Course Changes
May 7, 2012

MEMORANDUM

TO: Dr. Mark Zoran, Chair
    Graduate Council

THROUGH: Dr. Robin Autenrieth
          Associate Dean for Academic Affairs

FROM: Dr. R. Bowersox
      Professor, Associate Department Head

RE: Aerospace Engineering Course Change Request: AERO 631

Attached is a Departmental Request for a Change in Course Form and revised syllabus for the existing AERO 631 Advanced Trajectory Optimization for Aerospace Systems:

  Change of title to: MODEL PREDICTIVE CONTROL FOR AEROSPACE SYSTEMS
  Change of wording for description: To show multiple uses of the material and broader application
  Change of prerequisite wording: Specify need for control theory background by listing
      prerequisite AERO 623 rather than requiring instructor approval.

The instructor who created the course in 2008 continues as instructor with the above refinements reflecting his experience with the course. Thank you for your consideration of this request.

cc: D. Lagoudas
    K. Shryock
    R. Bhattacharya
    file
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
• Submit original form and attachments •

1. Request submitted by (Department or Program Name):
   Department of Aerospace Engineering

2. Course prefix, number and complete title of course:
   AERO 631 Model Predictive Control for Aerospace Systems

3. Change requested
   Attach a brief supporting statement for changes made to items 3a through 3d and 6 below.
   
   a. Prerequisite(s):
      From: Graduate classification of approval of instructor.
      To: Graduate classification, AERO 623 or comparable course.
   
   b. Withdrawal (reason):
      
   c. Cross-list with:
      Cross-listed courses require the signature of both department heads.

   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.

   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description:
   Advanced Trajectory Optimization for Aerospace Systems: Numerical solution of optimal control problems (OCP) as a nonlinear programming problem (NLP); control of a nonlinear missile using SNOPT, trajectory generation, motion planning, atmospheric entry problems; elements of approximation, distributed and parallel computation techniques, dynamical systems, stability theory, parameter optimization.

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):
   Model Predictive Control for Aerospace Systems: Nonlinear optimal control and optimization, optimal control theory, dynamical systems stability and control, approximation theory, convex optimization; control of engineering systems with state and control constraints with parametric uncertainty; formulate optimal control problems, solve as nonlinear programming problems using available solvers; requires background in control theory.

7. a. As currently in course inventory:

   Prefix  Course #  Title (excluding punctuation)
   AERO  631  OPTMZTN  AERO SYSTEMS
   Lect.  Lab  SCH  CIP and Fund Code  Admin. Unit  FICE Code  Level
   0 3 0 0 0 3 1 4 0 2 0 1 0 0 0 0 1 0 0 0 3 6 3 2 6

   b. Change to:

   Prefix  Course #  Title (excluding punctuation)
   AERO  631  PREDICTIVE  CTRL  AERO
   Lect.  Lab  SCH  CIP and Fund Code  Admin. Unit  Acad. Year  FICE Code  Level
   0 3 0 0 0 3 1 4 0 2 0 1 0 0 0 6 0 1 0 0 1 3 1 4 0 0 3 6 3 2

   Approval recommended by:
   Robert D. Bowser - AERO
   Department Head or Program Chair (Type Name & Sign) Date
   5-8-11

   Department Head or Program Chair (Type Name & Sign) Date
   (if cross-listed course)
   Submitted to Coordinating Board by:
   Associate Director, Curricular Services
   Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
   Curricular Services – 02/11
AEROSPACE ENGINEERING
AERO 631  Model Predictive Control for Aerospace Systems
Semester: TBA
Day/Time/Place: TBA

Course Description and Prerequisites

This course will address model predictive control (MPC) that is increasingly becoming a design method of choice in aerospace, mechanical, chemical, petroleum and nuclear engineering. In this course, the students will learn how to formulate constrained control problems as optimal control problems and analyze robustness of such algorithms in the presence of system uncertainty. The students will also learn how to solve optimal control problems as nonlinear programming problems using available solvers. Students will be introduced to elements of approximation theory, numerical analysis, stochastic optimal control theory, dynamical systems and stability theory and advanced parameter optimization methods. Projects will be assigned individually and a term paper is expected at the end of the semester. A background in optimal control theory is necessary.

Prerequisites: Graduate classification and AERO 623 or comparable course.

