New Courses
Texas A&M University

Departmental Request for a New Course
Undergraduate • Graduate • Professional

Submit original form and attach a course syllabus.

1. Course request type:
   - □ Undergraduate
   - ☑ Graduate
   - □ First Professional

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

3. Course prefix, number and complete title of course:
   AERO 651 Human Spaceflight Operations

4. Catalog course description (not to exceed 50 words):
   Essential aspects of human spaceflight operations as performed by NASA; in-depth understanding of the state-of-the-art in spacecraft operations, including spacecraft systems, ground and launch operations, mission management and on-orbit activities such as science, robotics, spacwalking and human health maintenance; applications to future space systems.

5. Prerequisite(s):
   Cross-listed with:
   Stacked with: AER0 451
   Cross-listed courses require the signature of both department heads.

6. Is this a variable credit course? □ Yes ☑ No
   If yes, from ______ to ______

7. Is this a repeatable course? □ Yes ☑ No
   If yes, this course may be taken ______ times.
   Will this course be repeated within the same semester? □ Yes ☑ No

8. Will this course be submitted to the Core Curriculum Council? □ Yes ☑ No

9. How will this course be graded? ☑ Grade □ S/U ☑ P/F (CLMD)

10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

MEN, MS, PHD in Aerospace Engineering

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. ☑ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix:
   Course #: 651
   Title (excluding punctuation): Human Spaceflight Operations
   Lec. Lab Other
   3.00 0.00 0.00
   SCH 3.00 1402010006
   CHEM 16 17 0 0 3 6 3 2

   Approval recommended by:
   (Signature)
   Date

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

   Submitted to Coordinating Board by:
   (Signature)
   Date

Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricula: Services – 07/14
Aerospace Engineering - AERO 651 Human Spaceflight Operations
Semester: Spring 2017
Day/Time/Room: TBA
Credit: 3 (3-0), Elective Course

Course Brief Description
Essential aspects of human spaceflight operations as performed by NASA; in-depth understanding of the state-of-the-art in spacecraft operations, including spacecraft systems, ground and launch operations, mission management and on-orbit activities such as science, robotics, spacewalking and human health maintenance; applications to future space systems.

Course Description
The intent of this course is to give graduate students a solid background and understanding of the essential aspects of human spaceflight operations as it has been done by the experts in their respective fields over the past few decades (primarily at NASA). A broad and complete range of subjects will be studied, including all the spacecraft systems, ground and launch operations, mission management and on-orbit activities such as science, robotics, spacewalking and human health maintenance. Within each subject area, the course will delve into the basic theory, practical aspects of day-to-day operations, problem solving and lessons learned. The overall intent of this course is to give the student an in-depth understanding of the state-of-the-art in spacecraft operations that can be applied to future space systems.

Prerequisites
Graduate Classification. This course is intended for Aerospace Engineering graduate students.

Learning Objectives
At the end of this course, students will have a broad background, an in-depth understanding, and some keen insights into how human spaceflight operations have been conducted, how the spacecraft systems work, what issues have arisen, and how challenges have been overcome. Regardless of their area of future specialization, this course will give students a solid foundation in spaceflight operations that will be a great asset for space related careers. In each section of the course, as outlined in the topics below, the student will learn the fundamental principles and the essence of how things operate in the actual space environment. This will be followed by real-life examples, issues, and stories that give special insight that can only come from the experts ‘who were there’. Communicating important lessons learned for future space engineers and operators is also an important objective of the course. At the end of this course, students will be able to

a) Plan human spaceflight mission operations of the launch, space, and ground segments.

b) Provide mission parameter specifications, design spacecraft subsystems, and conduct trade studies for human space missions.

c) Incorporate lessons learned from previous spaceflight experience into current and future mission operations and procedures.

d) Extrapolate the current operational concepts to future missions.

Instructor Information
Greg Chamitoff, HRBB-746B. chamitoff@tamu.edu
Rao Vadali, HRBB-727B. svadali@tamu.edu
Textbook and Resource Material
None. Study materials and lecture notes will be provided for each section of the course throughout the semester.

Method of Evaluation / Grading Policies
Most topics below will include study material and related homework assignments. Working together on homework is acceptable but copying homework is not. **Do your own work!** Some homework assignments will be in the form of group project that will be performed partially during workshops in class. Graduate students will receive additional, more advanced problems on the homework, workshops, quizzes or final project when this course is stacked with the undergraduate course. Attendance and participation is an essential part of the course. In lieu of a final exam there will be a final project worth 30% of the total grade. Grading percentages will be **Homework 70%, Final Project 30%**. Grading Policy: A 90 – 100%, B 80 – 89%, C 70 – 79%, D 60 – 69%, F below 60% (raw scores will be curved based on the performance of the class as a whole).

Attendance and Make-up Policies
This course is unique in that much of it will be taught by recognized experts in each field who will be coming as visiting lecturers from government and industry. **Attendance is a vital component of the value of the course and full participation is expected.** Late homework will not be accepted unless absence due to a University excused absence and the work is provided by a revised date specified by the instructor. If you have special circumstances, please contact one of the instructors prior to your absence or have a friend submit your homework on time. You are responsible for any material covered and any assignments given even if absent from class. (University Student rule 7: [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07)).

Course Topics

<table>
<thead>
<tr>
<th>Course Topic</th>
<th>Week</th>
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<tr>
<td>Introduction to Human Spaceflight Operations</td>
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<tr>
<td>Mission Integration and Execution</td>
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<td>Mission Planning</td>
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<td>Space-Based Power Systems</td>
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<td>Attitude Determination, Control &amp; Propulsion</td>
<td>7</td>
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<tr>
<td>Thermal Control Systems</td>
<td>8</td>
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<tr>
<td>Extra Vehicular Activity (EVA/Spacewalking)</td>
<td>9</td>
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<td>Space Robotics</td>
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<td>Science and Payload Operations</td>
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<td>Flight Crew Operations</td>
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<td>Mission Engineering Operations</td>
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<td>Flight Medical Operations</td>
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<td>Mission Safety</td>
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<td>Launch Operations and Vehicle Processing</td>
<td>14</td>
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<tr>
<td>International Operations</td>
<td>14</td>
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<tr>
<td><strong>FINAL PROJECT DUE (No Final Exam)</strong></td>
<td>15</td>
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Academic Integrity

**Aggie Honor Code**: *An Aggie does not lie, cheat or steal, or tolerate those who do.*

Americans with Disabilities Act (ADA)

Notice: 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.
Texas A&M University

Departmental Request for a New Course
Undergraduate • Graduate • Professional

• Submit original form and attach a course syllabus. •

Form Instructions

1. Course request type:
   ☐ Undergraduate    ☑ Graduate    ☐ First Professional (ODS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Anthropology

3. Course prefix, number and complete title of course:
   ANTH 680: Teaching Anthropology

4. Catalog course description (not to exceed 50 words):
   Course is an introduction to course planning for future instructors of anthropology courses. Topics include course design, syllabus design, student motivation and engagement, assessment design and implementation, and technology use in education.

5. Prerequisite(s):
   Graduate standing; admission to graduate program in Department of Anthropology

   Cross-listed with:

   Stacked with:
   Cross-listed courses require the signature of both department heads.

6. Is this a variable credit course? ☐ Yes    ☑ No
   If yes, from ________ to ________

7. Is this a repeatable course? ☐ Yes    ☑ No
   If yes, this course may be taken ________ times.

   Will this course be repeated within the same semester? ☐ Yes    ☑ No

8. Will this course be submitted to the Core Curriculum Council? ☐ Yes    ☑ No

9. How will this course be graded? ☑ Grade    ☐ S/U    ☐ P/F (CLMD)

10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
        MA, MS, PhD in Anthropology

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. ☑ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vor.tamu.edu/resources/export-controls/Export-control-basics-for-distance-education).

