University of Texas at El Paso
ECE 4354: Microprocessor Systems II
EE 5390: Special Topics: Microprocessor Systems II
Fall 2024

Lecture: Mondays/Wednesdays 9:00AM-10:20AM (Old Main 211) **CRN: 15482, 17437**

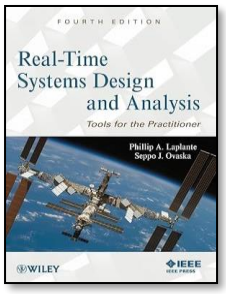
Instructor Dr. Miroslava Barúa **E-mail** mbarua@utep.edu

Office Engineering Building **A-314** or virtually via **Microsoft Teams** (*click on link posted on Blackboard*)

Office Hours Mondays 3:00PM-4:00PM (via Teams) & Wednesdays 10:30AM-12:00PM or by appointment

REQUIRED COURSE MATERIALS

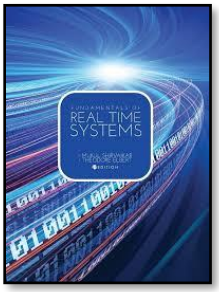
1. **Required Textbook: "*Real-Time Systems Design and Analysis: Tools for the Practitioner*"**



   Authors: Phillip A. Laplante, Seppo J. Ovaska.
   Edition: 4th Edition
   Publisher: IEEE Press
   ISBN-10: 0470768649 **ISBN-13:** 978-0470768648

   Additional References:

   - **Textbook: "Fundamentals of Real Time Systems"**
     Authors: Mukul Shirvaikar and Thodore Elbert
     Edition: 1st Edition
   - **ESP32 Technical Reference Manual Espressif**
   - **The FreeRTOS Reference Manual (www.freertos.org)**



2. **UTEP Miner Gold Card–** All students must have their photo on their UTEP ID. **For information visit https://www.utep.edu/vpba/miner-gold-card/**

3. **Technology Requirements**

   - **Access to our Blackboard (BB) shell**- Course content is delivered via Blackboard Learning Management System (LMS). Here you will find course resources, announcements, link to virtual office, submit/participate in assessment activities using integrated tools such as **Gradescope** and **iClicker**. Students must have a computer/mobile device and internet connectivity.
   - Use your **@*miners* e-mail account** – all official class communication should be from this domain.
   - **Create PDF files** -- be able to create PDF files to upload assignments *{by converting directly from Word to PDF, by using a scanner scanning App, etc.}*

- You must have access to all these tools for content delivery, assignment submission, and to participate in assessment activities. ***Detailed instructions for these tools can be found on the "How to…{instructions}" folder located on our course Blackboard shell.***

COURSE DESCRIPTION: What this class is about

Course Description: In this course you will learn about 16/32 bit microprocessor family and companion devices, and various design aspects of microprocessor systems. ECE4354 Lecture and ECE4154 Laboratory provide an advanced treatment of the design of embedded microcomputer systems using a systems approach. Material includes a study of a modern reduced-instruction set processor for embedded applications, peripheral devices, high-level and assembly language software, and advanced topics such as real-time operating systems.

Prerequisite: ECE 2304/EE3376 and ECE2104/EE3176 each with a grade of "C" or better. Prerequisite by Topic: (1) Assembly language programming (2) C programming (3) Basic computer architecture (4) Introductory course on embedded system design.

Restricted to majors: Electrical Engineering, Computer Engineering, Computer Science

Corequisite: ECE 4154/5190 must be taken concurrently with ECE 4354.

Students completing ECE 4354/ EE5390 and associated laboratory (ECE4154) will be able to:

1. Design and implement embedded systems using an advanced microcontroller, a modular software system, I/O and other devices.
2. Understand major architectural features of advanced microcontrollers.
3. Apply concepts and principles of sensors, actuators, analog and digital signals, device. interfaces, and communications to design systems.
4. Understand and apply the principles of real-time processing to embedded system design.

