

REQUEST FOR A NEW COURSE
University of Central Oklahoma

Course Subject (Prefix), Number, and Title:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Course</th>
<th>Recommended</th>
<th>Course Title (maximum of 30 characters)</th>
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<tbody>
<tr>
<td>ENGR</td>
<td>4403</td>
<td></td>
<td>Adv. Control Sys. Design &amp; Lab</td>
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Course Title: (full title of course if longer than 30 characters)
Advanced Control Systems Design and Lab

For information regarding CIP codes contact your department chair or visit: http://www.uco.edu/academic-affairs/ir/program_inventory.asp
CIP Code:  14.1001

For graduate courses, please attach a syllabus for this course. (See syllabus requirement policy 2.2.)

Course description as it will appear in the appropriate catalog.
Course description only  Do not include prerequisites or enrollment restrictions, these should be added under questions 6-12.
(Please use standard American English including full sentences.)

This course will provide a comprehensive treatment of the analysis and design of advanced control systems. Modern control theories in state-space domain and Laplace transform domain will be introduced. Topics include modern control design techniques such as root locus design, lead-lag and PID controllers; and controller design via frequency response and state space. This course has a lab component and lab experiments are related to the theoretical material covered in the class.

Engineering and Physics
Department submitting the proposal

Alaeddin Abuabed aabuabed@uco.edu 3459
Person to contact with questions  email address  Ext. number

Approved by:

Department Chairperson

College Curriculum Committee Chair
(Date: 2020.09.28 18:09:10 -05'00')

College Dean
(Date: 2020.09.28 18:09:10 -05'00')

Office of Academic Affairs
(Date: 2020.09.28 18:09:10 -05'00')
1. Does this course have an undergraduate / graduate counterpart?
   _x_ Yes  ____ No

2. Is this proposal part of a larger submission package including a program change?
   _x_ Yes  ____ No

3. Does this new course affect a teacher preparation program? (All courses required for any teacher preparation program must have approval from the Council on Teacher Education (CTE) before approval from AACC or Graduate Council.)
   ____ Yes  _x_ No  If yes, send copy of proposal to the Education Curriculum Committee Chair, Dr. Darla Fent.

CTE Approval (Stamp or initial) ________________________

4. Has this course been previously taught as a common course (4910 seminar, 4960 institute, etc.)?
   ____ Yes  _x_ No  If yes, when was the most recent offering? __________________________

5. Does this course affect majors or minors outside the department?
   _x_ Yes  ____ No  If yes, provide name(s) of department chair(s) contacted, dates, and results of discussion.

This new course is part of the curriculum for the currently-proposed Computer Engineering B.S., which the Department of Engineering & Physics developed as a joint degree through discussions in 2019 and 2020 with Dr. Gang Qian from Computer Science.

6. Prerequisite courses:
   Example 1: MATH 1213 and (MATH 2165 or MATH 2185) and CHEM 1213
   Example 2: (ACCT 2113 and 2213) and (MGMT 3013 or ISOM 3613)
   Example 3: 8 hours of biology including BIO 1404

ENGR 4303

7. Co-requisite(s): Which of the above prerequisite courses, if any, may be taken in the same semester as the proposed new course?
   None

8. Concurrent enrollment: Courses that must be taken the same semester. Example: lab courses.
   None

9. Will this course have enrollment restrictions?
   ____ Yes  _x_ No  If No, go to question 13.

10. Specify which major(s) may or may not take this course. Specifying a major, excludes all other majors from enrolling.
    Check one:  May _____  May not _____
    Major Code: ________  ________  ________  ________  ________  ________

11. Which of the following student classification(s) may enroll in this course?
    Check all that apply:
    Graduate  (2) 19 + hours
    Graduate  (1) 0-18 hours
    Post Baccalaureate *
    Senior
    Junior
    Sophomore
    Freshman
    * Graduate level courses are not open to Post Baccalaureate students.

