College of Engineering and Architecture
Electrical Engineering and Computer Science
COURSE SYLLABUS

EECE416 Microcomputer Design

Instructor's name: Charles Kim   CRN: 80105
Title: Microcomputer Design   Credit hours: 3 credits
Office location: LKD 3014   Class meeting days and hours: F 9:10 – 12:00 pm
Office/department phone: 202-806-4821 Classroom location: LKD3113
Office hours: TW 1 - 3   Semester and year: Fall 20213
Email address: ckim@howard.edu   Course website: www.mwftr.com/416F23.html

COURSE DESCRIPTION
The course examines microprocessor and support architectures, hardware and software system design, assembly language coding, and microcontroller applications.

Prerequisites or Co-requisites
EECE212 Fundamentals of Digital Systems

Course Goals
1. Understanding ARM Architecture
2. Understanding ARM Instruction Sets
3. Sufficient skill development for ARM Assembly Language coding

Learning Objectives: Upon completion of the course, students attain
1. (ABET Outcome 3) Ability to communicate effectively with a range of audiences
2. (ABET Outcome 4) Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
3. (ABET Outcome 6) Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Instructional Methods
1. Lecture and class activity
2. Embedded lab sessions for coding practices
3. ARM Emulator for checking codes for proper operation
4. ARM Coding with a target microcontroller or SoC

TEXTBOOKS AND OTHER RESOURCES
Required: Mazidi et. al, ARM *Assembly Language Programming & Architecture, 2nd Edition, MicroDigitalEd.com 2016*
Supplementary: Knaggs & Welsh, ARM: Assembly Language Programming, 2014
            C. W. Kann, Introduction to Assembly Language Programming: ARM Edition, 2021

COURSE OUTLINE
I.   ARM Fundamentals
II.   Numbering System overview

III.   ARM Architecture and Assembly Language Programming
IV.   Arithmetic and Logic Instructions
V.   Branch, Call, and Looping in ARM
VI.   Signed Integer Number Instructions
VII.   ARM Assembly Language Programming in ARM Emulator
VIII.   ARM Memory Map, Memory Access, and Stack
IX.   ARM Assembly Language Programming with Target SoC

COURSE REQUIREMENTS *(What must students do to fulfill the objectives?)*
1.   Class Attendance
2.   Active Coding Participation
3.   Sufficient background in number systems
4.   Timely submission of coding practices/assignments

5.   **Academic Integrity**

The "Academic Code of Conduct" in the H-Book prohibits cheating, plagiarism, and copyright infringement. Penalties for violations range from a "0" for the assignment or exam to an "F" in the course or suspension. See CETLA's Plagiarism webpage for more information about plagiarism as well as ways to avoid it. Please note that in this course I reserve the right to check your work using a plagiarism detector such as Turnitin or Blackboard's Safe Assign.

6.   **Manuscript Conventions** *(including required citation format)*

"Writing Matters" Statement

Writing is an essential tool for thinking and communicating in virtually every discipline and profession. Therefore, in this course I expect you to produce writing that is not only thoughtful and accurate, but also organized, clear, grammatical, and consistent with the conventions of the field. If your writing does not meet these standards, I may deduct points or ask you to revise. For assistance with your writing, go to the student section of the Writing across the Curriculum (WAC) website, http://www.cetla.howard.edu/wac/students.aspx.

COURSE POLICIES

1. Grading

Computation of Final Course Grade
Assignment …………………………………..……...…...20 %
        Late submission of 2 to 3 days after the due date: 30% deduction
        Late submission of 4 to 5 days after the due date: 50% deduction
        Late submission of more than 7 days after the due date: 70% deduction
Technical Essay …………………………………….…..…10 %
Exam 1 …………………………………………………....25%
Project …………………………………………………….20 %
Exam 2 …..……………………………………………....25%

Grading Criteria

Incomplete Grades and Withdrawals
A grade of Incomplete (I) is given only if you have fulfilled most of the course requirements prior to the Registrar's withdrawal deadline and an emergency prevents you from completing the course. Such an emergency must be documented by your dean or advisor. However, if you have not completed most of the coursework, make sure you withdraw before the deadline; otherwise, I will have to enter the grade you have earned thus far. Please note that if you receive an Incomplete, you can complete only the coursework you missed, and you must complete that work by the end of the following semester, in accordance with University policy.

Lateness
 If you cannot submit homework on time because of an emergency, you should document the emergency. (For instance, submit a doctor's note.)

Missed Exams or Classwork
If you miss a quiz or other classwork because of an emergency, you should submit a documented excuse as explained above. Then I will determine whether to excuse you from the assignment or permit you to make up the missed work.

2. **Class Participation**

Attendance, Tardiness, and Class Participation
You are expected to attend classes regularly and promptly. If you are absent or tardy, you will miss not only valuable instruction but possibly credit as well. In either case, you are responsible for finding out from your classmates what was discussed, assigned, or distributed in class.

Electronic Devices
You are expected to conduct yourself during class time in a professional and respectful manner. Therefore, unless I instruct otherwise, please turn your cellphone off or put it on "vibrate" during class. Also, please refrain from surfing the Web, emailing, texting, tweeting, and engaging in other distracting activities during class time. If you engage in such activities, you will be required to turn off the device or leave the classroom, forfeiting class participation points.

3. **Communication**

The best way to reach me is email/Slack. If I receive a message, I will try to respond within 24 hours or the next business day.

