

Submit original with signatures + 1 copy + electronic copy to UAF Governance.

See <http://www.uaf.edu/uafgov/faculty/cd> for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	Electrical & Computer Engineering	College/School	CEM
Prepared by	Seta BOGOSYAN	Phone	474-2755
Email Contact	sbogosyan@alaska.edu	Faculty Contact	Seta Bogosyan

1. ACTION DESIRED
(CHECK ONE): Trial Course ☐ New Course ☒

2. COURSE IDENTIFICATION: Dept Course # No. of Credits

Justify upper/lower division status & number of credits:

This is a graduate level course, which requires some background in mechanics and automatic control. However, upper division undergraduates with the prerequisites of physics, math, and control could also take the course. The course requires coverage of kinematics, dynamics, and control, hence the planned content calls for a minimum of 3 credits.

3. PROPOSED COURSE TITLE:

4. To be CROSS LISTED? If yes, Dept: Course #

(Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

5. To be STACKED? If yes, Dept. Course #

6. FREQUENCY OF OFFERING:
Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (if approved)

8. COURSE FORMAT:

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT: (check all that apply) ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☒ 6 weeks to full semester

OTHER FORMAT (specify)

Mode of delivery (specify lecture, field trips, labs, etc)

9. CONTACT HOURS PER WEEK: LECTURE hours/weeks LAB hours/week PRACTICUM hours/week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See <http://www.uaf.edu/uafgov/faculty/cd/credits.html> for more information on number of credits.

OTHER HOURS (specify type)

10. COMPLETE CATALOG DESCRIPTION including dept., number, title and credits (50 words or less, if possible):

EE F675- Robot Modeling and Control: Introduction to basic concepts in robotics; homogeneous transformations; Denavit-Hartenberg parameters, forward and inverse kinematics; velocity kinematics, Jacobians; dynamics and modeling; robot control: independent joint control, multivariable control, Lyapunov stability, PD+, computed

torque, inverse dynamics control with the use of Matlab/Simulink, kinematics and control related demonstrations on the PUMA 560 manipulator (3+0).

11. COURSE CLASSIFICATIONS: (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

H = Humanities ☐

S = Social Sciences ☐

Will this course be used to fulfill a requirement for the baccalaureate core?

YES ☐

NO ☐

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, Format 6 ☐

W = Writing Intensive, Format 7 ☐

Natural Science, Format 8 ☐

12. COURSE REPEATABILITY:

Is this course repeatable for credit?

YES ☐

NO ☒

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).

How many times may the course be repeated for credit?

TIMES

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?

CREDITS

13. GRADING SYSTEM: *Specify only one.*

LETTER: ☒

PASS/FAIL: ☐

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES

EE 471, PHYS 212, or equivalent courses in automatic control systems, and mechanics.

These will be *required* before the student is allowed to enroll in the course.

RECOMMENDED

EE 303 or equivalent electrical machinery courses and some experience with MATLAB

Classes, etc. that student is strongly encouraged to complete prior to this course.

15. SPECIAL RESTRICTIONS, CONDITIONS

none

16. PROPOSED COURSE FEES

none

Has a memo been submitted through your dean to the Provost & VCAS for fee approval?
Yes/No

☐

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously?

☒ yes

If yes, give semester, year, course #, etc.:

Fall 2004, Fall 2006, Fall 2009.

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

None, will be offered in place of another graduate class.

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No ☒

Yes ☐

From previous years, I know there is adequate material available at the library for the course.

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

Students from all graduate programs, or undergraduate options in ECE and ME could benefit from this course. ECE has already offered the course for 3 times, with a good number of multidisciplinary students taking it.

21. POSITIVE AND NEGATIVE IMPACTS

Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.

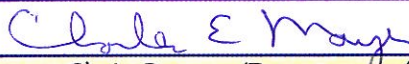
No negative impacts expected on any course or program, but certainly some positive impact due to the application oriented content of this course, demonstrating the students where to use their acquired knowledge in mechanics and math, as well as providing them a good opportunity to see semi-sophisticated applications of control theory (which they do not see in any other course).

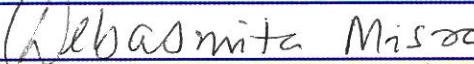
JUSTIFICATION FOR ACTION REQUESTED


The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

This course has always attracted a good number of graduate students in the past (on average about 6-8) as it provides a good opportunity for students to use their knowledge on motors, mechanical systems, control and programming in various motion control systems. As also mentioned above, this course is the only place the students will see the practical benefits of "control", which is not too transparent to most, taking EE 471. The provided information is not limited to robots, but to all systems that are required to move for a certain application. The potential and importance of the content in a variety of engineering domains make this course very worthwhile for electrical and computer engineering students as well as those of ME department. Another important aspect of the course is that this course also offers the only available material in our curriculum on modeling and control of servo motors and drives, which are ubiquitously used in industry, and certainly not covered in our electrical machinery course (EE 303).