Topics Covered:

1. Introduction and Overview
2. Embedded System Design Process
3. Software Design
4. I/O and Hardware-Software Synchronization
5. Interrupt Synchronization
6. Time Interfacing
7. Analog Interfacing
8. Data Acquisition Systems
9. Communication Systems
10. Real-Time Operating Systems

Grading & Course Assignments – How grade is calculated.

There will be no curving of grades in this course.

Grading will be based on the standard scale:

90% >……**A**

80% -89%……**B**

70% -79%……**C**

60% -69%……**D**

Below 59%……**F**

***Graduate students - Please see note at the end of this section for additional work and requirements.**

Course Grade Distribution	
Exam #1	**20%**
Exam #2	**20%**
***Homework**	**10%**
Class Participation/Quizzes	**15%**
***Final Project**	**30%**
Instructor Assessment	**5%**
TOTAL	**100%**

Your final grade is earned by your active participation and performance in the following components:

- **Exams**: There will be 2 partial exams (1and 2, all equally weighted) taken to assess your knowledge of the Microprocessor Systems topics studied during each period of the course. You should use your own notes, homework problems, examples, reference materials, quizzes and handouts as your study guide for the exams. The use of calculators or other electronic devices is strictly prohibited during all exams/quizzes. **Refer to the associated "Course Schedule" for *estimated* exam dates. Official exam dates will be announced in a timely manner.**
  - **No exam score will be dropped;** however, ***if*** there is an **extenuating circumstance** that can cause a student to **miss one** examination, such student must **notify instructor immediately (ideally before the exam takes place), and:**
    - ***If*** the circumstance warrants an excused absence approved by the instructor, the student will need to provide: (1) proof of illness or emergency, (2)a written and signed statement describing the reasons for missing an exam, and (3) a petition in writing to take a ***comprehensive*** exam (*all chapters in the semester*) at the end of the semester to replace that **one** missed exam. All the submitted documents will be kept under the student record. Note: the student **must have taken the other exam to qualify for this replacement**. Be aware that inherently a comprehensive exam will be more difficult.
    - **If you missed an exam without having an approved excuse, it will be graded with a "zero" in that exam** and the student will **not** qualify to take a comprehensive exam.

- **Homework:** A portion of your content mastery depends on completion of homework assignments, so make sure you understand and can solve all the problems by yourself. You are responsible for doing the homework, even though **it may or may not be collected**. Homework assignments will include:
    - **Problem sets** – Series of problems will be assigned for you to practice your skills. When these problem sets are collected, you must submit them by **scanning and uploading it as a single PDF file.** Good homework presentation ~ including neat/legible PDF scanned files~ are **expected and required.** To be able to receive full credit, each assignment **must be submitted by the deadline and must have student's *Name, course name, assignment number and Due date.*** Assignments will be submitted thru **Gradescope**. **Problems should be presented in the same order as listed on the assignment instructions and final answers clearly marked with a box around it.** *Software must be properly documented, must compile and run without errors and Hardware must function as required by the assignment.*
    - **Reading assignments** → Read the assigned sections from the textbook and reference materials. You might be asked to participate in quizzes or polls based on the reading.
    - **All homework assignments** must be completed by the posted **deadline**. Late homework will only be accepted in the case of illness or an emergency; you are responsible for notifying me as soon as possible (ideally **before the deadline**) of the situation (illness or emergency) necessitating late submission of homework.
    - You must submit your own work. Any student suspected of cheating or copying will be submitted to the Office of Student Conduct and Conflict Resolution (OSCCR) and the report will become part of your permanent record at UTEP.

