### Trial Course or New Course Proposal

**SUBMITTED BY:**

<table>
<thead>
<tr>
<th>Department</th>
<th>College/School</th>
<th>CEM-Engineering and Mines</th>
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<tbody>
<tr>
<td>Electrical and Computer</td>
<td></td>
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<tr>
<td>Engineering</td>
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**Prepared by**

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
<th>Email Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richard Wies</td>
<td>474-7071</td>
<td><a href="mailto:ffrww@uaf.edu">ffrww@uaf.edu</a></td>
</tr>
</tbody>
</table>

**1. ACTION DESIRED**

<table>
<thead>
<tr>
<th>CHECK ONE</th>
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<tbody>
<tr>
<td>Trial Course</td>
<td>New Course</td>
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**2. COURSE IDENTIFICATION:**

<table>
<thead>
<tr>
<th>Dept</th>
<th>Course #</th>
<th>No. of Credits</th>
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<tbody>
<tr>
<td>EE</td>
<td>655</td>
<td>3</td>
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This is a graduate course that meets three hours per week for lecture.

**3. PROPOSED COURSE TITLE:**

Adaptive Filters

**4. CROSS LISTED?**

<table>
<thead>
<tr>
<th>YES/NO</th>
<th>Dept</th>
<th>Course #</th>
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<tr>
<td>NO</td>
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(Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

**5. STACKED?**

<table>
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<tr>
<th>YES/NO</th>
<th>Dept</th>
<th>Course #</th>
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<tr>
<td>NO</td>
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**6. FREQUENCY OF OFFERING:**

Alternate Spring

(Every or Alternate) Fall, Spring, Summer — or As Demand Warrants

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

Spring 2010

**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.

<table>
<thead>
<tr>
<th>COURSE FORMAT: (check one)</th>
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<tbody>
<tr>
<td>1 2 3 4 5 6 weeks to full semester</td>
<td>X</td>
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**OTHER FORMAT (specify)**

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

**9. CONTACT HOURS PER WEEK:**

<table>
<thead>
<tr>
<th>LECTURE hours/weeks</th>
<th>LAB hours/week</th>
<th>PRACTICUM hours/week</th>
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<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
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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](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 655 Adaptive Filters

(3 credits)

Study of self-designing filters which recursively update depending on the statistics of the input data for optimum performance. Topics will include foundational material in probability of stochastic processes, spectral analysis, linear optimum filtering, Wiener-Hopf filters, Yule-Walker equations, forward and backward linear predictors, method of steepest descent, least squares techniques, and auto-regressive filters. **Prerequisites: EE 451 or permission of instructor.**
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.)

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<tbody>
<tr>
<td>H = Humanities</td>
<td>N = Natural Science</td>
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Will this course be used to fulfill a requirement for the baccalaureate core? **YES**  **X**  **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:**

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<tbody>
<tr>
<td>Is this course repeatable for credit?</td>
<td><strong>YES</strong>  <strong>X</strong>  <strong>NO</strong></td>
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</table>

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:**

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<tr>
<td>LETTER</td>
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<tr>
<td>PASS/FAIL</td>
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**RESTRICTIONS ON ENROLLMENT (if any)**

14. **PREREQUISITES**

EE 451 or permission of instructor

**RECOMMENDED**

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

15. **SPECIAL RESTRICTIONS, CONDITIONS**  **None**

16. **PROPOSED COURSE FEES**  **$0**

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/No**  **Yes**

If yes, give semester, year, course #, etc.:  **Fall 2000, Spring 2003**

18. **ESTIMATED IMPACT**

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

There will be no impact since this course will be taught as a scheduled graduate course in alternate spring semesters. The facilities, space and faculty are available to teach this course.

19. **LIBRARY COLLECTIONS**

Have you contacted the library collection development officer (ffklj@uaf.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.

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)

The Electrical and Computer Engineering graduate programs will be affected by this course.

21. **POSITIVE AND NEGATIVE IMPACTS**

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

The offering of this course will provide a cross-concentration topic that is important for graduate education in Electrical and Computer Engineering. The topics covered in this course will strengthen the graduate program in Electrical and Computer Engineering.
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.

The course is important for the areas of concentration covered by our graduate program and has already been offered two previous times in the Fall 2000 and Spring 2003 as a special topics course. The course will be offered for a third time in the Spring 2009 semester as a special topics course and the department will be able to offer this course in alternate spring semesters or as demand warrants.