Learning Outcomes

(i) Formulate constrained control problems as optimal control problems.
(ii) Understand stability of MPC algorithms and their robustness properties.
(iii) Understand and derive numerical solution techniques to solve linear and nonlinear optimal control problems.
(iv) Understand elements of approximation theory to transcribe optimal control problems to nonlinear programming problems including direct collocation, pseudo-spectral methods, Spline approximations, mesh less FEM approaches.
(v) Learn to apply MPC algorithms to engineering problems.

Instructor Information

Name: Dr. R. Bhattacharya, Associate Professor, Department of Aerospace Engineering
Telephone number: (979) 862-2914
Email address: raktim@aero.tamu.edu
Office hours: By Appointment
Office location: 727C HRBB
TA name:

Textbook and/or Resource Materials

No text book. Material will be provided in form of handouts. Following references will used.

References:
1. Practical Guide to Splines, Carl de Boor.
2. Orthogonal Polynomials, G. Szego.
3. Applied Optimal Control by A.E. Bryson and Y.-C. Ho
4. IEEE Transactions in Automatic Control
5. Automatica, A Journal of IFAC, the International Federation of Automatic Control
6. Journal of Guidance, Control, and Dynamics

Grading Policies
Homework will be assigned, but not graded.
Midterm Project 50%
Final Project 50%
Total 100%

Grades: Grades are based on the weighted average following the schedule above.
A 90 - 100%
B 80 - 89%
C 70 - 79%
D 60 - 69%
F below 60%

More information on the grading policy can be found at: http://student-rules.tamu.edu

Course Topics, Calendar of Activities, Assignments, Test Dates

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction</td>
<td>6</td>
</tr>
<tr>
<td>Constrained control &amp; limitation of other</td>
<td></td>
</tr>
<tr>
<td>methods, optimal control review, linear</td>
<td></td>
</tr>
<tr>
<td>and nonlinear optimal control problems.</td>
<td></td>
</tr>
<tr>
<td>2. Numerical Solution of Optimal Control</td>
<td>12</td>
</tr>
<tr>
<td>Problems</td>
<td></td>
</tr>
<tr>
<td>Direct and indirect methods, orthogonal</td>
<td></td>
</tr>
<tr>
<td>polynomials, spline theory, numerical</td>
<td></td>
</tr>
<tr>
<td>sensitivity, error analysis.</td>
<td></td>
</tr>
<tr>
<td>3. Model Predictive Control</td>
<td>6</td>
</tr>
<tr>
<td>Literature review, stability &amp; robustness</td>
<td></td>
</tr>
<tr>
<td>issues, formulation.</td>
<td></td>
</tr>
<tr>
<td>4. Robust Model Predictive Control</td>
<td>9</td>
</tr>
<tr>
<td>Uncertainty description, stochastic system</td>
<td></td>
</tr>
<tr>
<td>analysis.</td>
<td></td>
</tr>
<tr>
<td>5. Stochastic Optimal Control</td>
<td>6</td>
</tr>
<tr>
<td>Problem formulation and solution process.</td>
<td></td>
</tr>
<tr>
<td>6. Applications</td>
<td>3</td>
</tr>
<tr>
<td>Total = 42</td>
<td></td>
</tr>
</tbody>
</table>

Other Pertinent Course information

Attendance Policy: Students are expected to attend class. The following link has more information on student rule 7 - Attendance: http://student-rules.tamu.edu/rule07

Copyrights
The handouts used in this course are copyrighted. By "handouts" we mean all materials generated for this class, which include but are not limited to syllabi, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless the author expressly grants permission.

Americans with Disabilities Act (ADA) Policy Statement
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1537. For additional information, visit http://disability.tamu.edu.

Academic Integrity Statement and Policy
For additional information, please visit: http://aggiehonor.tamu.edu
"An Aggie does not lie, cheat, or steal, or tolerate those who do."
Texas A&M University
Departmental Request for a Change in Course
Undergraduate ∙ Graduate ∙ Professional
Submit original form and attachments

1. Request submitted by (Department or Program Name):
   Department of Biological and Agricultural Engineering

2. Course prefix, number and complete title of course:
   BAEN 665: Design of Biological Waste Treatment Systems

3. Change requested
   a. Prerequisite(s): From: ___________________________ To: ___________________________
   b. Withdrawal (reason): ___________________________
   c. Cross-list with: ___________________________
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked: 465

5. Complete current course title and current catalog course description:

   Design of Biological Waste Treatment Systems. (3-0). Credit 3.