- **Class Participation/Quizzes:** A portion of your grade will come from **polls or quizzes** so make sure to be well prepared for them on a timely manner. Quizzes will assess your completion and understanding of all homework assignments as well as your basic understanding of the class material. The intention of the quizzes is to encourage you to stay on track with the class material. Please note that:
    - **No make-up quiz will be given;** however, your lowest quiz score will be dropped.
    - Polls and Quizzes will be administered **during class time** and using **iClicker or Gradescope**, so make sure you know how to use this tool (refer to the '***How to…{instructions}***' folder) and how to access it using your electronic devices.
- **Instructor Assessment:** this assessment is based on your **active participation** in all the course activities: quizzes, homework, completion of assignments and in-class participation. Each of these activities will be given point values that add up to the total *instructor assessment* portion of your grade. Because these activities are designed to contribute to your learning each week, they **cannot be made up** after their due date has passed. If you have an excessive number of missed items, you may be dropped from the course.
- **Extra credit:** ***If needed,*** extra credit may be assigned to the ENTIRE CLASS ONLY. No individual can request to present work for extra credit. When needed, optional questions/challenge problems will be added to assignments, quizzes or exams that will count as extra credit.

- **Graduate Students:** If you are a **graduate student** taking this course as part of your degree plan, please note that you are responsible for completing all work required of undergraduates **and**, in addition you are expected to:
  - Successfully complete the **final project with extra requirements** that require individual critical thinking and design.
  - Complete **extra homework**, assigned especially for graduate students; and
  - **Maintain an 80% average** (minimum) on homework, design work and exams

  Failure to comply will warrant a failing grade in the course

Course Schedule: This information will be available on Blackboard as a separate document highlighting topic sequence, key assignments, important dates and activities. **Document is subject to changes at the discretion of the instructor to adapt to the needs of the class.**

Relationship to ECE Undergraduate Program Outcomes

b. Have an ability to design and conduct experiments and interpret data. Students have lab assignments to design various aspects of a system based on an embedded microprocessor.

c. have an ability to design a system, component, or process to meet desired needs. There is a final project where each student designs and implements a system with an embedded microprocessor.

e. Have an ability to identify, formulate, and solve engineering problems. In the final project, students will use laboratory equipment to test and debug their designs.

g. Have an ability to communicate effectively. A final report for the final project is required.

k. Have an ability to use techniques, skills, and modern engineering tools necessary for modern engineering practice. Assignments and test problems are given that are related to major architectural features of modern embedded processors.

COURSE COMMUNICATION and LEARNING ENVIRONMENT

Office Hours: You are highly encouraged to interact and talk one-on-one with me about your questions and comments related to the course. You can either stop by my physical office located at room **A-314 or** connect via the virtual office conveniently accessible from anywhere using **Microsoft Teams** (all you need to do is click on the access link located on our home page on Blackboard). **I will be available during the posted times.** Please send me an email if you have schedule conflict and need to **make an appointment** to meet with me outside the posted office hours.

E-mail Communication: Send all your class related e-mails to **mbarua@utep.edu** . Due to high volume of emails received, please be patient and be certain that I will make every attempt to respond to your email within 24-48 hours of receipt (usually much sooner but do not wait until the last minute to send me a message about something that is due in a few hours or the next day because - due to response window- my response may not get back to you on time). **Make sure** the message's subject description has prefix "**ECE 4354: " or "ECE5390:"** followed by the rest of the message's subject (Example: "*ECE 4354: Question about homework*"). In the body of email, clearly state your question. All this will **help receive a quicker response time**! Send all messages **from your Miners account** and **include your name**. Treat e-mail correspondence as a professional exchange of information.

- **Announcements**: Check the Blackboard announcements for any updates, deadlines, or other important messages.

- **Classroom Etiquette/ Student Conduct:** Remember that you must be courteous, respectful and professional in the way you address others. Therefore, please keep these (network guidelines in mind. **Failure to observe them may result in disciplinary action.**
  - Respect and courtesy must be provided to classmates, TAs and instructor at all times. No harassment will be tolerated.
  - Blackboard is **not** a public internet venue. **Whatever is posted in these online spaces is intended for classmates and instructor only.** Please do not copy documents and paste them to a publicly accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).