13. Prefix  Course #  Title (excluding punctuation)
    ANTH  680  Teaching Anthropology

    Lect.  Lab  Other  SCH  CHP and Fund Code  Admin. Unit  Acad. Year  FCE Code
    1.00  0.00  0.00  1.00  4502C10001  0280  16 - 17  0 0 3 6 3 2

    Approval recommended by:
    Ted Goebel
    Department Head or Program Chair (Type Name & Sign)  Date

    Chair, College Review Committee  Date

    Dean of College  Date

    Chair, CE or UCE  Date

    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 – 07/14
Teaching Anthropology:
Training for First-Time Graduate Instructors & Teaching Assistants
ANTH 680 – Fall 2016

Tuesday 9:35-10:25, ANTH 105
Office Hours Monday 10:30 – 11:30 – Anthropology Bld. 105A
Instructor: Dr. Filipe Castro (fvcastro@tamu.edu) Tel.: 979-853 8103

Course Description
The course is an introduction to course planning. It prepares graduate students to be effective teachers and deal with a number of subjects that will help them navigate through their first teaching experience, such as course design, syllabus design, student motivation and engagement, assessment design and implementation, and technology use in education.

Learning Objectives
The objective of this course is to get students familiar with the fundamental tasks required to teach a course at Texas A&M University. The key components of this objective are:

1. How to design a course;
2. Choose a bibliography;
3. Write a syllabus;
4. Plan each class;
5. Prepare didactic aids;
6. Incorporating available technology;
7. Define and implement the assessment plan;
8. Deal with conflict.
Prerequisites
Graduate standing; admission to graduate program in Department of Anthropology

Readings

Grading
The course grade will be based on five assignments each counting 20% to your final grade (100%). Letter Grades are based on the following scale: 100-90 = A; 80-89.9 = B; 70-79.9 = C; 60-69.9 = D; <60 = F. The final exam is not comprehensive.

Grades will only be posted on the course website and can be accessed there.

Attendance
I don’t take attendance. If a student fails to turn in an assignment on time, a university approved excused absence will be required to make up the work. No late assignments will be accepted unless documentation is provided for a university approved excused absence on the due date. All late assignments must be completed before the next assignment due date. Students should notify the instructor in advance if they know they will need to take an excused absence. University approved excused absences are defined in the Texas A&M University Regulations: [http://studentrules.tamu.edu/rule07](http://studentrules.tamu.edu/rule07).

Course Schedule

**Week 1: Introduction**

The purpose of education. Is education a topic outside politics? Aggies, money, jobs, competition, education, citizenship, democracy.

What are the most important outcomes of undergraduate education? What is the social relevance of Anthropology?! What is the use of an anthropologist?! Video: [https://www.youtube.com/watch?v=pzrUt9CHtpY](https://www.youtube.com/watch?v=pzrUt9CHtpY) (Don McLeroy)

For next class watch video:

Week 2: Planning a course

The basic rules of course planning. (CTE Learning Outcomes PowerPoint).

http://teachingcenter.wustl.edu/strategies/Pages/course-planning.aspx#.VFFAUnF98E

Discussion: Bain, What the Best College Teachers Do, Introduction.

Week 3: Choosing a bibliography

Editors, politics, text books, articles and other resources. Evans Library. (CTE Teaching Strategies PowerPoint).

Discussion: Bain, What the Best College Teachers Do, Chapter 1

For next class watch video:

https://www.youtube.com/watch?v=u6XAPnuFj1c&list=PL4611E32F61B257F5

(Dan Pink)

Assignment 1: Write a bibliography (2 pages, TNR12, single-spaced, margins 1").

Week 4: Defining and adopting a teaching philosophy

Assessing, punishing, rewarding, motivating. Competition and citizenship. (CTE Classroom management PowerPoint).

Videos: https://www.youtube.com/watch?v=7sywMkf5QhI (Alfie Kohn)

https://www.youtube.com/watch?v=EQt-ZlS8wpw (Alfie Kohn)

Discussion: Bain, What the Best College Teachers Do, Chapter 2

Assignment 2: Write a teaching philosophy (half page, same format)

Week 5: How to put a syllabus together

Course title, number and section, schedule and location, academic calendar, resources, prerequisites, policies, grades. (CTE Grading PowerPoint).

http://teachingcenter.wustl.edu/strategies/Pages/syllabus-checklist.aspx#.VFFuZBb4rwt

Discussion: Bain, What the Best College Teachers Do, Chapter 3

Assignment 3: Write the first draft of your syllabus (no longer than five pages).

Week 6: Defining learning objectives

Information, critical thinking, writing skills, curiosity. (CTE Advanced Technology PowerPoint).

Discussion: Bain, What the Best College Teachers Do, Chapter 4

Assignment 4: Write a one-page list with the five principal learning objectives for your class.
Week 7: How to manage a classroom

Student participation, lectures, exercises, grading, plagiarism, language, cultural sensitivity. (CTE Application of Teaching Strategy PowerPoint).

Discussion: Bain, What the Best College Teachers Do, Chapter 5

Week 8: How to construct a lecture

Rules to teach a perfect class. (CTE Self Reflection for Instructors PowerPoint).

http://teachingcenter.wustl.edu/strategies/Pages/default.aspx

Discussion: Bain, What the Best College Teachers Do, Chapter 6

Week 9: Assessment

Exams, assignments, laboratories. Communicating about grades. (CTE International PowerPoint).

Discussion: Bain, What the Best College Teachers Do, Chapter 7

Assignment 5: Write the final version of your syllabus (no longer than six pages).

Week 10: Effective Teaching

What makes a good teacher?

Discussion: Bain, What the Best College Teachers Do, Epilogue

Week 11: Trends in academia

Universities as employment facilitators. Universities as places where knowledge is created and disseminated.

"Knowledge-Based Education – We oppose the teaching of Higher Order Thinking Skills (HOTS) (values clarification), critical thinking skills and similar programs that are simply a relabeling of Outcome-Based Education (OBE) (mastery learning) which focus on behavior modification and have the purpose of challenging the student's fixed beliefs and undermining parental authority.

Texas Republican Party 2012 Platform"

Week 12: Critical thinking

Is there an alternative to the federal/state requirement “memorize this, regurgitate it the day after and forget it forever?” Higher Order Thinking Skills (HOTS), Outcome-Based Education (OBE).

Video: https://www.youtube.com/watch?v=dUqRTWCdXt4 (Derek Cabrera)

Week 13: Social intelligence

What makes a great teacher?

Video: https://www.youtube.com/watch?v=9T9Kp4NE5l4 (Jamie Dimon)

Week 14: Discussion

How do I want to evolve as a teacher?

Websites

http://teaching.tamu.edu/Home.aspx
http://teaching.tamu.edu/Classroom-Management-and-Administration
http://teachingcenter.wustl.edu/strategies/Pages/syllabus-checklist.aspx#.VFFLpfnF98E

Title IX (of the Education Amendment of 1972)

Prohibits discrimination on the basis of sex in educational programs and activities at institutions that receive federal financial assistance: sexual discrimination, sexual harassment, sexual assault and violence.

Visit: (http://urc.tamu.edu/title-ix/).

Disabilities

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.
Diversity Statement

Respect for cultural diversity is a core concept of Anthropology. In this course, each voice in the classroom has something of value to contribute to class discussion. Please respect the different experiences, beliefs and values expressed by your fellow students and refrain from anti-intellectual comments about other individuals, cultures, groups, or viewpoints. The Anthropology Department supports the Texas A&M University commitment to Diversity, and welcomes individuals of all ethnic groups, genders, sexual orientations, and family backgrounds.

