC_Val1;
32     }
33
34     else if (IC_Val1 > IC_Val2)
35     {
36         Difference = (0xffff - IC_Val1) + IC_Val2;
37     }
38
39     Distance = Difference * .034/2;
40     Is_First_Captured = 0; // set it back to false
41
42     // set polarity to rising edge
43     __HAL_TIM_SET_CAPTUREPOLARITY(htim, TIM_CHANNEL_1, TIM_INPUTCHANNELPOLARITY
44     __HAL_TIM_DISABLE_IT(&htim1, TIM_IT_CC1);
45 }
46 }
47
48
49
```

Figure 6: LCD Distance Reading Programming

Results and Analysis

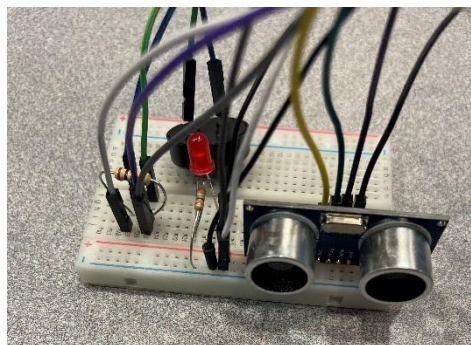


Figure 7: Sensor, LED, and Buzzer Hardware Connection

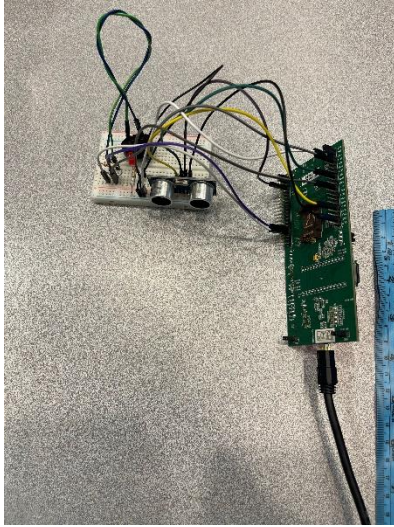


Figure 8: Design

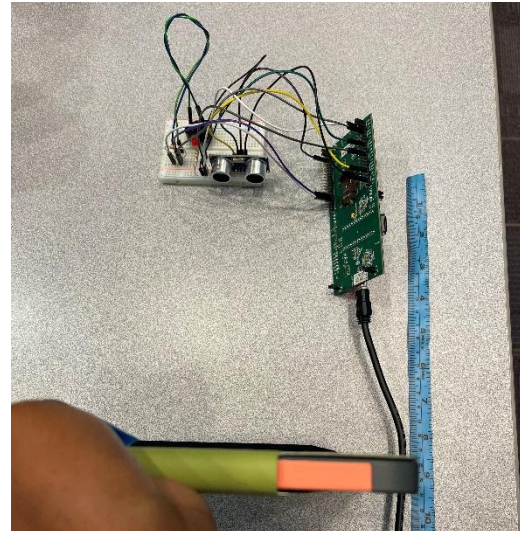


Figure 9: Design Implementation

After putting the pin design together, we developed the outcome in Figure 7. This shows the breadboard layout of all the components we added to the microcontroller. Figure 8 shows the design in its entirety and Figure 9 shows what task design is meant to perform. Our device was developed to be able to detect when the green object in the image is too close. When it is deemed too close, the red LED flashes and the buzzer sounds off.

Makerspace Implementation

For our device to be considered a product on the market, it would need a few touch-ups. The idea is for the device to be used by a person as a tool they would carry and have nearby. So as a marketable device it would need to be a simple attachment or carry on. For any development towards this a 3D printer would be used. This common Makerspace tool would create a cover around our device and turn it into whatever kind of portable tool we would need for the market. Figure 10 shows a model of a detection device installed into a wearable wristband. This band's face is created using a 3D printer enclosing the microcontroller and other components inside.

With Makerspace our project goes from a design to an actual product that customers would like to see and use.



Figure 10: Distance Detection Wristwatch

Influence on Microcontroller/Microprocessor Industry

Our device directly impacts the microcontroller industry by exploring and implementing solutions to real-life problems using lower-tier boards. There are plenty of microcontrollers on the market, but the more upgraded these become, the more expensive and complicated they become as well. A project like this forces the use of the cheaper and more simple microcontrollers in bigger problems. Our project also exposes the advantages of microcontrollers that have built-in components, rather than those that need to be added via breadboard and pin connection. For example, not all STM32 devices have a built in LCD screen. In fact, most of the products and full designs we found during research had no LCD built in. This simple factor played a huge role in the time and knowledge it would take to add on that component just to be

able to program it.

Conclusion

We successfully built the design using STMCubeMX, and hardware skills to build the model for our device. However, our device was not successful during the testing phase. For a project of this magnitude, we would need several months to test out the kinks and find the solution to the problem whether it be hardware or software. Nonetheless, we have successfully developed an assistance to the nationwide issue of COVID-19 through the form of social distancing.

Youtube Link with Video Presentation

<https://youtu.be/GVkjMK7kZgI>

References

“STM32 Discovery Kits.” *STMicroelectronics*, <https://www.st.com/en/evaluation-tools/stm32-discovery-kits.html>.

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