APPROVALS:

	Date	9/29/10
Signature, Chair, Program/Department of: ECE		

	Date	10/15/10
Signature, Chair, College/School Curriculum Council for:		

	Date	10/15/10
Signature, Dean, College/School of: CEM		

	Date	
Signature of Provost (if applicable)		

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

	Date	
Signature, Chair, UAF Faculty Senate Curriculum Review Committee		

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

	Date	
Signature, Chair, Program/Department of:		
	Date	
Signature, Chair, College/School Curriculum Council for:		
	Date	
Signature, Dean, College/School of:		

ATTACH COMPLETE SYLLABUS (as part of this application).

Note: The guidelines are online: <http://www.uaf.edu/uafgov/faculty/cd/syllabus.html>

The department and campus wide curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course change will be denied.

SYLLABUS CHECKLIST FOR ALL UAF COURSES

During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. Course information:

☐ Title, ☐ number, ☐ credits, ☐ prerequisites, ☐ location, ☐ meeting time
(make sure that contact hours are in line with credits).

2. Instructor (and if applicable, Teaching Assistant) information:

☐ Name, ☐ office location, ☐ office hours, ☐ telephone, ☐ email address.

3. Course readings/materials:

☐ Course textbook title, ☐ author, ☐ edition/publisher.
☐ Supplementary readings (indicate whether ☐ required or ☐ recommended) and
☐ any supplies required.

4. Course description:

☐ Content of the course and how it fits into the broader curriculum;
☐ Expected proficiencies required to undertake the course, if applicable.
☐ Inclusion of catalog description is *strongly* recommended, and
☐ Description in syllabus must be consistent with catalog course description.

5. ☐ Course Goals (general), and (see #6)

6. ☐ Student Learning Outcomes (more specific)

7. Instructional methods:

☐ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

8. Course calendar:

☐ A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

9. Course policies:

☐ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

10. Evaluation:

☐ Specify how students will be evaluated, ☐ what factors will be included, ☐ their relative value, and
☐ how they will be tabulated into grades (on a curve, absolute scores, etc.)

11. Support Services:

☐ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

12. Disabilities Services:

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials.

☐ State that you will work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities."

SYLLABUS AND COURSE INFORMATION

Lecture Time: TR (5:15-6:45 PM)

Room: TBA

2009 Catalog Description:

Introduction to basic concepts in robotics; homogeneous transformations; Denavit-Hartenberg parameters, forward and inverse kinematics; velocity kinematics, Jacobians; dynamics and modeling; robot control: independent joint control, multivariable control, Lyapunov stability, PD+, computed torque, inverse dynamics control with the use of Matlab/Simulink, kinematics and control related demonstrations on the PUMA 560 manipulator.

Prerequisites: EE471 or equivalent in control; PHYS F211X/F212 or equivalent

Text: Introduction to Robotics: Mechanics and Control, Craig, 3rd edition, Pearson Prentice Hall, 2005

Instructor: Seta Bogosyan **Office:** Duckering 221
Telephone: 474-2755 **e-mail:** ffsob@uaf.edu

Office Hours:

Wed : 1:00- 4:00 PM; or by appointment.

COURSE POLICIES

Point Distribution:	Midterm I	20%
	Midterm II	20%
	Final Exam	25%
	Quizzes	10%
	Homework& Project	15%
	Class Performance	10%
	Total	100%

Assessment Criteria:

- ➔ No late homework will be accepted unless previously authorized by the instructor. Work should be done on an individual basis.
- ➔ Students are expected to know Matlab/Simulink software.
- ➔ Two 60 minute midterms will be administered during the semester.
- ➔ One 2-hour final will be administered at the end of the semester.
- ➔ Regular class attendance is strongly recommended and participation in class by asking relevant questions and answering the instructor's questions will be graded by the above mentioned percentage.
- ➔ Tests will be open/close book at the instructor's discretion.
- ➔ There will be a course project that uses MATLAB/SIMULINK. Students are expected to present their project work and results in the form of a technical report.

University of Alaska Fairbanks
Electrical and Computer Engineering Department
EE675 – Robot Modeling and Control
Fall 2011

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Support Services:

Blackboard will be used to support instruction, specifically, to post past lectures, announcements, assignments, and solutions for tests and assignments.

DETAILED COURSE TOPICS:

Week 1,2	Introduction to robotics; basic concepts; homogeneous transformations
Week 3	Transformations cont'd; forward kinematics
Week 4	Denavit-Hartenberg parameters
Week 5	Inverse kinematics
Week 6	Velocity kinematics
Week 7	Jacobians and force/torque relationships
Week 8	MIDTERM I
Week 9	Dynamics; Euler-Lagrange method
Week 10	Independent joint control of robots
Week 11	Review and MIDTERM II
Week 12	IJC cont'd; introduction to Lyapunov stability theory
Week 13	Multivariable control
Week 14	Feedforward control; PD+
Week 15	Inverse dynamics control
Week 16	FINAL (TBA)

Disabilities Services:

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. The instructor, the teaching assistant, and the administrative assistant will work with the Office of Disabilities Services to provide reasonable accommodation to students with disabilities. Disability Services is located at the Center for Health and Counseling in 203 WHIT. The coordinator of Disability Services can be contacted by phone at 474-7043 or 474-7045 (TTY), and by email at fydso@uaf.edu.