



College of Engineering

122 Hitchcock Hall  
2070 Neil Avenue  
Columbus, OH 43210-1278  
Phone 614-292-2651  
FAX 614-292-9379  
E-mail engosu@osu.edu

Date: 20 February 2015

To: Randy Smith  
Vice Provost, Office of Academic Affairs (OAA)

From: Ed McCaul  
Secretary, College Committee on Academic Affairs (CCAA)

Subject: Computational Science and Engineering Minor

CCAA has reviewed and approved the attached Computational Science and Engineering Minor on the 19th of February 2015. This minor is being submitted to you as required by the university's new minor policy. If you have any questions concerning this minor please let me know.



**THE OHIO STATE UNIVERSITY**

College of Engineering  
Department of Computer Science and Engineering  
395 Dreese Lab  
2015 Neil Ave  
Columbus, OH 43210-1277  
614-292-5813 Phone  
614-292-2911 Fax  
<http://www.cse.osu.edu>

Date: February 13, 2015  
To: Dr. Mark Ruegsegger, Chair, CCAA  
Re: Minor in Computational Science and Engineering

Dear Dr. Ruegsegger,

The CSE Department currently offers a Minor in Computational Science and Engineering, designed for science and engineering majors who are interested in applying computational techniques to address problems in their own major area. The only change being proposed is to replace CSE 2221 by CSE 1223 (in the "Programming & Algorithms") requirement of the minor; this will parallel the other two courses, CSE 1221/1222 that students may instead choose, to complete this requirement. In addition, we have specified a number of constraints that each student's minor program must satisfy to make it consistent with the new rules that apply to all minor programs in the university.

I had sent you a previous version of this proposal in early January and we got some comments back from Dr. George Valco, chair of Subcommittee A. We have updated the proposal taking account of those comments. I am attaching the updated proposal. It maybe worth noting here that the Ralph Regula School of Computational Sciences (RRSCS) (<https://www.osc.edu/rrscs>) "is a statewide virtual school focused on the exciting new area of computational science -- the use of computer modeling and simulation to solve complex business, technical and academic research problems". Our minor program is designed to be consistent with the principles enunciated by RRSCS and its recommendations.

I hope CCAA will re-approve the Minor in Computational Science and Engineering at an early date. If there are any questions about the minor or if additional information is needed, please contact me.

Sincerely,

Neelam Soundarajan  
Chair, Undergraduate Studies Committee  
Dept. of Computer Science and Engineering

# **Computational Science and Engineering Minor**

## **Undergraduate Minor Program Policy, College Of Engineering**

(Approved by CCAA, November 1999;

Revised: February '05, Feb. '08, March '10, May '12, November '12, April '14)

### **Minor Programs at The Ohio State University:**

An undergraduate minor consists of a coherent curricular program designed to allow students to pursue academic interests that go beyond their major. Students pursue minors to complement their major's area of specialization, to better define themselves academically and to employers, to gain credit for classes previously taken that do not count towards a major degree, or merely to pursue other interests. In addition, some academic units require their students to obtain a minor. Students may take any minor in any college provided that they follow the curricular guidelines set by the college or unit that administers the minor.

### **Actions Required Of Students**

Minors pursued by students with Majors in the College of Engineering are administered as follows:

1. Approval of many minors is managed entirely through the Degree Audit Reporting System (DARS).
2. Minor Program Forms will only be required if a student's DARS does not certify the courses for the minor as prescribed by the college or unit that administers the minor.
  - a. Minor Program Forms must be signed by an advisor in the college or unit that administers the minor and by the student's advisor in their Major Program prior to the student being accepted into the Minor program. Copies of this form will be retained by the college or unit that administers the minor and the Major Program.
  - b. Students typically file Minor Program Forms with the College of Engineering when they file applications to graduate. Students are advised to check with the college or unit that administers the minor in advance of the deadline for filing applications to graduate.
  - c. To change a Minor after submitting a Minor Program Form, a student must re-file a new Minor Program Form with all the appropriate signatures.