Visit:
http://diversity.tamu.edu/WhatsDiversity/CommitmentToDiversity.aspx.

Aggie Code of Honor

"An Aggie does not lie, cheat, or steal or tolerate those who do." Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information on the Aggie Honor Code, please visit: www.tamu.edu/aggiehonor. All cases of plagiarism and cheating will be handled according to university policies. If you are caught plagiarizing, you will receive a zero for the assignment and you may receive an F for the class. Plagiarism is one of the worst academic sins, for the plagiarist destroys trust among colleagues without which research cannot be safely communicated.
Texas A&M University  
Departmental Request for a New Course  
Undergraduate • Graduate • Professional  
• Submit original form and attach a course syllabus.

Form Instructions

1. Course request type:  
   - [ ] Undergraduate  
   - [x] Graduate  
   - [ ] First Professional (DDS MD JD PharmD DVM)

2. Request submitted by (Department or Program Name):  
   Department of Architecture
   ARCH 637 - Seminar in Japanese Architecture History and Theory

3. Course prefix, number and complete title of course:  

4. Catalog course description (not to exceed 50 words):  
   Background and exploration of traditional, modern and contemporary Japanese architecture, including consideration of region, materials, structure and style, as well as the social and economic factors that influence architectural form and content; discussion of the works and writings and building models of case study of Japanese architects’ design

5. Prerequisite(s):  
   Cross-listed with:  
   Stacked with:

6. Is this a variable credit course?  
   - [ ] Yes  
   - [x] No  
   If yes, from ______ to ______

7. Is this a repeatable course?  
   - [ ] Yes  
   - [x] No  
   If yes, this course may be taken ______ times.

8. Will this course be repeated within the same semester?  
   - [ ] Yes  
   - [x] No

9. Will this course be submitted to the Core Curriculum Council?  
   - [ ] Yes  
   - [x] No
   - P/F (CLMD)

10. This course will be:  
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix | Course # | Title (excluding punctuation)
   --- | --- | ---
   ARCH | 637 | Sem Japanese Arch Hist & Theor

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Approval recommended by:

Ward V. Wells  
Department Head or Program Chair (Type Name & Sign)  
Date

Leslie Feigenbaum  
Chair, College Review Committee  
Date

Leslie Feigenbaum  
Dean of College  
Date

Leslie Feigenbaum  
Chair, GC or UCC  
Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or send email to curricularequests@tamu.edu  
Curricular Services – 07/14
Course title and number  ARCH 637 Seminar in Japanese Architecture History and Theory
Term (e.g., Fall 200X)  Spring 2017
Meeting times and location  TR 11:10-12:25 ARC A302

Course Description and Prerequisites
Japanese Architecture: Theory and History. Background and exploration of Traditional, Modern and Contemporary Japanese Architecture, including consideration of region, materials, structure and style, as well as the social and economic factors that influence architectural form and content; discussion of the works and writings and building models of case study of Japanese architects’ design. Prerequisite: Graduate classification or approval of instructor.

3.000 Credit hours
3.000 Lecture hours

Learning Outcomes
1. Identify, define and describe the visual and textual languages of architecture in theory and in practice and critically assess various works of art and architecture through the analysis of formal elements and aesthetic principles.
2. Articulate the creative process of artistic and architectural design as expressions of human experience and cultural values.
3. Prepare the student for final study by investigating the creative role ideas play in the design process and how they are made manifest in architecture.
4. Develop the student’s ability to understand how architecture theory and idea translated into the space and structure by the analysis and building case study models, and speak and write effectively on key subjects in their field of study.
5. Complement the design studio by surveying, analyzing and interpreting historical precedents, investigating their contemporary relevance and evaluating their usefulness as formal, structural and programmatic models.
6. Raise the student’s awareness of architectural discourse in the context of global change and sustainability.

Instructor Information
Name  Koichiro Aitani
Telephone number  979.845.3218
Email address  kaitani@arch.tamu.edu
Office hours  By appointment
Office location  Langford Building A – Room 431
Textbook and/or Resource Material
(Reading Assignment)
In Praise of Shadows by Junichiro Tanizaki, Loete's Island Books, 1977, pp. 5-64
The Metabolism/1960, Bijutsu Syuppan, 1960, pp. 4-69
Fumihiko Maki, An Aesthetic of Fragmentation, Rizzoli (August 15, 1988) pp. 7-16

Assessment

Summary of Reading Assignments (Six assignments x 5% each = 30% of final grade)
There will be six writing assignments, each worth 5% of your final grade. You will be required to summarize the main points and reflect on key issues. Each paper should be 1 page in length or approximately 300 words.
- The due dates are indicated on the schedule of lectures.
- Format: Include your name and the author/title of the reading in the header.

Research Project Presentation and Review (50% of the final grade)
Each student will select a topic, theme, object, structure, medium, method, technique, practice, reign, or narrative that is of interest to them, and then prepare an analysis of the chosen topic to present in a format that is most relevant to you and/or useful to your own field of study.

Written proposal of research topic Due February 7 or 9: 5%
Proposal Mid-Term Presentation Due March 7 or 9: 5%
Final Presentation and Discussion (10 minutes) Due April 25, 27, or May 5: 20%
Analytical Research Paper Due May 5: 20%

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<td>Relevance of the topic to the student's chosen field</td>
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<td>Degree of completion as compared to proposal</td>
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</table>

Guidelines for Written Proposal
Submit a one-paragraph description of your project that includes the following information:
- Specific topic, theme, image, object, structure, medium, period, practice, technique, reign or narrative
- Statement of relevance of the topic to the course material
- Statement of relevance of the topic to the student's chosen field of study or professional practice
- Form or medium of presentation
- Statement of objective(s) to be achieved by completion and submission of project
- List of references (scholarly works)
Guidelines for Analytical Research Paper (if you decided to present in this format)

- A machine-printed, double-spaced paper of 2,500 words minimum (approximately ten pages), Times New Roman font size 11, presented in this order:
  - Creative title;
  - Abstract at the beginning of the paper. In no more than 150 words, it should summarize the argument and define the methodological approach of the article. The abstract should be written in the third person.
  - Text and accompanying endnotes.
  - Bibliography
  - Chicago Style Citation: http://www.chicagomanualofstyle.org/tools_citationguide.html
  - Presentations: In addition to the written paper, you will explain your project in about 10 minutes. This exposition includes:
    - A brief explanation of the sources/references (annotated bibliography) that you have used.
    - Image and drawings of the main ideas of your essay.

Note: ANALYTICAL: uses evidence to analyze facets of an issue; ARGUMENTATIVE: uses evidence to attempt to convince the reader of your particular stance on a debatable topic. For more information see:

http://writingcenter.uman.edu/how-to/academic/ and http://owl.english.purdue.edu/owl/resource/545/01/

Important: Be clear, concise and specific! Grade is based on quality and not quantity! A bibliography must be included; you must use at least three scholarly references; avoid “.com” references; include web site if used; include the title of the paper!

Do not download text information directly on your report. Plagiarism is non-professional! Images, plans, photos are acceptable.

Participation (20% of the final grade)
Your grade will be based upon attendance and active participation in class exercises:
Presentations 2 x 5% = 10%,
Discussion questions (bi-weekly) = 5%
Class discussion (bi-weekly) = 5%

While attendance is the responsibility of the individual student, a point will be deducted for every two unexcused absences.