   Management and treatment of organic wastes, with emphasis on human, agricultural and food processing wastes; engineering design of biological waste treatment processes; regulatory aspects affecting management of organic waste

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

   Design of Biological Waste Treatment Systems. (3-0). Credit 3.

   Management and treatment of high organic content waste streams, with emphasis on agricultural, municipal, and agro-industry wastewater; engineering design of biological waste treatment processes; resource recovery from waste streams; recycle and reuse of finished effluents

7. a. As currently in course inventory:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 665</td>
<td>Design of Biological Waste Treatment Systems</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>Schedule</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 3 0 0 0 0 3 1 4 0 3 0 1 0 0 6</td>
<td>BIOL WASTE TREAT SYS</td>
<td></td>
</tr>
</tbody>
</table>

   b. Change to:

<table>
<thead>
<tr>
<th>Title</th>
<th>Schedule</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 3 6 3 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   Approval recommended by:
   Stephen W. Searcy
   Department Head or Program Chair (Type Name & Sign) Date

   Chair, College, Review Committee Date

   Department Head or Program Chair (Type Name & Sign) Date
   (if cross-listed course)

   Submitted to Coordinating Board by:

   Associate Director, Curricular Services Date

   Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 02/11
BAEN 465/665 Design of Biological Waste Treatment Systems

Spring 2012

Syllabus

Professor: Dr. R. Karthikeyan ("Dr. Karthi" or "Dr. K")
Office: 306-A Scoates Hall
Phone: 979.845.7951
E-mail: karthi@tamu.edu
Lecture hours: 11:10 – 12:25 PM (TR)
Lecture location: 215 Scoates Hall
Office hours: 2:00 – 3:00 (TR); other times - only through appointment.

Prerequisites
BAEN 302; junior or senior classification or approval of instructor

Text Book
The following text book is highly recommended for this class:


Course Description
Management and treatment of high organic content waste streams, with emphasis on agricultural, municipal, and agro-industry wastewater; engineering design of biological waste treatment processes; resource recovery from waste streams; recycle and reuse of finished effluents.

Learning Objectives and Outcomes
At the end of the course, students should be able to design biochemical treatment systems to process high organic content waste streams. Engineering design emphasis will be placed on resource recovery from waste streams, recycle and reuse of finished effluents, and recharge aquifers by treated effluents.

Grading

BAEN 465 (undergraduate credit)
1. Quiz: There will be four quizzes (4 x 15 = 60 points).
2. Design Project: There will be one “team” design project (1 x 40 = 40 points).

Final Grade (100 points maximum); A: 90-100; B: 80-89; C: 70-79; D: 60-69; and F: <60.
BAEN 665 (graduate credit)

1. Quiz: There will be four quizzes (4 x 15 = 60 points).
2. Design Project: There will be one “team” design project (1 x 40 = 40 points).
3. Term Paper: There will be one term paper (1 x 50 = 50 points)

Final Grade (150 points converted to 100 points maximum); A: 90-100; B: 80-89; C: 70-79; D: 60-69; and F: <60.

Note: For every unexcused lecture absence, 1 point will be subtracted up to 5 points total from the final grade. (Example: if your final grade is 90 and you were absent for 4 classes unexcused, your final grade will be: 90 – (1 x 4) = 86. You will get a B instead of A!). For make-up quiz guidelines, please refer to http://student-rules.tamu.edu

Guidelines & Policies

The philosophy in this course is that each student is encouraged and motivated to learn as much as he or she can by active in-class learning, self study, taking quizzes, and working on a design project.

Self Study

Quiz
There will be four quizzes (30 minutes each; closed-book; closed-notes) given in class and graded towards final grade. In addition to this, one sample quiz and one optional quiz for bonus points will be given. There will be no makeup quiz under normal (unexcused) circumstances. In general, each quiz will have one conceptual question and one workout problem. Grading rubric will be discussed in class.

Design Project
There will be one team design project. Rubric for individual grading and specific design project guidelines will be handed in class.