### **Overlap With Majors Offered By The College Of Engineering**

1. For the purposes of determining overlap between majors in the College of Engineering and 12 hour minimum for a minor, the major is defined as all specifically required courses.
  - a. Approved substitutions for required courses are considered part of the major.
  - b. Requirements for which the student must take one of two courses are considered part of the major.
2. Elective courses may overlap with the minor.

## Computational Science and Engineering Minor Requirements

The Minor in Computational Science and Engineering is designed for science and engineering majors interested in applying computational techniques to address problems in their own major. The program is also appropriate for CSE/CIS majors interested in numerical and computational aspects of Computer Science. The program below applies to students who start the program in Autumn 2015 or later; students who started before that date may follow the previous program.

### **A. Prerequisites:** (Hours not counted in minor since these courses are at 1000-level):

#### **I. Programming and Algorithms:**

*One of the following:*

- a. CSE/ENGR 1221: Intro to Comp. Pgming in MATLAB (2 credit hours); *or*
- b. CSE 1222: Intro to Computer Programming in C++ (3 credit hours); *or*
- c. CSE 1223: Intro to Computer Programming in Java (3 credit hours)

### **B. Core Courses:**

#### **I. Simulation and Modeling:** (3 credit hours):

*One of the following:*

- a. BIOMEDE 5430: Finite element applications in BIOMEDE (3 credit hours); *or*
- b. CBE 5790: Modeling and simulation (3 credit hours); *or*
- c. ISE 2010: Systems modeling (3 credit hours); *or*
- d. ISE 5100: Discrete event simulation (3 credit hours); *or*
- e. MECHENG 5139: Applied finite element method(3 credit hours); *or*
- f. MATSCEN 2321: Modeling and simulation Lab I (3 credit hours)

#### **II. Numerical Methods:** (3 credit hours):

*One of the following:*

- a. AEROENG 3581: Numerical methods in Aerospace Engineering (3 credit hours); *or*
- b. CIVILEN 2060: Numerical analysis methods for Civil/Env. Eng. Applns (3 cr hrs); *or*
- c. CSE 5361: Numerical methods (3 credit hours); *or*
- d. ECE 5510: Intro to computational electromagnetics (3 credit hours); *or*
- e. MATH 3607: Beginning scientific computing (3 credit hours); *or*
- f. MECHENG 2850: Intro to numerical methods (3 credit hours)

### **C. Discipline-Specific Computational Study:** (3 credit hours):

*One of the following:*

- a. AEROENG 5615: Intro to computational aerodyn. (3 credit hours); *or*
- b. CBE 5734: Molecular Informatics (3 credit hours); *or*
- c. CHEM 5440: Computational chemistry (3 credit hours); *or*
- d. CSE 2331: Foundations II: Data structures and alg. (3 credit hours); *or*
- e. CSE 2431: Systems II: Intro to Operating Systems (3 credit hours); *or*
- f. CSE 3241: Intro to database systems (3 credit hours); *or*
- g. CSE 3341: Prin. of prog. langs. (3 credit hours); *or*
- h. CSE 3421: Intro to computer architecture (3 credit hours); *or*
- i. CSE 3461: Computer networking and internet technologies (3 credit hours); *or*
- j. CSE 3521: Survey of AI I (3 credit hours); *or*
- k. CSE 3541: Computer game and animation tech. (3 credit hours); *or*
- l. ECE 5510: Intro to Computational Electromagnetics (3 credit hours); *or*
- m. MATSCEN 6756: Computational Materials Modeling (3 credit hours)

