CEAS-14-CS-076

REQUEST TO COLLEGE CURRICULUM COMMITTEE FOR CURRICULAR IMPROVEMENTS

DEPARTMENT: CS **PROPOSED EFFECTIVE SEMESTER:** Spring 2015 **COLLEGE:** CEAS

PROPOSED IMPROVEMENTS

Academic Program
- ☐ New degree*
- ☐ New major*
- ☐ New curriculum*
- ☐ New concentration*
- ☐ New certificate
- ☐ New minor
- ☐ Revised major
- ☐ Revised minor
- ☐ Admission requirements
- ☐ Graduation requirements
- ☐ Deletion ☐ Transfer
- ☐ Other (explain**)

Substantive Course Changes
- ☐ New course
- ☒ Pre or Co-requisites
- ☐ Deletion (required by others)
- ☐ Course #, different level
- ☐ Credit hours
- ☐ Enrollment restriction
- ☐ Course-level restriction
- ☐ Prefix ☒ Title and description (attach current & proposed)
- ☐ General education (select one) Not Applicable
- ☐ Other (explain**)

Misc. Course Changes
- ☒ Title
- ☒ Description (attach current & proposed)
- ☐ Deletion (not required by others)
- ☐ Course #, same level
- ☐ Variable credit
- ☐ Credit/no credit
- ☐ Cross-listing
- ☐ COGE reapproval
- ☒ Other (explain**)

** **Other:** A minimum grade of B in the prerequisite courses

Title of degree, curriculum, major, minor, concentration, or certificate:

Existing course prefix and #: CS6320 **Proposed course prefix and #:** **Credit hours:**

Existing course title: Analysis of Computer Algorithms
Proposed course title: Intractable Problems and Approximation Algorithms

Existing course prerequisite & co-requisite(s): CS 4310 and CS 5800
Proposed course prerequisite(s) : (CS4310 or CS5310) and CS5800

If there are multiple prerequisites, connect with "and" or "or". To remove prerequisites, enter "none."

Proposed course co-requisite(s)
If there are multiple corequisites, they are always joined by "and."

Proposed course prerequisite(s) that can also be taken concurrently:

Is there a minimum grade for the prerequisites or corequisites?
A minimum grade of B in the prerequisite courses.

Major/minor or classification restrictions:
List the Banner 4 character codes and whether they should be included or excluded.

For 5000 level prerequisites & corequisites: Do these apply to: (circle one) undergraduates graduates **both**

Specifications for University Schedule of Classes:

a. Course title (maximum of 30 spaces): Intractable Problems and Approximation Algorithms
b. Multi-topic course: ☒ No ☐ Yes
c. Repeatable for credit: ☒ No ☐ Yes
d. Mandatory credit/no credit: ☒ No ☐ Yes
e. Type of class and contact hours per week (check type and indicate hours as appropriate)

1. ☒ Lecture 3 credit hrs.
2. ☐ Lab or discussion
3. ☐ Lecture/lab/discussion
4. ☐ Seminar or ☐ studio
5. ☐ Independent study
6. ☐ Supervision or practicum

CIP Code (Registrar's use only):

Chair/Director _____ Date 2/27/15

Chair, College Curriculum Committee _____ Date

Dean _____ Date: Graduate Dean: _____ Date

Curriculum Manager: Return to dean ☐ Date Forward to: _____ Date

Chair, COGE/ PEB / FS President _____ Date

FOR PROPOSALS REQUIRING GSC/USC REVIEW:

* ☐ Approve ☐ Disapprove Chair, GSC/USC _____ Date

* ☐ Approve ☐ Disapprove Provost _____ Date

Revised May 2007. All previous forms are obsolete and should not be used.