Grading Policies
Final letter grades will be determined consistent with University regulations and the College of Architecture grading guidelines:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100 Excellent/outstanding (extremely good work)</td>
</tr>
<tr>
<td>B</td>
<td>80-89 Above average (very good work)</td>
</tr>
<tr>
<td>C</td>
<td>70-79   Average (fairly good work)</td>
</tr>
<tr>
<td>D</td>
<td>69-60   Below average (poor work)</td>
</tr>
<tr>
<td>F</td>
<td>below 60 Failure (unacceptable work)</td>
</tr>
</tbody>
</table>

Late Assignment Policy: Late assignments will be accepted without question for excused absences as defined by University regulations. Any late assignments without an excused absence will be accepted for a period of three days after the due date and will be assessed a 10% penalty.
Plagiarism

The most common type of misconduct reported to the Honor System Office, this is using someone else's intellectual content (ideas, words, pictures, etc.) with giving appropriate credit or attribution.

Examples:
- Intentionally, knowingly, or carelessly presenting the work of another as one’s own (i.e., without crediting the author or creator).
- Failing to credit sources used in a work product in an attempt to pass off the work as one’s own.
- Attempting to receive credit for work performed by another, including papers obtained in whole or in part from individuals or other sources. Students are permitted to use the services of a tutor (paid or unpaid), a professional editor, or the University Writing Center to assist them in completing assigned work, unless the instructor explicitly prohibits such assistance. If the student uses such services, the resulting product must be the original work of the student. Purchasing research reports, essays, lab reports, practice sets, or answers to assignments from any person or business are strictly prohibited. Sale of such materials is a violation of both these rules and State law.
- Failing to cite the World Wide Web, databases and other electronic resources if they are utilized in any way as resource material in an academic exercise.
- Other similar acts

Attendance Policies

The University views class attendance as the responsibility of an individual student. Attendance is essential to complete the course successfully. University rules related to excused and unexcused absences are located online at http://student-rules.tamu.edu/rule07

Project due dates will be provided in the project statements. Students should contact the instructor if work is turned in late due to an absence that is excused under the University’s attendance policy. In such cases the instructor will either provide the student an opportunity to make up any quiz, exam or other graded activities or provide a satisfactory alternative to be completed within 30 calendar days from the last day of the absence. There will be no opportunity for students to make up work missed because of an unexcused absence.

Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Required Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Introduction</td>
<td>In Praise of Shadows, pp. 5-64</td>
</tr>
<tr>
<td>#2</td>
<td>Traditional Architecture</td>
<td>Assignment 1(Due: Jan. 26)</td>
</tr>
<tr>
<td></td>
<td>Religious Architecture: Buddhist Temple and Shinto Shrine</td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>Traditional Architecture</td>
<td>What is Japanese Architecture, pp. 7-52</td>
</tr>
<tr>
<td></td>
<td>Residential Houses: Palace, Town/Row House</td>
<td>Assignment 2(Due: Feb. 9)</td>
</tr>
<tr>
<td>#4</td>
<td>Traditional Architecture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Development of Castle Town</td>
<td></td>
</tr>
<tr>
<td>#5</td>
<td>Modern Architecture</td>
<td>The Metabolism/1960, pp. 4-69</td>
</tr>
<tr>
<td></td>
<td>British and American Influence</td>
<td>Assignment 3(Due: Feb. 23)</td>
</tr>
<tr>
<td>#6</td>
<td>Modern Architecture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Le Corbusier's Influence</td>
<td></td>
</tr>
</tbody>
</table>
#7 (Feb. 28 & March 2)  
**Modern Architecture**  
*Works of Kenzo Tange*  
Fumihiko Maki: Building and Projects, pp. 206-217

#8 (March 7 & March 9)  
**Modern Architecture**  
*Metabolism Movement: Kiyonori Kikutake, Kisho Kurokawa*  
Fumihiko Maki, An Aesthetic of Fragmentation, pp. 7-16  
Assignment 4 (Due: March 9)

#9 (March 21 & March 23)  
**Contemporary Architecture**  
*Works of Fumihiko Maki and Arata Isozaki*  
Learning from the Japanese City by Barrie Shelton, pp. 66-150  
Assignment 5 (Due: March 30)

#10 (March 28 & March 30)  
**Contemporary Architecture**  
*Works of Tadao Ando and Yoshio Taniguchi*  
Light Construction by Terence Riley, pp. 9-32  
Assignment 6 (Due: April 13)

#11 (April 4 & April 6)  
**Contemporary Architecture**  
*Works of Toyo Ito and SANAA*  
Final Review

#12 (April 11 & April 13)  
**Contemporary Architecture**  
*Works of Emerging Architects 1*  
Reserved, might be completed by April 30

#13 (April 18 & April 20)  
**Contemporary Architecture**  
*Works of Emerging Architects 2*  
Final Review

#14 (April 25 & April 27)  
**Contemporary Architecture**  
*Final Review*

#15 (May 2)  
**Final Review**

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**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](http://disability.tamu.edu).

**Academic Integrity**

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

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information please visit: [http://aggiehonor.tamu.edu](http://aggiehonor.tamu.edu)
Care of Facilities

The use of spray paint or other surface-altering materials is not permitted in the Langford Complex, except in designated zones. Students who violate this rule will be liable for the expenses associated with repairing damaged building finishes and surfaces. At the end of the semester, your area must be clean of all trash.

Studio Policy (required of all studios)

All students, faculty, administration and staff of the Department of Architecture at Texas A&M University are dedicated to the principle that the Design Studio is the central component of an effective education in architecture. They are equally dedicated to the belief that students and faculty must lead balanced lives and use time wisely, including time outside the design studio, to gain from all aspects of a university education and world experiences. They also believe that design is the integration of many parts, that process is as important as product, and that the act of design and of professional practice is inherently interdisciplinary, requiring active and respectful collaboration with others.

Students and faculty in every design studio will embody the fundamental values of optimism, respect, sharing, engagement, and innovation. Every design studio will therefore encourage the rigorous exploration of ideas, diverse viewpoints, and the integration of all aspects of architecture (practical, theoretical, scientific, spiritual, and artistic), by providing a safe and supportive environment for thoughtful innovation. Every design studio will increase skills in professional communication, through drawing, modeling, writing and speaking.

Every design studio will, as part of the syllabus introduced at the start of each class, include a clear statement on time management, and recognition of the critical importance of academic and personal growth, inside and outside the studio environment. As such it will be expected that faculty members and students devote quality time to studio activities, while respecting the need to attend to the broad spectrum of the academic life. Every design studio will establish opportunities for timely and effective review of both process and products. Studio reviews will include student and faculty peer review. Where external reviewers are introduced, the design studio instructor will ensure that the visitors are aware of the Studio Culture Statement and recognize that the design critique is an integral part of the learning experience. The design studio will be recognized as place for open communication and movement, while respecting the needs of others, and of the facilities.

Important Links Below

Department of Architecture Website http://dept.arch.tamu.edu/
Department Financial Assistance http://dept.arch.tamu.edu/financial-assistance/
Academic Calendar http://admissions.tamu.edu/registrar/general/calendar.aspx
Final Exam Schedule Online http://admissions.tamu.edu/registrar/general/finalschedule.aspx
On-Line Catalog http://catalog.tamu.edu
Student Rules http://student-rules.tamu.edu/
Aggie Honor System Office http://aggiehonor.tamu.edu/
American Institute of Architecture website http://www.aia.org/index.htm
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

Form Instructions
1. Course request type: □ Undergraduate ✓ Graduate □ First Professional (DVM, MD, JD, PharmD, DVM)
2. Request submitted by (Department or Program Name): Department of Atmospheric Sciences
   ATMO 618 Numerical Methods for the Geosciences
3. Course prefix, number and complete title of course: ATMO 618 Numerical Methods for the Geosciences
4. Catalog course description (not to exceed 50 words):
   Mathematical theory and numerical techniques for modeling physical systems and processes in the Geosciences;
   discretization of continuum equations for solids and fluids; finite difference methods, convergence, consistency, and
   stability; finite element and spectral methods in fluid dynamics and seismology; iterative solvers; implicit and explicit
   methods for diffusion and advection.