COURSE AND UNIVERSITY POLICIES:

COPYRIGHT STATEMENT FOR COURSE MATERIALS: All materials used in this course (such but not limited to assignments, exams, quizzes, handouts, etc) are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. **You may not further disseminate (i.e., share, send or post) any class materials/resources outside of this course. Doing so may result in disciplinary action.**

MAKE-UP WORK POLICY: Make-up work will be given **only** in the case of a documented emergency. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to me—in advance if at all possible—and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

COURSE DROP POLICY: According to UTEP Curriculum and Classroom Policies, "When, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class". If you have a large number of missed assignments, you may be dropped from the course. The grade that you will receive will be a **"W"** before the **course drop deadline** and a grade of **"F" after the course drop deadline. If** you feel that you are unable to complete the course successfully and you need to **drop this class**, please contact the Registrar's Office to initiate the drop process before the **Drop Deadline on Nov 1th**. If you cannot complete this course for whatever reason, please contact me. Disappearing without formally dropping a course or withdrawing from the University, will result in a zero on each assessment activity you miss thereafter and will ultimately result in you receiving a grade of "F" at the end of the semester.

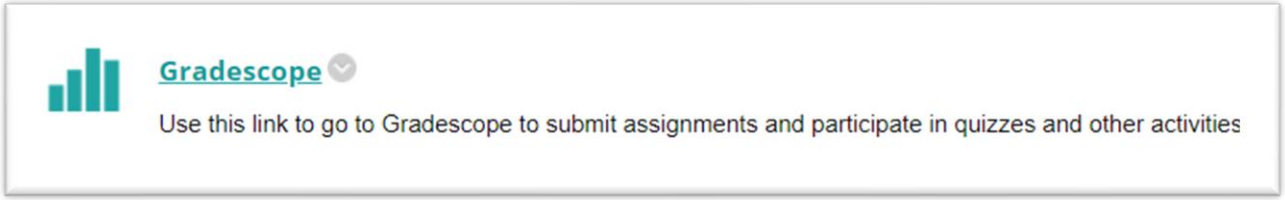
INCOMPLETE GRADE POLICY: Incomplete grades may be requested only in exceptional circumstances after you have completed at **least half of the course requirements**. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

ELECTRONIC DEVICES POLICY: Must use an internet connected device to access course resources, participate in assessment activities (such as submitting homework, quizzes, etc) using the appropriate tools within Blackboard.

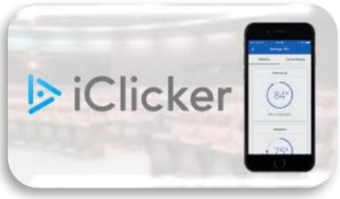
TECHNICAL DIFFICULTIES POLICY: I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. I also suggest you save a copy of all submitted/uploaded work. If you are experiencing difficulties, please contact UTEP's technical support and email if necessary.

> **Technical Support:** Please follow this link for Blackboard Student Orientation to review/learn how to post assignments, participate in discussions, take a test on Blackboard, review feedback/grades, etc. If you need technical support with Blackboard, please contact UTEP's Help Desk at (915)747-4357 (HELP), helpdesk@utep.edu. For help with equipment, internet access and tech support please visit https://www.utep.edu/technologysupport/learningremotely.html

GRADESCOPE: For assessment activities, you will **need to submit through Gradescope**. This tool will be accessible by clicking on the link located on our Blackboard home page (tool link is illustrated below).



iClicker : This Classroom Response System (CRS) technology enables instructors to ask questions, gather student responses, display those responses in real-time. **Students use their own mobile device (laptop, tablet, or smartphone) to submit their responses.** Visit this link to learn more: https://www.utep.edu/technologysupport/ServiceCatalog/INST_ClassResponseSystem.html



SCHOLASTIC INTEGRITY/ACADEMIC HONESTY:

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. Any form of academic dishonesty will not be tolerated. "Plagiarism" is the unattributed use of someone else's work – coming from a classmate's, a website's, tool, even a teacher's from another course. In accordance with University regulations, scholastic dishonesty on a given assignment **will** be subject to disciplinary action and **will** be referred to the Office of Student Conduct and Conflict Resolution (OSCCR).
Dishonesty/cheating/plagiarizing may result in a zero on the assignment, an "F" in the course, or even suspension from the university. If you need assistance with your assignments, please consult authorized sources of help. For more information on Scholastic Dishonesty and/or Plagiarism, consult the Handbook of Operating Procedures: Student Affairs, which is available in the Office of Student Life or visit HOOP: Student Conduct and Discipline.

