Date of request: 08-OCT-2019

Request ID: A-2019-CS-34

College: A

Department: CS

Initiator name: Jason Johnson

Initiator email: jason.e.johnson@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:
New Course CS 4541
New course selected: This new course is not seeking approval as a general education course.

1. Proposed course prefix and number:
CS 4541

2. Proposed credit hours:
3

3. Proposed course title:
Computer Systems Fundamentals

4. Proposed course prerequisites:
CS 3310 AND CS 3240

5. Proposed course corequisites:
none

6. Proposed course prerequisites that may be taken concurrently (before or at the same time):
none

7. Minimum grade for prerequisites (default grades are D for Undergrad and C for Grad):
C

8. Major and/or minor restrictions:
Not Applicable
9. List all the four-digit major and/or minor codes (from Banner) that are to be included or excluded:
none

10. Classification restrictions:
Not Applicable

11. List all the classifications (freshman, sophomore, junior, senior) that are to be included or excluded:
none

12. Level restriction:
Not Applicable

13. List the level (undergraduate, graduate) that is to be included or excluded.
Not Applicable

14. Do prerequisites and corequisites for 5000-level courses apply to undergraduates, graduates, or both?
Not Applicable

15. Is this a multi-topic course?
No

16. Proposed course title to be entered in Banner:
Comp Sys Fundamentals

17. Is this course repeatable for credit?
No

18. Is this course mandatory credit/no credit?
No

19. Select class type:
Lecture/Lab/Discussion

20. How many contact hours per week for this course?
3

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.
Create an undergraduate level computer architecture and operating systems course.

E. Rationale. Give your reason(s) for the proposed improvement. (If your proposal includes prerequisites, justify those, too.).
The ABET Computing Accreditation Commission has released new accreditation requirements for Computer Science programs. To maintain accreditation, the Department of Computer Science needs to cover computer architecture and operating systems in greater depth. This class will focus on both of those topics and help us to meet the new requirements.

CS 3310 and CS 3240 are listed as prerequisites for this course because each contains information that students will need before starting CS 4541 in order to be successful. The advanced study of data structures and algorithms from CS 3310 will be required to implement programs that demonstrate concepts introduced in CS 4541. CS 3240 is necessary because students will gain a familiarity with, and level of competence in the use of, UNIX-based operating systems, also necessary for success in CS 4541.

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.
Students will be able to:
• Demonstrate an ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline
• Exhibit knowledge of computer systems concepts such as data representation, memory management, and processor architecture
• Exhibit knowledge of operating systems concepts such as processes and threads, concurrency, scheduling, and virtual memory
• Demonstrate programming ability through extensive programming projects

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.
This change is necessary to meet new ABET CAC requirements.

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. None.

I. Effect on your department’s programs. Show how the proposed change fits with other departmental offerings.
This new course allows us to satisfy new ABET accreditation outcomes and is, therefore, a necessary change.

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.

While students will be required to take this course, which has not been the case in the past, it will be offered in both Fall and Spring semesters each year. That being the case, scheduling will not be difficult and the time required to complete a Bachelor of Science in Computer Science degree will not change.

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?

Estimated audience is all undergraduate CS students.

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.)

Offering this class will not require any additional faculty or advising resources.

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.

The addition of this course will in no way restrict any curricular transfer articulation agreements, and may add options for students to transfer credits.

O. Current catalog copy:

N/A

P. Proposed catalog copy:

This course offers an intensive study of computer system design, emphasizing modern operating systems and their impact on application programming. Topics covered include processes and threads, CPU scheduling, process synchronization, deadlock, memory management, caches, virtual memory, virtual machines, shared-memory and message-passing based parallelism, clusters, security and protection, authentication, and cloud computing.
Department Curriculum Chair approver: Jason Johnson

Department Curriculum Chair comment:

Date: 08-OCT-2019

Department approver: Steve Carr

Chair comment:

Date: 08-OCT-2019
CS 4541: Computer Systems Fundamentals
Master Syllabus

**Introduction and Representing Numbers (2 weeks)**
Data Representation in Computer Systems
Integer Representations
Floating Point

**Machine Code (2 weeks)**
Machine Code Control
Machine Code Procedures
Machine Code Data Manipulation

**Caches (1 week)**
Memory Hierarchy
Locality
Cache Memories
Cache-Friendly Code

**Memory Allocation (2 weeks)**
Dynamic Memory Allocation
Memory Mapping
Garbage Collection

**Processes and Threads (1 week)**
Process Description and Control
Thread Description and Control

**Process Synchronization (2 weeks)**
Multiprocessing
Multiprogramming
Shared Resources
Mutual Exclusion

**Scheduling (1 week)**
Process and Thread Scheduling
Scheduling Algorithms (Round-Robin, FCFS, etc.)

**OS Security (1 week)**
Types of Attackers
Common Vulnerabilities
Common Mitigations
Survey of Topics of Interest (2 weeks)
Client-Server and Clusters
Input-Output
Virtual Machines
Embedded Systems

Course Prerequisites

CS 3310 AND CS 3240

Catalog Description

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Learning Outcomes

Students will be able to:
• Demonstrate an ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline
• Exhibit knowledge of computer systems concepts such as data representation, memory management, and processor architecture
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• Demonstrate programming ability through extensive programming projects