Term Paper (only for BAEN 665)
There will be one term paper related to a contemporary topic on biological wastewater treatment. Specific term paper guidelines will be handed out in class.
**Attendance and Classroom Policy**
Class participation is highly recommended. For each unexcused lecture absence, 1 point will be deducted up to a total of 5 points from the final grade. If you have an excused absence, please email the details to me prior to the absence if possible. There will be no makeup quiz or exam under normal (unexcused) circumstances. For make-up quiz/exam guidelines, please refer to [http://student-rules.tamu.edu](http://student-rules.tamu.edu). Your attention and interaction is important to my concentration and that of your classmates. Those engaged in activities disruptive to other students or to me will be warned or asked to leave. Disruptive activities include but not limited to: reading newspapers, interacting with handheld devices (attending calls, texting, etc.), disruptive talking to others, and working on class materials that are not related to BAEN 465/665. As a courtesy, please turn off your mobile phone audible ringers.

**Communication Policy**
Since it is a “design” class, I expect you to handle the work professionally and follow high work ethic. I strongly encourage you to meet with me on a regular basis (I am available most of the TR afternoons - other days only through appointment) to discuss design aspects of biological WWT. This will not only enhance your learning but also help you understand the basic concepts better.

**Academic Honesty**
**Aggies do not lie, cheat or steal nor do they tolerate those who do.**
The Aggie Code of Honor states that the students at Texas A&M University should value honesty and personal integrity. Therefore, it is the responsibility of students and faculty members to help maintain scholastic integrity at the University by refusing to participate in or tolerate scholastic dishonesty.

In this course, it is permissible to discuss assignments and projects. It is NOT permissible to copy assignments from another student. It is NOT permissible to discuss any aspect of any examination until ALL students have completed the exam. The penalties for violating this policy will range from a ZERO on the assignment or exam to an F in the course. In addition, a report will be made to the TAMU Honor Council Office. If you have any questions about the Aggie Honor Code, please consult the website: [http://www.tamu.edu/aggiehonor/](http://www.tamu.edu/aggiehonor/). Please get familiar with university regulations and student rules ([http://student-rules.tamu.edu/](http://student-rules.tamu.edu/)); all relevant rules will be enforced in this class.

**Additional Accommodations**
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable
accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building. The phone number is 845-1637.

**Tentative Schedule:**

<table>
<thead>
<tr>
<th>Class #</th>
<th>Date</th>
<th>Topic</th>
<th>Reading Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01/17/2012</td>
<td>7. Fundamentals of Biological Treatment – FBT</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>2</td>
<td>01/19/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>01/24/2012</td>
<td><em>Animal Science facility visit</em></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>01/26/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>01/31/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>02/02/2012</td>
<td>Q # A*</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>02/07/2012</td>
<td>8. Aerobic Suspended Growth Processes – ASP</td>
<td>Q # 1 (ch – FBT)</td>
</tr>
<tr>
<td>8</td>
<td>02/09/2012</td>
<td></td>
<td>Chapter 8</td>
</tr>
<tr>
<td>9</td>
<td>02/14/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>02/16/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>02/21/2012</td>
<td>9. Aerobic Attached Growth Processes – TFP</td>
<td>Q # 2 (ch – ASP)</td>
</tr>
<tr>
<td>12</td>
<td>02/23/2012</td>
<td></td>
<td>Chapter 9</td>
</tr>
<tr>
<td>13</td>
<td>02/28/2012</td>
<td>WWTP visit</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>03/01/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>03/06/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>03/08/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>03/13/2012</td>
<td>Spring Break – No Class</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>03/15/2012</td>
<td>Spring Break – No Class</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>03/20/2012</td>
<td>10. Anaerobic (Suspended &amp; Attached) Processes - AAP</td>
<td>Q # 3 (ch – TFP)</td>
</tr>
<tr>
<td>20</td>
<td>03/22/2012</td>
<td></td>
<td>Chapter 10</td>
</tr>
<tr>
<td>21</td>
<td>03/27/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>03/29/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>04/03/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>04/05/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>04/12/2012</td>
<td></td>
<td>Chapter 14</td>
</tr>
<tr>
<td>27</td>
<td>04/17/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>04/19/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>04/24/2012</td>
<td>Course evaluations &amp; summary</td>
<td>Q # 5** (ch – WWR)</td>
</tr>
<tr>
<td>30</td>
<td>04/26/2012</td>
<td>Last Day of Class</td>
<td>Design report due</td>
</tr>
<tr>
<td>31</td>
<td>05/01/2012</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* - sample Quiz; ** - optional Quiz
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
Submit original form and attachments

Form Instructions
1. Request submitted by (Department or Program Name): Civil Engineering
2. Course prefix, number and complete title of course: CVEN 684 Professional Internship
   
3. Change requested
   a. Prerequisite(s): From: Approval of the department head and one semester of graduate work completed. To: Approval of the department head and two semesters of graduate work completed.
   b. Withdrawal (reason):
   c. Cross-list with:
   
4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description: Professional Internship (3-0) Credit 3 Training under the supervision of practicing professional engineers in settings appropriate to the student's professional objectives, away from Texas A&M campus.