ACCOMMODATIONS POLICY ~ Center for Accommodations and Support Services (CASS): The University is committed to providing reasonable accommodations and auxiliary services. Students requiring unique accommodations **must** contact and register with the **CASS** office and make sure to **talk to the instructor at the beginning of the semester to discuss necessary arrangements.** The CASS office may be contacted at 747-5148, cass@utep.edu or go to Room 106 Union East Building. More information is available at: https://www.utep.edu/student-affairs/cass/

COVID-19 Precautions

Please stay at home if you have been diagnosed with COVID-19, and send me an **email as soon as possible**. If you are experiencing symptoms, it is recommended that you get tested immediately and wear a mask or face covering. COVID-19 testing options are available for free on campus for registered students. For updated information about **on-campus testing** visit: https://www.utep.edu/chs/covid-testing/index.html

COVID-19 Illness Reporting: For the safety of the campus community, it is very important to be informed. If you have any questions or concerns about COVID-19, you can contact UTEP EH&S at covidaction@utep.edu. For updated information about reporting visit: https://www.utep.edu/ehs/covid/

What you need to do to be successful in this course

Prepare in advance: In order to be successful, each student must be proactive in using all the resources (textbook and reference material) related to the current and upcoming topics, understand your homework, and complete any other assignment **BEFORE the deadline**.

Tips for Success in this class:

1. Be **organized**, keep your notes in order, make sure to meet all weekly expectations to receive credit and to avoid falling behind.
2. Visit the class Blackboard shell and read UTEP e-mail to avoid missing important announcements or deadlines. It's your responsibility to **stay on schedule and prioritize your time**.
3. **Read ahead** from by following the topic sequence as denoted in the '**Course Schedule**'. As you read, **take notes** and make summaries in your own handwriting (research shows handwriting has a better effect on your memory). All of this will help you study for assessment activities.
4. Be proactive and **meet all the deadlines**. Try to finish your **assignments early** (this will help in case something unexpected comes up). Make sure to understand how to solve these assignments as they are there to help you prepare and you may have a quiz about this content.
5. Visit the instructor during office hours if you need assistance, or use e-mail to set up an appointment. Remember to also seek assistance from our Lab TAs.
6. Start your success by not falling behind! You need to **be proactive** about meeting your education goals.
7. Remember that the grade you get is the grade you earn through your work**. It is up to you to monitor your own performance and adjust your efforts in a timely manner** if you find that you are falling behind in your grades.

UTEP Student Resources: Where to go for assistance

UTEP provides a variety of student services and support:

Technology Resources

- UTEP **Help Desk**: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone at (915)747-4357 (HELP), email to helpdesk@utep.edu , go to their website, chat, or by visiting their offices.

Academic Resources

- **UTEP Library:** Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- **University Writing Center (UWC)**: Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.

- **Math Tutoring Center (MaRCS)**: Ask a tutor for help and explore other available math resources.

Individual Resources

- **Military Student Success Center:** Assists personnel in any branch of service to reach their educational goals.
- **Center for Accommodations and Support Services**: Assists students with ADA-related accommodations for coursework, housing, and internships.
- **Counseling and Psychological Services:** Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.

COVID-19 Resources

- UTEP COVID-19 website: **https://www.utep.edu/ehs/covid/**
- UTEP COVID-19 Testing: **https://www.utep.edu/chs/covid-testing/index.html**
- UTEP Counseling and Psychological Services: 747-5302 or **CAPS@utep.edu**
- UTEP Student Health and Wellness Center**: https://www.utep.edu/chs/shc/**
- El Paso Strong statistics website: **http://epstrong.org/**