Date of request: 18-SEP-2019

Request ID: A-2019-ECE-24

College: A

Department: ECE

Initiator name: Lina Sawalha

Initiator email: lina.sawalha@wmich.edu

Proposed effective term: 202040

Does course need General Education approval?: N

Will course be used in teacher education?: N

If 5000 level course, prerequisites apply to: U

Proposed course data:
Change Course ECE 3570
Specific Course Change type selected: Description
Specific Course Change type selected: Credit hours
Specific Course Change type selected: Other (explain**)
Specific Course Change type selected: Type of Class

1. Existing course prefix and number:
   ECE 3570

2. Existing credit hours:
   3.00

3. Proposed credit hours:
   4.0

4. Select class type:
   Lecture/Lab/Discussion

5. How many contact hours per week for this course?
   6.00

6. Other (** explain)
   Adding a laboratory component to ECE 3570 and change course number to ECE 4570

A. Please choose Yes or No to indicate if this class is a Teacher Education class:
   No
B. Please choose the applicable class level:
Undergraduate

C. Please respond Yes if this is a current general education course and/or a course being submitted for the new WMU Essential Studies program. Please respond No if it is neither.
No

D. Explain briefly and clearly the proposed improvement.
This change will add a hands-on laboratory for students to practice the concepts they learn in class.

E. Rationale. Give your reason(s) for the proposed improvement. (If your proposal includes prerequisites, justify those, too.)
In this class, students learn computer architecture design concepts, where they learn the different tradeoffs of the design of a computer processor and memory. Through the proposed hands-on laboratory they will implement a sequence of laboratories to implement a simple computer from scratch, examining the different design decisions and tradeoffs and analyzing their results.

F. List the student learning outcomes for the proposed course or the revised or proposed major, minor, or concentration. These are the outcomes that the department will use for future assessments of the course or program.
7- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

G. Describe how this curriculum change is a response to student learning assessment outcomes that are part of a departmental or college assessment plan or informal assessment activities.
The students will apply the knowledge they gain in class and the different design concepts related to one architecture, and use this knowledge to design a new architecture from scratch through a series of hands-on labs.

H. Effect on other colleges, departments or programs. If consultation with others is required, attach evidence of consultation and support. If objections have been raised, document the resolution. Demonstrate that the program you propose is not a duplication of an existing one.
This is primarily a Computer Engineering Program required course. However, Electrical Engineering and Computer Science students can choose to take as an elective course. This change will improve the learning outcomes of both computer science and electrical engineering students.

I. Effect on your department's programs. Show how the proposed change fits with other departmental offerings.
ECE3570 is a required course for the Computer Engineering program and can be taken as an elective course for electrical engineering. The proposed change will improve students' learning outcomes in both programs.
J. Effects on enrolled students: are program conflicts avoided? Will your proposal make it easier or harder for students to meet graduation requirements? Can students complete the program in a reasonable time? Show that you have considered scheduling needs and demands on students' time. If a required course will be offered during summer only, provide a rationale.

This change will not make an effect on current students. This course is usually offered every Spring semester and the new change is expected to start in Spring 2021. The proposed improvement will increase the computer engineering program by one credit hour, making it a total of 128 hours. The addition of one credit hour will still allow the students to graduate in the same time frame. An available teaching lab has been already identified within the ECE department.

K. Student or external market demand. What is your anticipated student audience? What evidence of student or market demand or need exists? What is the estimated enrollment? What other factors make your proposal beneficial to students?

We believe that adding a hands on laboratory will provide students with practical experience in the design and analysis of computer processors. The course currently enrolls around 20 students. We expect that this change will be attractive to other students form computer science and electrical engineering. This change will give student a practical ability into computer design using state-of the art tools that are used in industry.