5. Prerequisite(s): Graduate classification or approval of instructor.
   Cross-listed with: OCNG 618 and GEOP 618
   Stacked with: □ Yes □ No

6. Is this a variable credit course? □ Yes ✓ No
   If yes, from _______ to _______
7. Is this a repeatable course? □ Yes ✓ No
   If yes, this course may be taken _______ times.
   Will this course be repeated within the same semester? □ Yes ✓ No
8. Will this course be submitted to the Core Curriculum Council? □ Yes ✓ No
   How will this course be graded: □ Grade ✓ S/U □ P/F (CLMD)
10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
       M.S., Ph.D. in all Geosciences majors.

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.
12. ✓ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix Course# Title (excluding punctuation)

<table>
<thead>
<tr>
<th>ATMO</th>
<th>618</th>
<th>NUMERICAL METHODS GEOSCIENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec.</td>
<td>03</td>
<td>SCH</td>
</tr>
</tbody>
</table>

Approval recommended by:

Ping Yang

Department Head or Program Chair (Type Name & Sign) 11/9/2015

Chair, College Review Committee 11/01/15

Michael Pope

Department Head or Program Chair (Type Name & Sign) 11/07/15

Dean of College 12-15-15

Chair, GC or UCC

Submitted to Coordinating Board by:

Associate Director, Curricular Services 11/07/14

Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services — 07/14
Course title and number  Numerical Methods for the Geosciences, ATMO 618
Term (e.g., Fall 200X)  Fall 201X
Meeting times and location  TBD

Course Description and Prerequisites

Mathematical theory and numerical techniques for modeling physical systems and processes in the Geosciences; discretization of continuum equations for solids and fluids; finite difference methods, convergence, consistency, and stability; finite element and spectral methods in fluid dynamics and seismology; iterative solvers; implicit and explicit methods for diffusion and advection.

The goal of this course is to provide students with the mathematical and numerical foundations required to understand how to develop numerical models in the various disciplines of the Geosciences that employ the continuum approximation to study systems with a large number of degrees of freedom.

Students in this course are assumed to have a graduate-level working knowledge of and experience with continuum dynamics.

Learning Outcomes

By the end of this course, students will be able to:

1. Apply fundamental discretization techniques to the continuum partial differential equations (PDEs) used in the Geosciences to describe the physical behavior of solids and fluids;
2. Evaluate convergence, consistency, and stability of numerical solutions of initial value problems obtained by finite difference methods;
3. Identify problems of interest in the Geosciences whose solution may be approximated by using the finite element or spectral method and create a simplified numerical scheme based on the selected method;
4. Apply iterative methods to solve systems of linear equations resulting from discretized PDEs and address convergence issues;
5. Create one or more numerical models for specific physical processes in the Geosciences by identifying and applying the most suitable numerical techniques learned in the course;
6. Write a comprehensive technical report.

Instructor Information

Name  Ping Chang
Telephone number  979-845-8196
Email address  ping@tamu.edu
Office hours  Open
Office location  O&M 624

Textbook and/or Resource Material

Course material will be provided to the students in the form of lecture notes and handouts.

Students are encouraged, but not required, to read the following:


Grading Policies

Final grades will be based on the following weights:

1) Assignments (30% of course grade)
2) Midterm exam (20% of course grade)
3) Final project (50% of course grade)

Assignments will be due at the beginning of class on the scheduled week, unless stated otherwise by the instructor. Late homework will be assessed a penalty equal to 20% of its grade per day unless the students submits a university-excused absence (see Attendance and Make-up Policies section). An unexcused delay longer than 4 working days will automatically result in receiving zero points on the assignment.

Midterm. There will be a two-hour long in-class midterm exam.

Final Project. A final modeling project will be due by 5pm on the last day of the university's Final Examination Schedule for the semester, available at [http://registrar.tamu.edu/Courses,-Registration,-Scheduling/Final-Exam-Schedule](http://registrar.tamu.edu/Courses,-Registration,-Scheduling/Final-Exam-Schedule). This final project must include a 10-page written scientific report that comprehensively summarizes foundations, methods, and results of the modeling project in the style of the American Geophysical Union Geophysical Research Letters journal ([http://agupubs.onlinelibrary.wiley.com/aqu/journal/10.1002/(ISSN)1944-8007](http://agupubs.onlinelibrary.wiley.com/aqu/journal/10.1002/(ISSN)1944-8007)).

Final course grades will be posted on [http://elearning.tamu.edu](http://elearning.tamu.edu)

Please consult University Student Rule 10 (Grading) at [http://student-rules.tamu.edu/rule10](http://student-rules.tamu.edu/rule10) for additional details on grading policies.

Grading Scale

A final percentage grade will be calculated based on your total weighted scores as listed above. A final letter grade will be assigned as follows:

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = <60%
Attendance and Make-up Policies

The university views class attendance as an individual student responsibility. You are expected to attend class and to complete all assignments. Attendance is essential to complete the course successfully.

Please consult the University Student Rule 7 at [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07) for details on university-excused absences and make-up policies.

Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to fundamental physical systems and processes in Geosciences that can be represented using continuum partial differential equations (PDEs). Basic concepts in numerical modeling.</td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td>Mathematical description of continuum media and key physical properties: Fluids – Continuity equation; viscosity; classification of flow regimes; Eulerian and Lagrangian descriptions; advection. Solids – Deformation and stresses; stress and strain tensors; equations of motion; gravity and gravitational potential.</td>
<td></td>
</tr>
<tr>
<td>Week 4</td>
<td>Boundary value problems in the Geosciences. Dynamic and thermodynamic boundary conditions. Elliptic (Laplace’s equation), parabolic (diffusion equation), and hyperbolic (wave equation) PDEs. Examples of common transition cases between PDE types in solids (e.g. homogenous to localized deformation) and fluids (e.g. steady, irrotational, isentropic, compressible flow below and above the speed of sound).</td>
<td></td>
</tr>
<tr>
<td>Week 5-6</td>
<td>Discretization techniques for PDEs: Finite Difference Method (FDM), Finite Element Method (FEM), Spectral Method, Pseudospectral Method.</td>
<td></td>
</tr>
<tr>
<td>Week 7</td>
<td>Consistency, convergence, and stability of numerical solutions of initial value problems by FDMs. Equivalence theorem.</td>
<td></td>
</tr>
<tr>
<td>Week 8</td>
<td>Iterative solvers for discretized linear PDEs used in large three-dimensional problems: Jacobi method, Gauss-Seidel (GS) iteration, Successive Over Relaxation (SOR) method, Conjugate Gradient Method (CGM), Steepest Descent method. Convergence and preconditioning.</td>
<td></td>
</tr>
<tr>
<td>Week 8</td>
<td>Modelino diffusive processes: explicit and implicit methods.</td>
<td>Midterm Exam</td>
</tr>
<tr>
<td>Week 9</td>
<td>Modelino diffusive processes: explicit and implicit methods.</td>
<td></td>
</tr>
</tbody>
</table>
Week 10  Modeling linear advective processes: explicit and implicit methods.  
Modeling transport.  
Assignment #1 due

Week 11-12  Modeling nonlinear advective processes: Burger's equation.  
Positive-definite processes and flux-corrected methods.  
Nonlinear wave processes: Korteweg-de Vries equation.  
Assignment #2 due

Week 13  Elliptic boundary-value problems in the Geosciences.  
Energy- and enstrophy-conserving space finite-difference schemes.  
Assignment #3 due

Week 14  Basic models of physical systems in the Geosciences:  
spectral model for a homogeneous, non-divergent, incompressible flow on the surface of a sphere;  
quasi-geostrophic ocean model; spectral-element model for seismic wave propagation;

Final project due by 5pm on the last day of the university’s Final Examination Schedule for the semester.

