

**EE 354
Syllabus**

**Fall 2018/19
Dr. Blandford**

Web site: <http://csserver.evansville.edu/~blandfor>

Text: Notes on the 8051 from the EECS office.

Reference:

1. Stewart, James W. and Miao, Kai X., The 8051 Microcontroller, Hardware, Software, and Interfacing, 2nd edition, Prentice-Hall, 1999.
2. Schultz, Thomas, C and the 8051, 4th edition, Wood Island Prints, 2008
3. MacKenzie, I. Scott, The 8051 Microcontroller, 3rd ed., Prentice-Hall, 1999.
4. Zhu, Yifeng, Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C, Second Edition, E-Man Press, 2015
5. Yiu, Joseph, The Definitive Guide to the ARM CORTEX M3 and M4 Processors, Elsevier, 2014
6. Seal, David, ARM Architecture Reference Manual, 2nd ed., Addison-Wesley, 2000.

Software:

1. A51 Macro Assembler for the 8051 from Keil Software. Available on selected machines in the lab or you may download a student version from <http://www.keil.com/demo/>. The assembler is part of the C51 C Compiler tools listed below.
2. C51 C Compiler for the 8051 from Keil Software. The professional version is available on selected machines in the lab. Alternatively, you may download the most recent student version from <http://www.keil.com/> choose *Evaluation Software* under downloads and click on *C51 tools*. Fill out the registration form. The demo version includes complete manuals.
3. CA ARM C Compiler for the ARM Cortex M4 microcontroller from Keil Software. You may download the most recent student version from <http://www.keil.com/> choose *Evaluation Software* under downloads and click on *ARM Tools*. Fill out the registration form. The demo version includes manuals.

Hardware:

1. Each student will need a 3-wide solderless breadboard for project construction. These are available through the stockroom or you can use the one that was required for EE 210/215.
2. Printed circuit boards for the Atmel AT89C51CC03 and the ARM Cortex M4 Nucleo Board will be used for projects. The 8051 board is available through the EE Department office and the Discovery board can be purchased online.

There will be 3 hour exams, graded homework projects, and a 2 hour comprehensive final exam. The homework will count 18%, the final will count 22%, and the 3 hour exams will count 20% each. All exams are open book and open notes.

Final Exam is Monday, December 10, 2018 at 11:00am

EE 354

Fall 2017/18

Monday	Wednesday	Friday
	Aug. 22 Ch. 1-2M Microcontrollers Intro to the 8051 family	Aug. 24 Ch. 2M 8051 Hardware and architecture
Aug. 27 Ch. 2M 8051 memory, timing, and ports Special function registers	Aug. 29 Ch. 2M 8051 machine code Instruction set summary	Aug. 31 Ch. 2 M + Notes 8051 addressing modes Assembly language programs Keil Development software
Sept. 3 Labor Day	Sept. 5 Ch. 3 and notes Assembly examples	Sept. 7 Ch. 3 and notes Program structure
Sept. 10 Review and examples	Sept. 12 Hour Exam 1	Sept. 14 Review exam <i>Project Introduction</i>
Sept. 17 Ch. 4 M C for the 8051	Sept. 19 Ch. 4 M C for the 8051	Sept. 21 <i>Project Hardware Design</i>
Sept. 24 Ch. 4 M C for the 8051	Sept. 26 Ch. 4 M C for the 8051	Sept. 28 Ch. 2 and Ch. 4 Interrupts on the 8051
Oct. 1 Ch. 4 M Interrupts on the 8051	Oct. 3 Ch. 4 M Timer operation	Oct. 5 <i>Project Software Design</i>
Oct. 8 Fall Break	Oct. 10 Ch. 4 M Timer examples	Oct. 12 Ch. 4 and 5M Serial port operation
Oct. 15 Ch. 5M Hour Exam 2	Oct. 17 Review Exam	Oct. 19 <i>Project Due Date</i>
Oct. 22 Ch.1 N Intro to the ARM architecture <i>Project 2 Introduction</i>	Oct. 24 Ch. 1 N ARM M4 Instruction set	Oct. 26 Ch. 2 N μ Vision IDE
Oct. 29 Ch. 2, 3 and 5 N μ Vision C Compiler In line assembly	Oct. 31 Ch. 4 N General purpose I/O	Nov. 2 Ch. 5 N C Programs and examples
Nov. 5 Ch. 4 N Using timers Intro to interrupts	Nov. 7 Ch. 4 N Timers and interrupts	Nov. 9 Project 2 Status Report (Last day to withdraw with W)
Nov. 12 Ch 4 N A to D and D to A conversion	Nov. 14 Ch 4 N Pulse width modulation	Nov. 16 Ch 5 N Examples in C
Nov. 19 Hour Exam 3	Nov. 21 Thanksgiving Break	Nov. 23 Thanksgiving Break
Nov. 26 Ch. 1 to 5 N Review Exam	Nov. 28 Project 2	Nov. 30 Project 2
Dec. 3 <i>Project 2 Due Date</i>	Dec. 5 Final exam review	