L. Effects on resources. Explain how your proposal would affect department and University resources, including faculty, equipment, space, technology, and library holdings. Tell how you will staff additions to the program. If more advising will be needed, how will you provide for it? How often will course(s) be offered? What will be the initial one-time costs and the ongoing base-funding costs for the proposed program? (Attach additional pages, as necessary.)

This change will require assigned time for one ECE faculty to develop the laboratory component of the course. The change will also require a laboratory space that can be shared with other courses and laboratories in the ECE department. The lab has been identified. Furthermore, the change will require a teaching assistant commitment to conduct the laboratory. The department chair has committed to provide this resource.

M. With the change from General Education to WMU Essential Studies, this question is no longer used.

For courses requesting approval as a WMU Essential Studies course, a syllabus identifying the student learning outcomes and an action plan for assessing the student learning outcomes must be attached in the Banner Workflow system.

Not Applicable

N. (Undergraduate proposals only) Describe, in detail, how this curriculum change affects transfer articulation for Michigan community colleges. For course changes, include detail on necessary changes to transfer articulation from Michigan community college courses. For new majors or minors, describe transfer guidelines to be developed with Michigan community colleges. For revisions to majors or minors, describe necessary revisions to Michigan community college guidelines. Department chairs should seek assistance from college advising directors or from the admissions office in completing this section.

This is an ECE course that is normally taught for students at the junior level. The prerequisites
of the course stay the same. As such, this change does not affect for transferring Michigan community courses.

O. Current catalog copy:
Structural organization and hardware design of digital computers. Processing and control units, arithmetic algorithms, input-output systems, and memory systems.

Prerequisites & Corequisites: Prerequisites: CS 2230 or ECE 2510; with a grade of “C” or better.

Credits: 3 hours

Lecture Hours - Laboratory Hours: (3 - 0)

P. Proposed catalog copy:
This course introduces basic hardware structures and communication between components of a modern computer. It covers the basic concepts of instruction sets, computer arithmetic, processor design, memory system design, and input/output. A major component of the course will be reinforcing the principles presented in the lectures in the laboratory through group laboratory projects, in which each team of students will design and build a computer in real hardware and then run programs on it. One of the main goals of this class is to teach students to think critically about different computer architecture topics.

Prerequisites & Corequisites: Prerequisites: ECE 2510 or CS 2230; with a grade of “C” or better.

Credits: 4 hours

Lecture Hours - Laboratory Hours: (3 - 3)

Department Curriculum Chair approver: Ralph Tanner

Department Curriculum Chair comment:

Date: 09-OCT-2019

Department approver: Bradley Bazuin

Chair comment:

Date: 09-OCT-2019
List of Tentative Labs:

Lab 1:
Title: Instruction Set Architectures
Objective: The main objective of this lab is to give students deeper understanding of instruction set architectures (ISAs) design.

Lab 2:
Title: Introduction to Verilog – Part I
Objective: Introduce students to Verilog hardware description language basics and Xilinx.

Lab 3:
Title: Introduction to Verilog – Part II
Objective: Introduce students to Verilog hardware description language.

Lab 4:
Title: CPU- Components Implementation
Objectives:
The main objective of this lab is to give the student a deeper understanding of instruction set architectures (ISAs) design and implementation. This laboratory will also allow the student to understand how their design choices affect the execution time and hardware complexity.

Lab 5:
Title: Single-Cycle Microarchitecture
Objectives: The main objective of this lab is to give the student a deeper understanding of single-cycle-microarchitecture implementation and design tradeoffs.

Lab 6:
Title: Single-Cycle CPU
Objectives: Design instruction and data memories and connect them to the single-cycle microarchitecture. Understand the different design tradeoffs and their effect on CPU performance.

Lab 7:
Title: Cache Design
Objectives: The main objective of this lab is to give the student a deeper understanding of memory hierarchy and cache implementation.

Lab 8:
Title: Multi-Cycle (Pipelined) CPU implementation
Objective: The main objective of this lab is to give students a deeper understanding of a multi-cycle architecture implementation and design tradeoffs.