12. Check or list other restrictions for this course.
    Admission to Graduate Programs
    Admission to Nursing Program
    Admission to Teacher Education
    Other

Academic Affairs Form
August, 2015

Functional Review CF
(undergraduate proposals only)
13. **Course objectives:** Objectives should be observable, measurable and include scholarly or creative activities to meet the course level characteristics. Course objectives should also be in line with the course description. (Please refer to instructional objectives documents at: [http://www.uco.edu/academic-affairs/faculty-staff/aacc.asp#FAQ/Helpful%20Hints](http://www.uco.edu/academic-affairs/faculty-staff/aacc.asp#FAQ/Helpful%20Hints).)

Upon completion of this course, students will be able to:

1. Define the mathematics of state space representation;
2. Design linear controllers using PID controllers;
3. Demonstrate the understanding of root locus techniques;
4. Design controllers using root locus methods;
5. Design controllers using frequency response methods;
6. Design controllers using state space representations
7. Examine discrete time control theory;
8. Design digital controllers using lead-lag controllers;
9. Demonstrate the understanding of nonlinear control theory.

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**Course Detail Information:**

14. **Contact Hours (per week)**

- 2 Lecture hours (in class)
- 3 Lab hours (also studios)
- Other (outside activities)

15. **Repeatable course.**

- Number of times this course can be taken for credit.

16. **Schedule type:** (select one only)

- Activity P.E. (A)
- Lab only (B)
- Lecture/Lab (C)
- Lecture only (L)
- Recitation/Lab (R)
- Student Teaching (STU)
- Studio Art/Design (XSU)

17. **List existing course(s) for which this course will be a prerequisite.** Adding a "new course" as a prerequisite to an existing course will likely cause enrollment problems. (Please submit a prerequisite change form for each course for which this course will serve as a prerequisite.)

None

18. **What resources, technology or equipment must be acquired to teach this course?** List items, which must be purchased and estimate cost. (Be specific, e.g., technology software, equipment, computer lab; etc.)

None

19. **The UCO Library has the required library resources available for this new course?**

X Yes  No  If yes, provide names of Librarian/Faculty Liaisons contacted, dates, and results of discussion.

Librarian Deborah Thompson was contacted on July 20, 2020. Resources are currently available for this course. Databases, journals, books, and electronic access sites are available to students through the UCO virtual library and interlibrary loan system.
If no, what additional library resources must be acquired for this new course? List items which must be purchased and estimated cost. (Be specific, e.g., books, magazines, journals, etc.)

20. Names of current faculty qualified to teach this course.
   Alaeddin Abuabed, Nesreen Alsou, Evan Lemley

21. Additional faculty (adjunct or full-time) required and specific competencies required to teach this course:
   No additional full-time faculty will be required: Competencies are a background in EE and experience working with the embedded systems found in IoT devices.

22. How will this course be staffed and equipped? Identify the additional costs associated with this new course. If no costs, explain why not.
   The lab equipment will utilize electronic equipment currently available in the department's two EE labs, as well as equipment and software developed and donated by several industry partners: Nortek Air Solutions, Honeywell, Tridium, and others. Supplies needed to support the lab will be purchased with the fees generated by students taking the course (the current CMS fees are sufficient for this purpose). The department currently employs an Electronics Laboratory Associate to support its EE labs, and this lab will be included in those duties. The three-hour instructional load for the primary course instructor may require an adjunct to pick up a lower level course.

23. Identify the source(s) of funds for any additional costs for the new course. i.e. internal reallocations, special fees from students, etc. If you plan to propose special fees be assessed for this course, be aware there is a separate approval process for special fees.
   Tuition revenue from this course should more than offset the instructional cost of the adjunct covering the primary instructor's current load. Nortek Air Solutions has also indicated that they may be able to support this position once the course is in place. They are currently one of the college's and university's top recurring donors.