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words): Professional Internship Credit 1 to 2

7. a. As currently in course inventory:
   
<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course #</th>
<th>Title (excluding punctuation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN</td>
<td>684</td>
<td>PROFESSIONAL INTERNSHIP</td>
</tr>
</tbody>
</table>
   
<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>SCH</th>
<th>CP and Fund Code</th>
<th>Admin. Unit</th>
<th>FICE Code</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>00</td>
<td>03</td>
<td>14 08 010000</td>
<td>06</td>
<td>03 632</td>
<td>6</td>
</tr>
</tbody>
</table>

   b. Change to:
   
<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course #</th>
<th>Title (excluding punctuation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN</td>
<td>684</td>
<td>PROFESSIONAL INTERNSHIP</td>
</tr>
</tbody>
</table>
   
<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>SCH</th>
<th>CP and Fund Code</th>
<th>Admin. Unit</th>
<th>FICE Code</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>00</td>
<td>02</td>
<td>14 08 010000</td>
<td>06</td>
<td>03 632</td>
<td>6</td>
</tr>
</tbody>
</table>
   
   Approval recommended by: Mark Burris 4/10/12

   Department Head or Program Chair (Type Name & Sign) Date

   Department Head or Program Chair (Type Name & Sign) Date
   (if cross-listed course)

   Submitted to Coordinating Board by: Mark Zoran

   Chair, GC or UEC Date

   Associate Director, Curricular Services

   Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 02/11
CVEN 684 – Professional Internship Credit 1 to 2 credit hours

Catalog Description
Training under the supervision of practicing professional engineers in settings appropriate to the student’s professional objectives, away from Texas A&M campus.

Prerequisites: Approval of the department head and two semesters of graduate course work completed.

Departmental Policy

- A Record of Study must be submitted and approved by the student’s advisory committee chair or area graduate advisor and the department head.
- Before a student is permitted to register for CVEN 684; the student must submit in writing to the Civil Engineering Graduate Office the following:
  - Letter from Employer of the Internship and physical address
  - Immediate supervisor, place of internship
  - Period of employment: start and ending date
  - Professor that will supervise professional internship
  - After two semesters of graduate course work
- The Record of Study must be complete in order to receive Credit for CVEN 684.
- A satisfactory grade (S) will not be issued until the Record of Study has been approved by the Department head.
- Cannot be taken until at least one semester of graduate course work for domestic students (minimum 9 credit hours) and two semesters of graduate course work for international students that has been completed (Minimum 18 credit hours)
- Registration for CVEN 684 must be completed by the start of the semester for which CVEN 684 credit is desired.
- CVEN 684 credit hours may not be changed to either CVEN 685 or CVEN 691 credit hours.
- CVEN 684 credit hours has to be on your degree plan to receive credit.

Americans with Disabilities Act (ADA) Policy Statement
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Cain Hall, Room B118, or call 845-1637.

Academic Integrity Statement

“Aggies do not lie, cheat, or steal, nor do they tolerate those who do.” It is the responsibility of students and instructors to help maintain scholastic integrity at the university by refusing to participate in or tolerate scholastic dishonesty. (Please see the Honor Council Rules and Procedures at http://www.tamu.edu/aggiehonor)
Texas A&M University
Departmental Request for a Change in Course
Undergraduate  Graduate  Professional
• Submit original form and attachments •

Form Instructions
1. Request submitted by (Department or Program Name): Department of Electrical and Computer Engineering
2. Course prefix, number and complete title of course: ECEN 687 VLSI Physical Design Automation

Attach a brief supporting statement for changes made to items 3a then 3c and 3d below.

3. Change requested
   a. Prerequisite(s): From: ECEN248, CSCE311 To: ECEN248
   b. Withdrawal (reason): 
   c. Cross-list with: 

   Cross-listed courses require the signatures of both department heads.

   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.

   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description: VLSI Physical Design Automation. The course is on algorithms for VLSI physical design automation, which include partitioning, floor planning, placement, and routing. Technical papers on the above topics will be chosen from premier CAD, conference proceedings, journals and presented in class.