Please note that the above schedule and topics are subject to change.

Other Pertinent Course Information

Copyright Policy. All materials used in this class are copyrighted. These materials include but are not limited to syllabi, quizzes, exams, 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 permission is expressly granted.

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://aggiehonor.tamu.edu

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

Students are encouraged to study together and discuss the information presented in the course lectures and material with other students. However, all coursework submitted to the instructor must be the result of the original work of the student. Intentional or careless appropriation of someone else’s work or ideas, even with their explicit consent, violates the Aggie Honor System Rules (Student Rule 20.1.2) and will result in all the students involved automatically receiving zero points for the assignment as well as mandatory reporting of the violation.

Each student is responsible for authenticating all submitted work and, if asked, to produce proof that the item submitted is indeed the work of that student. The inability to authenticate one’s work upon the instructor’s request is sufficient grounds to initiate an academic dishonesty case.
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

Form Instructions

1. Course request type:
   - [ ] Undergraduate
   - [ ] Graduate
   - [ ] First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Atmospheric Sciences
   ATMO 634 - Fundamentals of High Performance Computing for the Geosciences

3. Course prefix, number and complete title of course:

4. Catalog course description (not to exceed 50 words):
   Architecture of High Performance Computing (HPC) systems; Unix operating system, shell environment; algorithms and programming languages for the Geosciences; concurrency, dependency, parallelism; parallel performance, scalability; structured programming; serial, parallel patterns; parallel programming models; parallel algorithms and software design for the Geosciences; techniques for empirical parallel performance analysis.

5. Prerequisite(s):
   Graduate classification or approval of instructor.
   Cross-listed with: CNG 634, GEOP 634
   Stacked with:

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

6. Is this a variable credit course?
   - [ ] Yes
   - [ ] No
   If yes, from _______ to _______

7. Is this a repeatable course?
   - [ ] Yes
   - [ ] No
   If yes, this course may be taken _______ times.

   Will this course be repeated within the same semester?
   - [ ] Yes
   - [ ] No

8. Will this course be submitted to the Core Curriculum Council?
   - [ ] Yes
   - [ ] No

9. How will this course be graded?
   - [ ] Grade
   - [ ] S/U
   - [ ] P/F (CLMD)

10. This course will be:
   a. required for students enrolled in the following degree programs(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
      M.S., Ph.D. in all Geosciences majors.

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix Course# Title (excluding punctuation)

   ATMO 634  FUND HPC GEosciences

   Lec.  Lab  Other  SCH  CRIP and Fund Code  Admin. Unit  Acad. Year  EICE Code
   03       02   00    04          4008990202         0351       16    -17 0 0 3 6 3 2

   Approval recommended by:
   Ping Yang
   Department Head or Program Chair (Type Name & Sign) Date 11/9/2015

   Michael Z. Pope
   Department Head or Program Chair (Type Name & Sign) Date 11/11/15

   Chair, College/Dean Committee Date 11/11/15

   Dean of College Date 12-15-15

   Chair, GC or UCC Date

   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 – 07/14
Course title and number: Fundamentals of High Performance Computing for the Geosciences, ATMO 634
Term: Spring 201X
Meeting times and location: Lectures: TBD (3 hours); Laboratory: TBD (2 hours).

Course Description and Prerequisites

This course will present the architectural concepts, theoretical basis, common tools, and practical knowledge required to use current, state-of-the-art High-Performance Computing (HPC) systems to accurately and efficiently solve large-scale problems in the Geosciences.

The basic architecture of HPC systems will be discussed, and you will become familiar with Unix-based operating systems and shell environments. The main part of the course will focus on how to design and implement serial and parallel algorithms specific to Geosciences’ problems by using structured, pattern-based programming techniques along with computer languages and widely used models in the Geosciences’ research community. Concepts such as concurrency, dependency, and parallelism will be used as basis for understanding parallel code performance and techniques for empirical performance analysis.

The course will specifically focus on programming languages such as Fortran and deal with design and implementation concepts present in current models for general circulation, regional climate and weather, seismic wave propagation, data inversion, and others, as used on HPC systems. Dominant performance bottlenecks deriving from the data-intensive nature of computations in the Geosciences will be discussed, including disk I/O.

The course includes a laboratory section designed to improve the understanding of the topics presented during lecture hours and to further develop your computational skills. Through lab exercises you will become familiar with available computing environments, software and tools, and gain realistic, hands-on experience on HPC systems that may be applied to your future research work.

The intent of this course is to provide Geosciences students with diverse backgrounds a common knowledge set that will help them advance more effectively in their discipline, and to emphasize shared aspects of computational modeling in the Geosciences that may be leveraged to foster interdisciplinary exchanges.

There are no course prerequisites, but basic knowledge of programming is required.

Prerequisites: Graduate classification or approval of instructor.

Learning Outcomes

By the end of this course, you will be able to:

1. Describe the basic architecture and design features of a modern HPC system;
2. Understand the structure of the Unix operating system and make use of its main capabilities;
3. Break down a given computational task into primary steps and design a basic algorithm to carry out the work;
4. Use a programming language (Fortran) and leverage its main features to implement serial and parallel Geosciences-oriented computer codes;
5. Understand structured, pattern-based serial and parallel programming;
6. Identify and apply parallel programming patterns to parallel code design for modeling in the Geosciences;
7. Understand the concepts of concurrency, dependency, and parallelism;
8. Evaluate the performance of a parallel code on a HPC system;
9. Develop a parallel computer code to simulate a basic physical process relevant to the Geosciences;
10. Give an oral presentation of your programming project;
11. Write a comprehensive technical report of your programming project.

Instructor Information

Name: Raffaele Montuoro
Telephone number: 979-862-3182
Email address: rmontuoro@tamu.edu
Office hours: Open
Office location: O&M 1017B

Textbook and/or Resource Material

Course material will be provided in the form of lecture notes and handouts.

I encourage you to consult the following reference material:


Grading Policies

Your final grade will be determined based on the following categories and weights:

1) Programming assignments (20% of course grade)
2) Midterm exam (30% of course grade)
3) Final project (50% of course grade)

Assignments. Assignments will be due at the beginning of class on the scheduled week, unless stated otherwise by the instructor. Late homework without a university-excused absence (see Attendance and Make-up Policies section) will be assessed a penalty equal to 20% of its grade per day. An unexcused delay longer than 4 working days will automatically result in receiving zero points on the assignment.
Midterm Exam. There will be a two-hour, in-class midterm exam.

Final Project. A final programming project will be due by 5pm on the last day of the university's Final Examination Schedule for the semester, available at http://registrar.tamu.edu/Courses,-Registration,-Scheduling/Final-Exam-Schedule.

This final project must include:
1) a 10-page technical report written in the style of the Institute of Electrical and Electronics Engineers (IEEE) Transactions (https://www.ieee.org/publications_standards/publications/authors/author_templates.html). The report must comprehensively summarize and explain the objectives and technical approach, software design and implementation, and computational results of your project;
2) a presentation during last week of class.

Final course grades will be posted on http://elearning.tamu.edu

Please consult University Student Rule 10 (Grading) at http://student-rules.tamu.edu/rule10 for additional details on grading policies.

Grading Scale

You will be assigned a final letter grade based on your final percentage grade according to the following scale:

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = <60%

Your final percentage grade will be calculated by adding your weighted scores, divided by the maximum attainable score, for each of the categories listed in the Grading Policies section.

Attendance and Make-up Policies

The university views class attendance as an individual student responsibility. You are expected to attend class and to complete all assignments. Attendance is essential to complete the course successfully.

Please consult the University Student Rule 7 at http://student-rules.tamu.edu/rule07 for details on university-excused absences and make-up policies.

Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to the architecture and design of state-of-the-art High Performance Computing systems</td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td>Description of the UNIX operating system, including the shell environment.</td>
<td></td>
</tr>
<tr>
<td>Week 3</td>
<td>Algorithm design and basic principles of computer programming.</td>
<td></td>
</tr>
<tr>
<td>Week 4-5</td>
<td>Fundamentals of Fortran programming language.</td>
<td></td>
</tr>
<tr>
<td>Week 6</td>
<td>Advanced Fortran features for computational Geosciences. Introduction to structured programming. Pattern-based serial programming.</td>
<td>Assignment #1 due: Serial codes for one-dimensional physical models</td>
</tr>
</tbody>
</table>
Week 7  Concepts of concurrency, dependency, and parallelism. Potential and actual parallelism, data locality, parallel efficiency, speedup, and scalability.

Assignment #2 due:
Apply structured programming techniques and serial patterns to design and implement simple models.

Midterm Exam

Week 8

Week 10 Pattern-based parallel programming in the Geosciences. Examples include: geometrical decomposition and communication patterns in climate models, sequences in coupled models and reservoir simulations, map/reduce operations for convergence testing or large matrix operations.

Week 11 Description of the main parallel programming models used in computational Geosciences. Shared-memory parallelism with OpenMP.

Week 12-13 Distributed-memory parallelism with the Message Passing Interface (MPI)

Week 14 Concepts and tools for empirical performance analysis of parallel codes.

Assignment #3 due:
Design a pattern-based parallel code for a two dimensional problem

Assignment #4 due:
Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.

Assignment #5 due: Use MPI to create a distributed-memory parallel code. Evaluate parallel efficiency.

Final project due by 5pm on the last day of the university’s Final Examination Schedule for the semester.

Please note that the schedule and topics of lectures and laboratory assignments are subject to change.

Other Pertinent Course Information

Email. All Texas A&M students are expected to use their official TAMU email account for all the communications regarding this course. It is the student’s responsibility to check your TAMU email account regularly throughout the course.

Cell Phones/Mobile devices. You should set your mobile devices to silent and refrain from texting during class.

Access to HPC systems. You should have a working account on one of Texas A&M HPC systems to take full advantage of this course and successfully complete your assignments. You may apply for a basic supercomputing account by contacting High Performance Research Computing (http://sc.tamu.edu) before the beginning of the course. I am also available to help you obtaining a supercomputing account if you contact me during the first week of class.

Copyright Policy. All materials used in this class are copyrighted. These materials include but are not limited to syllabi, quizzes, exams, 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 permission is expressly granted.
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://aggiehonor.tamu.edu

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

You are encouraged to study together and discuss the information presented in the course lectures and material with other students. However, all coursework submitted to the instructor must be the result of your original work. Intentional or careless appropriation of someone else's work or ideas, even with their explicit consent, violates the Aggie Honor System Rules (Student Rule 20.1.2) and will result in all the students involved automatically receiving zero points for the assignment as well as mandatory reporting of the violation.

You are responsible for authenticating all submitted work and, if asked, to produce proof that the item submitted is indeed the work of that student. The inability to authenticate one's work upon the instructor's request is sufficient grounds to initiate an academic dishonesty case.
Texas A&M University

Departmental Request for a New Course

Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

Form Instructions
1. Course request type: □ Undergraduate   □ Graduate   □ First Professional (DDS, MD, JD, PharmD, DVPA)
2. Request submitted by (Department or Program Name): Department of Biological and Agricultural Engineering
3. Course prefix, number and complete title of course: BAEN 642 Water-Energy-Food Nexus: Toward Sustainable Resource Management
4. Catalog course description (not to exceed 50 words):
   Study the principles and application of the Water-Energy-Food nexus to state, national and international Water-Energy-Food securities and the interlinkages between them. Explore a quantitative framework to develop and assess sustainable tradeoffs of resources. Hands on experiences: following subject matter fundamentals, students will work on relevant real world projects or case studies.

5. Prerequisite(s):
   Strong analytical background; with consent of instructor

Cross-listed with: CVEN 642

Stacked with: 

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

6. Is this a variable credit course? □ Yes   □ No
   If yes, from _______ to _______.

7. Is this a repeatable course? □ Yes   □ No
   If yes, this course may be taken _______ times.
   Will this course be repeated within the same semester? □ Yes   □ No

8. Will this course be submitted to the Core Curriculum Council? □ Yes   □ No

9. How will this course be graded? □ Grade   □ S/U   □ P/F (CLMP)

10. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

   MS AGSM, MS BAEN, MEn BAEN, PhD BAEN

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. □ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-control/export-control-basics-for-distance-education).

13. Prefix   Course #   Title (excluding punctuations)

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<tr>
<td>BAEN</td>
<td>642</td>
<td>WEF Nexus Sust Res Mgmt</td>
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</table>

Approval recommended by:

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

Robin Autenrieth
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 – 07/14
Water-Energy-Food Nexus: Toward Sustainable Resource Management
Spring 2017 Course Syllabus (CVEN 642-BAEN 642)

Instructor: Dr. Rabi H. Mohtar
E-mail: mohtar@tamu.edu
Office: Civil Engineering 401B and Scoates Hall 306B
Phone: 979-458-9886
Website: www.wefnexus.tamu.edu
Office Hours: by appointment
Class Day, Time, & Location: TR 9:35-10:50 SCTS 144

Course Description (3 lectures)
Study the principles and application of the Water-Energy-Food nexus to state, national and international Water-Energy-Food securities and the interlinkages between them. Explore a quantitative framework to develop and assess sustainable tradeoffs of resources. Hands on experiences: following subject matter fundamentals, students will work on relevant real world projects or case studies.

Prerequisites: Strong analytical background; with consent of instructor

Textbook/Resource Materials: Current literature will be used. In addition, the Water-Energy-Food nexus tool developed by Mohtar and Daher (2014) will be used in this course. The tool designed off a scenario-based framework that quantifies the interlinkages and tradeoffs between these resources. Reading material will be available on the course website.

Grading Policies:
Grading scale (A=90-100, B=80-89, C = <80).
Final project/paper = 40%
Presentation(s) = 20%
Biweekly progress reports = 30%
Class attendance and participation = 10%

Learning Outcomes:
By the end of the semester, you should be able to:

➢ Understanding of the global risks and the how the nexus can drive sustainability of the resources management and allocation
➢ Explicitly quantify the inter-linkages of the Water, Energy, Food systems and how to identify a nexus hot spot for a specific condition
➢ Competent in running the nexus tool to simulate and conduct tradeoff analysis for the scenario of interest
➢ Understand how engineering and analytics interface with economics, policy and supply chain at local and global scale.
➢ Explore nexus friendly solutions for a specific case study towards a more sustainable resource nexus
Homework Assignments, test dates
Weekly assignments are expected and are listed by week on the syllabus.

Sample Lab/Case Studies: The instructor will meet potential students prior to the beginning of the semester to explore case studies and data gathering.

The Water-Energy-Food nexus is a crosscutting theme. We therefore aim to provide at least two case studies to connect domestic water use with industrial and agricultural use. The scope of the case studies is to provide the young generation with improved knowledge on water use all along the food supply chain. The following themes would be explored:

1. **Securing clean water**: Providing access to safe drinking water, revealing the extent of water use and thereby teaching a new generation on how to reduce water stress in the food value chain
2. **Green agriculture**: Growing agricultural production through innovative clean energy technologies and reduced carbon emissions
3. **Role of renewable energy** in energy portfolio and in bridging water and food gap.