1. Explain briefly and clearly the proposed improvement.

   This proposed improvement is to make the following changes to CS6320 (Analysis of Computer Algorithms): (1) change its title to Intractable Problems and Approximation Algorithms, (2) change the prerequisite from CS4310 and CS5800 to (CS4310 or CS5310) and CS5800, and (3) change the catalog description to "The course covers the theory of NP-completeness and techniques that help to apply the theory to practical problems. The model of non-deterministic Turing machines is used to classify various problems as NP (Non-deterministic Polynomial), Polynomial, NP-Complete, NP-Hard, and Pseudo-Polynomial. Problems for various computer science areas, such as scheduling, routing, compiler optimization, chip packaging, graph embedding, are used to illustrate the concepts and techniques. Effective approximation algorithms are designed and analyzed to deal with various NP-complete problems."

   Proposed course prerequisite(s) : (CS4310 or CS5310) and CS5800
   A minimum grade of B in the prerequisite courses.

2. Rationale. Give your reason(s) for the proposed improvement. (If your proposal includes prerequisites, justify those, too.)

   - Title. The title of CS6310 has been changed to "Advanced Design and Analysis of Algorithms", which is very similar to the current title of CS6320 "Analysis of Computer Algorithms". To avoid confusion and better describe this advanced course that focuses on intractable problems and approximation algorithms, we propose to change its title.
   - Prerequisites. With the most recent addition of three graduate core courses, i.e. CS5310 (Algorithms), CS5410 (Computer Systems), and CS5800 (Theory of Computation), CS5310 provides adequate background as CS4310. Therefore we list it as an option in addition to the existing prerequisite of CS4310.
   - Description. The current description, "Computing-time and space requirements of algorithms are analyzed with emphasis given to the effect of data structure choice on program complexity. Various abstract models of computation are considered. Methods for proving program correctness and the related problems are identified. Students implement a number of algorithms and discuss aspects of the complexity and correctness of their programs", no longer present the topics of the current teaching. The revised description gives a more detailed description of the contents of the course.

3. 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.

4. Effect on your department's programs. Show how the proposed change fits with other departmental offerings.

   The perspective students will have a better understanding of what they expect to learn from the course.

5. 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.

   We expect more enrollments with an additional prerequisite option. The graduate students who did not take CS4310 during their undergraduate study may be able to take CS6310 after taking the mandatory core course CS5310.

6. 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?

   No change.

7. 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.)

   None.

8. General education criteria. For a general education course, indicate how this course will meet the criteria for the area or proficiency. (See the General Education Policy for descriptions of each area and proficiency and the criteria. Attach additional pages as necessary. Attach a syllabus if (a) proposing a new course, (b) requesting certification for baccalaureate-level writing, or (c) requesting reapproval of an existing course.) N/A

9. List the 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. N/A

10. Describe how this curriculum change is a response to assessment outcomes that are part of a departmental or college assessment plan or informal assessment activities. N/A

11. (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. N/A

Current catalog description:

CS 6320 - Analysis of Computer Algorithms

Computing-time and space requirements of algorithms are analyzed with emphasis given to the effect of data structure choice on program complexity. Various abstract models of computation are considered. Methods for proving program correctness and the related problems are identified. Students implement a number of algorithms and discuss aspects of the complexity and correctness of their programs.

Prerequisites/Corequisites: Prerequisites: CS 4310 and 5800.

Credits: 3 hrs.

Notes: Open to Graduate Students Only.

Proposed catalog description:

CS 6320 - Intractable Problems and Approximation Algorithms

The course covers the theory of NP-completeness and techniques that help to apply the theory to practical problems. The model of non- deterministic Turing machines is used to classify various problems as NP (Non-deterministic Polynomial), Polynomial, NP-Complete, NP-Hard, and Pseudo-Polynomial. Problems for various computer science areas, such as scheduling, routing, compiler optimization, chip packaging, graph embedding, are used to illustrate the concepts and techniques. Effective approximation algorithms are designed and analyzed to deal with various NP-complete problems.

Prerequisites/Corequisites: Prerequisites: (CS4310 or CS5310) and CS5800

Credits: 3 hrs.

Notes: Open to Graduate Students Only.