4. **Academic honesty and integrity AND student code of conduct**

You are expected to adhere to the student code of conduct in academic honesty and integrity. Giving or receiving help in assignments, exams, and any other required course submissions is cheating and violation of the code. If you are caught in the cheating, your score of the submission is automatically zero. Further disciplinary action may follow.

SUPPORT SERVICES

1. **American Disabilities Act (ADA)**
Howard University is committed to providing an educational environment that is accessible to all students. In accordance with this policy, students who need accommodations because of a disability

should contact [Special Student Services](#) (202-238-2420) as soon as possible after admission to the University or at the beginning of each semester. If you need a special accommodation required by the American Disabilities Act, please document and discuss your disability with me during the first week of classes**.**

2. **Statement on Interpersonal Violence**

Howard University takes sexual assault, dating violence, domestic violence, stalking and sexual harassment seriously. If a student reveals that he or she needs assistance with any of these issues, all Responsible Employees, which includes faculty, are required to share this information with the University Title IX Office (202-806-2550). Students can be referred for confidential services to the Interpersonal Violence Prevention Program (IVPP) (202 806-7647) or University Counseling Services (202 806-6870). For more information about these services, please go to www.CampusSafetyFirst.Howard.Edu.

2. **Center for Academic Excellence**
The Center for Academic Excellence provides tutors to assist undergraduates with a variety of General Education subjects. To request a tutor, go to http://undergraduatestudies.howard.edu/cae/tutor-clearinghouse. The center also provides academic counselors and student success workshops to help you stay in school and excel.

3. **Program for Academic Support Services (PASS)**
The Graduate School's PASS program offers courses for international graduate students and other graduate students who need to improve their English writing skills. To seek assistance, go to http://www.gs.howard.edu/pass/default.html.

4. **Writing Center** [FOR ENGLISH, WAC, OR WRITING MATTERS COURSES]
For assistance with your writing, you may visit the English Department's Writing Center online or in Locke Hall (Room 100)—with or without a referral. At the Center you will find tutors and software to help you with a variety of problems—from lack of organization to lack of subject-verb agreement. However, the tutors will not proofread or edit for you. Instead, the tutors will do the following: identify your writing problems, teach you how to solve those problems, and evaluate your progress. To schedule an appointment on campus, go to http://www.coas.howard.edu/writingcenter. To enroll in the online site, go to http://www.cetla.howard.edu/wac/students.aspx. Remember, however, that you can also find assistance on the Writing across the Curriculum (WAC) website*,* http://www.cetla.howard.edu/wac/students.aspx.

5. **Canvas**
You are expected to use Canvas throughout this course. If you are unfamiliar with Canvas, please complete the **hands-on orientation** described on the FAQs page and submit the confirmation page to me during the first week of classes.

6. **Technical Support**
If you encounter technical problems with your email, Canvas, Bison Web, or some other University-wide technology, go to http://itsupport.howard.edu to open a ticket or email helpdesk@howard.edu. For information about computer labs, software distribution, IT security, printing, and other IT topics, see the **service catalogue** (http://www.howard.edu/technology/services/service_catalogue.html) on the website of Enterprise Technology Services (ETS). Also, for online learning resources, click the **e-Learning tab** when you log into Blackboard.

7. **University Libraries**

Go to http://library.howard.edu/StudentLibraryInfo to find out how to access resources and services at the Howard University Libraries. Be sure to check the "Research Help" portal at http://library.howard.edu/searchportals, and find out how to use the Summon search engine, the RefWorks bibliography manager, and Ask a Librarian to "chat" with a reference librarian.

 OTHER COURSE-SPECIFIC POLICIES

1. Privacy

Video or Audio Recording
You are not permitted to record any of our classes without my written permission. If I authorize you to record a class, you may not distribute or disseminate the recording. If the Dean of Special Student Services has approved your request to record to accommodate a disability, I will require at least a week's notice to consider or prepare. Be advised that your voice or image may be recorded incidentally and shared with other persons interested in accessing the recording for educational purposes.

Student Writing
To build a learning community, I may ask students to read and critique one another's work. Not only can peer review provide student authors with helpful feedback, but it can also help them develop a "critical eye" to evaluate their own work. Therefore, please be advised that your coursework may be shared (online or in the classroom) with your classmates to improve everyone's learning. In addition, to improve teaching and learning, I may share sample student work with HU faculty or, anonymously, with other HU classes unless I receive a written request from a student to withhold his or her work. On the other hand, if I wish to publish student work, I will solicit permission from students via an Informed Consent Form. If you are asked, rest assured that your response will not affect your grade.

COURSE SCHEDULE (subject to change)

Important Due Dates

Date	Assignment
August	ARM Fundamentals + Number Theory
September	ARM Architecture + ARM Instruction Sets
October	ARM coding in ARM Emulator + EXAM 1
November	ARM Coding with a target SoC + Project
December	EXAM 2

Schedule of Activities and Assignments (daily or weekly)

Wk number	Topic	Assignment
1	ARM Introduction + Class kick-off	
2	ARM Fundamentals	
3	Numbering Theory	
4	ARM Architecture and Assembly Language Programming	
5	Arithmetic and Logic Instructions	
6	Branch, Call, and Looping in ARM	
7	ARM coding environment – ARM Emulator	

8	Signed Integer Number Arithmetic	
9	EXAM1	
10	Arm Memory Map, Memory Access, and Stack	
11	ARM and Thumb Instructions	
12 - 14	ARM coding with a target SoC	
15	Project	
16	EXAM2	