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words): Introduction to VLSI Design Automation. Introduction to algorithms and techniques for VLSI design automation, including basic optimization techniques, high level synthesis, logic synthesis/verification, physical design, timing verification and optimization.

7. a. As currently in course inventory:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course #</th>
<th>Title (excluding punctuation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECEN</td>
<td>6 8 7 VLSI</td>
<td>PHYS DESN AUTOMAN</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>SCH</th>
<th>CP &amp; Fund Code</th>
<th>Admin. Unit</th>
<th>E.C. Code</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 3 0 0 3 1 4 1 0 0 1 0 0 0 6 0 9 3 6 0 0 3 6 3 2 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Change to:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course #</th>
<th>Title (excluding punctuation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECEN</td>
<td>6 8 7 INTRO VLSI</td>
<td>DESN AUTO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>SCH</th>
<th>CP &amp; Fund Code</th>
<th>Admin. Unit</th>
<th>Year</th>
<th>Lecture Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 3 0 0 3 1 4 1 0 0 1 0 0 0 6 0 9 3 6 1 3</td>
<td>1 4 0 0 3 6 3 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Approval recommended by: 

Department Head or Program Chair (Type Name & Sign) Date

Chair, College Review Committee Date

(If cross-listed course)

Dean of College Date

Submitted to Coordinating Board by:

Associate Director, Curricular Services Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.

Curricular Services - 02/11
Supporting Statement:
The technology progress in the field of VLSI design automation demands a comprehensive preparation of the knowledge for students. Previously, this course is focused on only a part of this field, physical design. To meet the social and industrial needs for student education, we extend this course to cover a wider scope of the knowledge on physical design. The title, description and prerequisite changes correspond to the course content change.

Course Name: ECEN 687
Course Title: Introduction to VLSI Design Automation
Term: Fall 2013
Meeting time: TBD
Location: TBD

Instruction:
Jiang Hu, Associate Professor, Department of Electrical and Computer Engineering
jianghu@ece.tamu.edu
Office phone: 979-847-8768
Office: WERC 333L

Catalog Description:
687. Introduction to VLSI Design Automation. (3). Credit 3. The course provides a comprehensive introduction to algorithms and techniques for VLSI design automation, including basic optimization techniques, high level synthesis, logic synthesis/verification, physical design, timing verification and optimization.

Prerequisite(s): ECEN 248

Required Textbook: No

Course Objectives: At the end of this course, students should:
Understand basic algorithmic techniques for automated VLSI design and verification at circuit and system level.

Course Topics and Hours:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Linear programming</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Nonlinear programming</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Graph theory and computational complexity</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Combinatorial optimization</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Hardware models for high level synthesis</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Task scheduling algorithms</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Task binding algorithms</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Basics of logic synthesis</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Binary decision diagrams</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Two-level logic synthesis</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>Functional verification</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Automatic test pattern generation</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Partitioning</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Floorplanning</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>Cell placement</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Routing</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>Clock network synthesis</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>Gate models</td>
<td>1</td>
</tr>
</tbody>
</table>
Lecture Schedule – 150 minutes per week

Grading scale: A=85:100, B=70:85, C=55:70, D=40:55, F=0-40

Attendance policy: follow university student rules
Student rule 7 http://student-rules.tamu.edu/rule07

Student Evaluation:
Homework 25%
Midterm 1 25%
Midterm 2 25%
Midterm 3 25%
TOTAL POINTS 100%

Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity
For additional information please visit: http://www.tamu.edu/aggiehonor

"An Aggie does not lie, cheat, or steal, or tolerate those who do."
Texas A&M University

Departmental Request for a Change in Course

Undergraduate • Graduate • Professional

Submit original form and attachments

Form Instructions

1. Request submitted by (Department or Program Name): Entomology

2. Course prefix, number and complete title of course: ENTO 619

3. Change requested
   a. Prerequisite(s): From: _______________ To: _______________
   b. Withdrawal (reason): _______________
   c. Cross-list with: _______________
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked: _______________