APPROVALS:

<table>
<thead>
<tr>
<th>Signature, Chair, Program/Department of:</th>
<th>Date</th>
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<tr>
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<td>10/05/2008</td>
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<tr>
<th>Signature, Chair, College/School Curriculum Council for:</th>
<th>Date</th>
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<tbody>
<tr>
<td>CEM</td>
<td>10/12/08</td>
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<table>
<thead>
<tr>
<th>Signature, Dean, College/School of:</th>
<th>Date</th>
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<tbody>
<tr>
<td>CEM</td>
<td>10/12/08</td>
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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

<table>
<thead>
<tr>
<th>Signature, Chair, UAF Faculty Senate Curriculum Review Committee</th>
<th>Date</th>
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ADDITIONAL SIGNATURES: (If required)

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<th>Signature, Chair, Program/Department of:</th>
<th>Date</th>
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<tr>
<th>Signature, Chair, College/School Curriculum Council for:</th>
<th>Date</th>
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<table>
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<tr>
<th>Signature, Dean, College/School of:</th>
<th>Date</th>
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</table>
ATTACH COMPLETE SYLLABUS (as part of this application).
Note: syllabus must follow the guidelines discussed in the Faculty Senate Guide
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, prerequisite, 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 Student Learning Outcomes (more specific)

6. 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.).

7. 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.

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

9. 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.)

10. Support Services:
    - Describe the student support services such as tutoring (local and/or regional) appropriate for the
        course.

11. 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 (203 WHIT, 474-7043) to provide
      reasonable accommodation to students with disabilities."
Course Information: EE 655
Title: Adaptive Filters
Lecture Time: MWF (11:45AM-12:45PM) in Duckering 202
Prerequisites: EE 451 or permission of instructor

Instructor: Richard Wies
Office: Duckering 213
Office Hours: MW 3:00-4:00PM; TR 10:30AM-12:00PM or by phone/e-mail
Phone: 474-7071
E-mail: ffrww@uaf.edu

References: Provided as needed.

Course Description: Study of self-designing filters which recursively update depending on the statistics of the input data for optimum performance. Topics will include foundational material in probability of stochastic processes, spectral analysis, linear optimum filtering, Wiener-Hopf filters, Yule-Walker equations, forward and backward linear predictors, method of steepest descent, least squares techniques, and auto-regressive filters.

Course Goals: Students will develop an understanding of adaptive filter processing techniques and how to use these techniques in a variety of applications.

Instructional Methods: This is a lecture course which will meet for three hours per week. Blackboard will be used to display assignments and solutions.

Evaluation and Grading: Plus/Minus grading will be used – see page 77 of the 2007-2008 UAF catalog for numerical values.

<table>
<thead>
<tr>
<th>Test I</th>
<th>100</th>
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<tbody>
<tr>
<td>Test II</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>200</td>
</tr>
<tr>
<td>Homework</td>
<td>200</td>
</tr>
<tr>
<td><strong>Project (Computer)</strong></td>
<td><strong>200</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>800</strong></td>
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Note: The project will involve implementation of adaptive filter techniques in MATLAB and will include a Final Paper.

Class Policies:

**Homework:** Homework will typically be assigned on a weekly basis. Homework is due at the beginning of class on the due date. No late homework will be accepted unless previously authorized by the instructor. I encourage discussion of solution techniques with your fellow students, but you must independently formulate your submitted results. Solutions will be posted on Blackboard.

**Exams:** Exams are open book and closed notes with **two** 8.5x11 (INCHES) formula sheets allowed. Formula sheets cannot have solved problems and must be attached to the exam. The final exam is open book and closed notes with **six** 8.5x11 (INCHES) formula sheets allowed. Absences from exams must be preceded by a valid excuse. In the event of
a valid excused absence it is the student’s responsibility to contact the instructor to arrange for a make-up exam prior to the regularly scheduled exam.

**Cheating/Plagiarism:** Cheating and plagiarism will not be tolerated and will result in failure of the course.

**Attendance:** As directly quoted from the 2008-2009 UAF Course Catalog under Academics and Regulations (page 81):

“You are expected to attend classes regularly; unexcused absences may result in a failing grade. You are responsible for conferring with your instructor concerning absences and the possibility of arranging to make up missed work….However, your instructor is under no obligation to allow you to make up missed work for unexcused absences or if notification and arrangements are not made in advance of the absence.”

**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.

**Course Topics:**

Background and Introduction

Chapters 1: Stochastic Process and Models
- Probability in stochastic processes
- Spectral and eigenanalysis

Chapters 2-3: Linear Optimum Filtering
- Wiener filters
- Linear predictors

Chapters 7-9: Linear Adaptive Filtering
- Steepest descent methods
- Least squares techniques (LMS, NLMS, and RLS)
- Auto-regressive filters

Chapter 14: Tracking of Time-Varying Systems (Applications)