**D. Electives (One required) (3 credit hours):**

- a. CIVILEN 3080: Econ. evaluation and optimization in Civ/Env. engr. (3 cr hrs)
- b. CSE 5441: Intro to parallel computing (3 cr hrs)
- c. CSE 5544: Intro to scientific visualization (3 cr hrs)
- d. ECE 5759: Optimization for static and dyn. systems (3 cr hrs)
- e. ISE 3200: Optimization for enterprise systems (3 cr hrs)
- f. ISE 3210: Optimization for system design (3 cr hrs)
- g. ISE 3990: Engineering optimization (3 cr hrs)
- h. ISE 5200: Linear optimization (3 cr hrs)
- i. MATSCEN 4181: Materials Selection (3 cr hrs)
- j. MATH 2255: Diff. equations and their applications (3 cr hrs)
- k. MATH 2415: Ordinary and partial diff. equations (3 cr hrs)

**E. Discipline-specific capstone research/internship ( $\geq 2$  cr-hrs):**

Computationally oriented capstone course(s) or individual research ( $\geq 2$  cr-hrs)

**F. Additional Prerequisites:** Most of the courses in the lists (B), (C), and (D) above have additional prerequisites which are, typically, part of the major programs in the respective fields. Thus they may be unsuitable for students pursuing other majors. Students should consult with their advisors or with Prof. Sadayappan(.1) of CSE if they have questions concerning which courses may be most appropriate for their individual cases.

**Other Conditions:** Each of the following conditions must also be satisfied:

- a. The minor must include a minimum of 12 credit hours, not including 1000-level courses.
- b. The minor must include at least 6 credit hours of 3000-level courses or higher.
- c. No more than 6 hours of exam credit and/or transfer credit, including credit for courses from participating RRSCS institutions, may be counted toward the minor.
- d. No more than 6 credit hours may overlap between the minor and courses used to meet GE requirements.
- e. The minor must include a minimum of 12 credit hours that are distinct from the major program and/or additional minors.
- f. Courses with a grade of less than C- may not be included in the minor.
- g. Course work graded Pass/Non-Pass may not be included in the minor.
- h. No more than 3 credit hours of course work graded Satisfactory/Unsatisfactory may be included in the minor.
- i. A minimum of 2.00 cumulative point-hour ratio is required in the course work in the minor.

**C. Recommended Sequence of Classes:**

Autumn: Programing & Alg.	Spring: Num. Mthds./Computational study
Autumn: Cmp. stdy/Num mthds.	Spring: Simulation & modeling
Autumn: Elective	Spring: Capstone res./internship

## Computational Science and Engineering Minor Program Form

Student Name: \_\_\_\_\_

Student Identification Number: \_\_\_\_\_

Major: \_\_\_\_\_

E-Mail Address: \_\_\_\_\_

Name of Undergraduate Minor: Computational Science and Engineering

Topic Category	Course Number, Title	Credit Hours	Grade
Prog. & Algorithms		***	
Simulation & Modeling			
Numerical Methods			
Computational Study			
Elective			
Capstone research/internship			
<b>Total Credit Hours (min: 12)</b>			

\*\*\*Prerequisite for the minor; hours not included in the total for the minor.

\_\_\_\_\_  
Student Signature

Print: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Advisor Signature Major Program

Print: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Advisor Signature Minor Program

Print: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

### Notes:

- The minor must include a minimum of 12 credit hours, not including 1000-level courses. The minor must include at least 6 credit hours of 3000-level courses or higher.
- The course(s) for each *topic category* must be chosen from among those listed for that category in the *requirements* for the minor.
- No more than 6 hours of exam credit and/or transfer credit, including credit for courses from participating RRSCS institutions, may be counted toward the minor.
- The minor must include a minimum of 12 credit hours that are distinct from the major program and/or additional minors. No more than 6 credit hours may overlap between the minor and courses used to meet GE requirements.
- Neither courses with a grade of less than C- nor course work graded Pass/Non-Pass may be included in the minor.
- A minimum of 2.00 cumulative point-hour ratio is required in course work in the minor.
- This form must be filed by the time the graduation application is filed; no other approval is needed.
- No more than 3 credit hours of course work graded Satisfactory/Unsatisfactory may be included in the minor.