5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

7. As currently in course inventory:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course #</th>
<th>Title (excluding punctuation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>619</td>
<td>INSECT TOXICOLOGY</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Text</th>
<th>Lab</th>
<th>SCH</th>
<th>CIP and Fund Code</th>
<th>Admin Unit</th>
<th>TCH Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approval recommended by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>David Ragdale</td>
</tr>
<tr>
<td>Department Head or Program Chair (Type Name &amp; Sign)</td>
</tr>
<tr>
<td>Date</td>
</tr>
</tbody>
</table>

   | Department Head or Program Chair (Type Name & Sign) |
   | Date |

   | Dean of College |
   | Date |

<table>
<thead>
<tr>
<th>Submitted to Coordinating Board by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair, OC or UCC</td>
</tr>
<tr>
<td>Date</td>
</tr>
</tbody>
</table>

Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu

Curricular Services – 02/11
Insect Toxicology  ENTO 619
Spring Semester
Lecture: MWF 10:20-11:10 a.m.
Location: Heep Center Room 207
Credit: 3

COURSE DESCRIPTION: Classification and properties of major types of insecticides; chemistry, metabolism and mode of action; selectivity, use hazards, residues and resistance; environmental problems: biological magnification, persistence and effects on non-target organisms.

PREREQUISITES: one course in organic chemistry and ENTO 615 (Insect Physiology) or approval of instructor.

LEARNING OUTCOMES: Upon completion of the course, students should be able to demonstrate competency by:

► Describing the mode of action of the major groups of insecticides, comparing broad chemical structures by chemical group and/or site of action (target site).

► Describing the most common mutations in target sites that lead to insecticide/acaricide resistance through target site insensitivity, and the applications of molecular biology to insect toxicology (resistance detection).

► Comparing organismal symptoms, biochemical and molecular responses of insects to synthetic and biological insecticides or plant pesticides (transgenic plants) and when known, to symptoms in mammals.

► Predicting, evaluating and assessing health and environmental risks to insecticides in novel situations.

► Comparing and contrasting the molecular basis of insecticide selectivity, efficacy and safety to non-targets, especially mammals.

► Assessing best practices for safe insecticide handling and disposal.

► Constructing a bioassay (theory-dry/lab), analyzing data and interpreting numeric and in graphical summaries (Probit analysis) to assess the presence of insecticide resistance.

► Demonstrating mastery of a selected topic through classroom presentation and supporting
documentation.

Instructor: Patricia V. Pietrantonio, Professor
Office: Hepel Center Room 517
Mail Stop 2475
Email: p-pietrantonio@tamu.edu
Phone Office: (979) 845-9728 / Lab: 845-9755
Fax: (979) 845-6305

Consultation & Office Hours: By appointment.

Resource Materials: Reading assignments, supporting reference materials, and lectures will be posted to the course website http://insects.tamu.edu/students/grad/gcourses/ent0619/

Grading Policies:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Maximum Points</th>
<th>Percentage of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-term Examination</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Master Lecture*</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Final Comprehensive Exam</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Student Master Lectures are 45 minute power-point presentations on an instructor-approved topic pertaining to insect toxicology, based upon a scientific review of the topic (consisting of 12-15 sources). Presentation is to be accompanied by handouts and bibliography. Evaluation will include written assessments by student audience and instructor.

Student Attendance: Class attendance is a student responsibility (see Student Rules at http://student-rules.tamu.edu); 3 or more unexcused absences to lectures will result in a 5% reduction of course grade. Students are responsible for communicating with the instructor about absences and for obtaining the material(s) and handouts given while absent.

Lecture Topics and Schedule (Weekly basis):


Concept of LD<sub>90</sub>, LD<sub>50</sub>, LC<sub>50</sub>, LC<sub>90</sub>, etc. Bioassay principles and techniques. Synergism. Additive effects. EPA and WHO pesticide toxicity classifications. Introduction to the concept of insecticide resistance (see also 15). Resistance ratio. A tutorial on probit and resistance and real world Texas example can be found at: http://insecticideresistance.tamu.edu


14. Student master lectures: The instructor will provide a list of current topics to be selected by students within the first week of classes. Students are welcome to propose topics as long as they are NOT their research for graduate studies.

15. Student master lectures (cont.). Last lecture of this week for review session and conclusions: Review of the insecticide classification by target site presented in lecture 1. Summary of the key knowledge and understanding acquired through this course. Student evaluations of instructor at end of lecture. The instructor is available for an extra “out of schedule” review session if students indicate this need. FINAL EXAM according to University Calendar.
Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity

"An Aggie does not lie, cheat, or steal or tolerate those who do."

*For additional information please visit: [http://aggiehonor.tamu.edu](http://aggiehonor.tamu.edu)*