24. Projected enrollment for two academic years following approval of new course:

<table>
<thead>
<tr>
<th>Semester</th>
<th>2021-2022</th>
<th>2022-2023</th>
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<tbody>
<tr>
<td>Fall</td>
<td></td>
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<tr>
<td>Spring</td>
<td>10</td>
<td>15</td>
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<tr>
<td>Summer</td>
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25. Using State Regents' definition of liberal arts and sciences (quoted below), characterize the course as follows:
   x Non-liberal arts and sciences
   ___ Liberal arts and sciences

"The liberal arts and sciences are defined as those traditional fields of study in the humanities; social and behavioral sciences; communications; natural and life sciences, mathematics; and the history, literature, and theory of fine arts (music, art, drama, dance). Courses in these fields whose primary purpose is directed toward specific occupational or professional objectives, or courses in the arts which rely substantially on studio or performance work are not considered to be liberal arts and sciences for the purpose of this policy. Courses required for the General Educational Program are not necessarily synonymous or mutually exclusive with the liberal arts and sciences." State Regents Policy and Procedures. Chapter 2, Section 5, "Degree Requirements" part 1, (2). P. II-2-86
26. Please provide a concise, yet comprehensive, statement that explains the reasons for requesting the new course. Include documentation or assessment information supporting the specific request (if possible). Indicate the expected source of student enrollment (majors, minors, programs etc.)

UCO was approached by one of its key industry sponsors, Nortek Air Solutions, who expressed an interest in hiring UCO engineering students who were better prepared in the design and development of control systems. They arranged commitments from several of their industry partners (Honeywell, Tridium, and others) to donate hardware and software in support of this request. They suggested that for graduates to be trained to the level required in area industry, a 3-course sequence was required.

The Department of Engineering & Physics already has a Control Systems course, as well as a Mechatronics course where Control Systems theory is introduced. The 3-course sequence would then be Mechatronics, Control Systems, and Advanced Control Systems Design, the course proposed here. This sequence will support students in Mechanical Engineering (Nortek is an HVAC firm that hires many UCO graduates), Electrical Engineering (which relies heavily on Control Systems), and a new program in Computer Engineering being jointly proposed by the Departments of Engineering & Physics and Computer Science.

27. Which of the six transformative learning tenets does this course incorporate? (check all that apply or only those that apply) This question was a directive from the Provost and is used for informational purposes.

- Discipline Knowledge [X]
- Leadership
- Research, Scholarly and Creative Activities [X]
- Service Learning and Civic Engagement
- Global and Cultural Competencies
- Health and Wellness

28. Clearly explain how the characteristics of this course meet or exceed those outlined in Course Level Characteristics. (Copy and paste table from "Course Level Characteristics" document for the appropriate course level of proposed course. Document may be found on: http://sites.uco.edu/academic-affairs/files/course-level-characteristics-table.doc.

<table>
<thead>
<tr>
<th>4000 LEVEL COURSES</th>
<th>Please describe how this course meets this requirement.</th>
</tr>
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<tbody>
<tr>
<td>1. It is assumed that students in these courses have completed sufficient course work to have attained senior standing.</td>
<td>The prerequisite structure that leads to the specific prerequisites for this course (which includes a 4000-level course) will ensure that students have achieved senior standing.</td>
</tr>
<tr>
<td>2. It is assumed that students in these courses have a substantial background in the area of inquiry equivalent to 15 hours of study. Area of inquiry is defined broadly, including courses in the offering department, as well as courses in other departments that relate to the subject of study.</td>
<td>The prerequisite structure that leads to the specific prerequisites for this course (which includes a 4000-level courses) encompass more than the required 15 hours of study.</td>
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<tr>
<td>3. These courses should be offered at a level of sophistication of instruction and of expected student performance that is beyond that of other undergraduate courses. In short, 4000 level courses should offer more in-depth study than courses offered at the 3000 level and below.</td>
<td>This course requires students to synthesize the knowledge and apply the skills acquired in the prerequisite courses for this course.</td>
</tr>
<tr>
<td>4. Students in these courses should be required to undertake a substantial scholarly activity in addition to classroom instruction, such as a written research project, library assignment, juried performance, or creative work.</td>
<td>Students in this course will complete experimental design projects requiring creative solutions to engineering problems related to the design and analysis of advanced control systems. The results will be presented in the form of a written technical report.</td>
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<td>5. Included among 4000 level courses would be capstone courses that review and integrate previous learning, practicums and student teaching, and courses in which a major instructional responsibility is placed on the student (as in individual studies, directed readings, and seminars).</td>
<td>Students in engineering programs at UCO are required to take separate 4000-level capstone courses.</td>
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