M = The 8051 Microcontroller Class notes.

N = The ARM Cortex M4 Class notes.

Final Exam is Monday, December 10, 2018 at 11:00am

EE 354 Syllabus Supplement

Catalog Description Takes up the logical design of computer systems with emphasis on the interaction between hardware and software. Topics include register design, memory systems, programmable I/O devices, interrupt driven I/O, controller design and microprogramming, bus systems, interface electronics, and assembly language programming. Computer aided design tools are used throughout course. Several different microcontrollers are used for projects to illustrate concepts. Assembly language and C used for class projects. Prerequisites: Electrical Engineering 254; working knowledge of C or C++. Fall.

Credit Hour Policy This course meets the federal requirements of 15 in-class hours plus an expected 30 hours of out-of-class work per credit hour over a semester. (At least 135 hours total; 9 per week)

Time & Place EE 354 meets Monday, Wednesday, and Friday at 11:00 AM in Koch Center 137

Learning Objectives After completing this course, successful students will be able to:

Course Objectives Statement

The objectives of this course are to teach students the design process for the implementation of a complete project which uses one or more microcontrollers.

Objectives by outcome

- 1b. Students will be able to apply the concepts of their field of study to formulate problems and identify creative solutions.
Students will be able to write programs using selection, repetition, and functions in one or more assembly languages. (ABET e)
Students will be able to write programs using selection, repetition, and functions in at least one major high level language. (ABET e)
Students will understand the hardware/software interface for basic I/O devices such as A/D and D/A converters and parallel and serial ports. (ABET e)
Students will understand how to use a micro controller for fundamental I/O and control purposes. (1b ABET e)
All students will have experience in a high level language on at least two different microcontrollers. (ABET e)
- 2b. Students will be able to determine the requirements of an "open-ended" problem statement, complete a design and implementation to fulfill those requirements, and evaluate the effectiveness of the design.
Students will complete at least two open ended design problems requiring an understanding of hardware and software. (ABET C)

Homework Problems will be assigned weekly. Most will require a program in either assembly language or C to be executed on a microcontroller. Assignments will differ as to what is to be turned in and what is the due date. This information will be placed on the assignment sheet.

Attendance Policy You are expected to attend all class sessions. Absences may adversely affect your grade.

Office Hours Dr. Blandford's office is Koch Center 266, Campus phone is 2291. He will usually be in his office from 7:00 to 10:00AM.

Revised: August 21, 2018

Disability Policy It is the policy and practice of the University of Evansville to make reasonable accommodations for students with properly documented disabilities. Students should contact the Office of Counseling and Health Education at 488-2663 to seek services or accommodations for disabilities. Written notification to faculty from the Office of Counseling and Health Education is required for academic accommodations.

Honor code This course will be governed by the University of Evansville Honor Code, which is

I will neither give nor receive unauthorized aid, nor will I tolerate an environment that condones the use of unauthorized aid

This code has two fundamental expectations:

- Students will submit as their own work only those items that are indeed their own work
- Students will hold each other responsible for adhering to the Code