Sample Case Studies to be explored through students projects:
- a. Solar-Desalination
- b. Soil - Water – Food
- c. Water-wastewater reuse
- d. Transportation- fracking- water
- e. Energy-Food (bioenergy)

Calendar of activities, major assignments, test dates
Course will meet three hours weekly, biweekly written progress reports, and Final report due last meeting of class

Attendance and make-up policies
If an absence is excused, the instructor will either provide an opportunity to make up any quiz, exam or other work that contributes to the final grade or provide a satisfactory alternative by a date agreed upon by the student and instructor. The make-up work must be completed in a timeframe not to exceed 30 calendar days from the last day of the initial absence. See Student Rule 7 [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07) for details of excused absences. The fact that these are university-excused absences does not relieve the student of responsibility for prior notification and documentation. Failure to notify and/or document properly may result in an unexcused absence. Falsification of documentation is a violation of the Honor Code.

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 845-1637. For additional information visit [http://disability.tamu.edu](http://disability.tamu.edu).

Academic Integrity Statement and Policy - website link [http://aggiehonor.tamu.edu](http://aggiehonor.tamu.edu)
"An Aggie does not lie, cheat or steal, or tolerate those who do."
### Class by Topics and Readings

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Jan 21st</th>
<th>Resource scarcity and spatial variability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>a.</td>
<td>Introduction to ecosystems and ecosystem services</td>
</tr>
<tr>
<td></td>
<td>b.</td>
<td>Introduction to system’s theory</td>
</tr>
<tr>
<td></td>
<td>c.</td>
<td>Situational analysis of water, energy, and food resources at the state, national and international levels</td>
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<tr>
<td></td>
<td></td>
<td>Stresses on the resources (climate change, population, financial, health, governance, etc.)</td>
</tr>
<tr>
<td>Assignment</td>
<td></td>
<td>What are the nexus hotspots in the water, energy, food areas locally or worldwide (2-3 pages)</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.pnas.org/content/107/25/11155.full.pdf">http://www.pnas.org/content/107/25/11155.full.pdf</a></td>
<td></td>
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<tr>
<td>Week 2</td>
<td>Jan 28th</td>
<td>Interdependencies in resources I</td>
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<td>--------------------------------</td>
</tr>
<tr>
<td>Content</td>
<td>Nexus elements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Water for food</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Water for energy</td>
<td></td>
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<tr>
<td>Assignment</td>
<td>Individual Semester Class Project Scope</td>
<td></td>
</tr>
<tr>
<td>Readings</td>
<td>Online data resources for water-energy-food</td>
<td></td>
</tr>
</tbody>
</table>

Readings


<table>
<thead>
<tr>
<th>Week 3</th>
<th>Feb 2nd</th>
<th>Interdependencies in resources II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Nexus elements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Energy for water</td>
<td></td>
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<tr>
<td></td>
<td>b. Energy for food</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Food for energy</td>
<td></td>
</tr>
<tr>
<td>Assignment</td>
<td>Introduction to the nexus</td>
<td></td>
</tr>
<tr>
<td>Readings</td>
<td>Project Groups and Project Timeline</td>
<td></td>
</tr>
</tbody>
</table>

Readings


<table>
<thead>
<tr>
<th>Week 4  Feb 5th</th>
<th>Virtual Water (guest lecture by Tony Allan, King's College London)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>History of the virtual water concept</td>
</tr>
<tr>
<td></td>
<td>What is food-water</td>
</tr>
<tr>
<td></td>
<td>Analysis of the nexus through a supply chain framework</td>
</tr>
<tr>
<td>Assignment</td>
<td>Articulate research questions</td>
</tr>
<tr>
<td></td>
<td>Outline project timeline</td>
</tr>
<tr>
<td></td>
<td>Describe system inter-dependencies</td>
</tr>
<tr>
<td>Readings</td>
<td>Virtual Water by Tony Allan</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.amazon.com/gp/offer-listing/1845119843/ref=tmm_pap_used_olp_srp?ie=UTF8&amp;condition=used&amp;qid=">http://www.amazon.com/gp/offer-listing/1845119843/ref=tmm_pap_used_olp_srp?ie=UTF8&amp;condition=used&amp;qid=</a></td>
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<table>
<thead>
<tr>
<th>Week 5  Feb 16th</th>
<th>Nexus Success Stories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Energy (renewables, example solar farm) Water (alternative water,</td>
</tr>
<tr>
<td>Assignment</td>
<td>Describe full data and data gaps for all the system interconnectedness</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Readings   | Water Stewardship  
http://wwf.panda.org/what_we_do/how_we_work/conservation/freshwater/water_management/  

<table>
<thead>
<tr>
<th>Week:6 Feb.23rd</th>
<th>Localizing water and food security</th>
</tr>
</thead>
</table>
| Content        | Localizing water and food security  
Conceptual modelling (local-global nexus)  
Green water definition and accounting  
Water reuse  
Water conservation  
Technology (supplementary irrigation, genetics and breeding...) |
| Assignment     | Development of scenarios and analysis framework |
| Readings       | UN Concept paper (Mohtar, Assi, Daher)  
Integrative Modeling (Braudeau and Mohtar)  
World Energy Council. 2014. LAC Region High Level Scenario Explorations.  
<table>
<thead>
<tr>
<th>Week 7</th>
<th>March 2nd</th>
<th>Energy security and role of renewable energy in bridging the water and food gap</th>
</tr>
</thead>
</table>
| Content | Tradeoffs and Nexus solutions  
             Systems Modelling  
             Introduction to Nexus Tools | |
| Assignment | Initial simulation/analytics/analysis | |
| Readings | IRENA Report | |

<table>
<thead>
<tr>
<th>Week 8</th>
<th>March 9th</th>
<th>Quantitative Nexus Framework</th>
</tr>
</thead>
</table>
| Content | Tradeoffs and Nexus solutions  
             Systems Modelling  
             Introduction to Nexus Tools | |
| Assignment | Analytics and analysis | |
| Readings | Nexus Tool Chatham house (Mohtat and Daher)  
             Nexus Tool paper (Daher and Mohtat, SP WI) | |

| Week 9 | March 16-20 | Monday-Friday: Spring Break (Wed-Thu: Faculty and Staff Holiday) |

| Week 10 | March 21st | Mid Year Crit Presentations |

<table>
<thead>
<tr>
<th>Week 11</th>
<th>March 30th</th>
<th>Nexus Tool 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Examples case studies using the nexus tools by the instructor. Data preparation and file management</td>
<td></td>
</tr>
<tr>
<td>Assignment</td>
<td>Updated report draft</td>
<td></td>
</tr>
<tr>
<td>Readings</td>
<td>Same as above</td>
<td></td>
</tr>
</tbody>
</table>

| Week 12 | April 4th | Catching up with unfinished material from nexus analytics |

<table>
<thead>
<tr>
<th>Week 13</th>
<th>April 13th</th>
<th>Environmental policy (guest lecture by Gabe Eckstein, Raya Stephan, Ron Kaiser)</th>
</tr>
</thead>
</table>
| Content | Environmental policy  
             Regulations  
             Policy reform | |
<p>| Assignment | Report draft | |
| Readings | TBD | |</p>
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Content</th>
<th>Lessons learned and current gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>April 20th</td>
<td>From Science to policy (framework elaborated)</td>
<td>Lessons learned</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Future Nexus governance</td>
</tr>
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<td></td>
<td></td>
<td>Assignment</td>
<td>Enhanced project report</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Readings</td>
<td>No reading assignment</td>
</tr>
<tr>
<td>15</td>
<td>April 25th</td>
<td><strong>One Day Symposium</strong></td>
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<tr>
<td></td>
<td></td>
<td>Content</td>
<td>Student presentations</td>
</tr>
<tr>
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<td></td>
<td>Nexus stakeholder panel discussion between students and decision-</td>
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<tr>
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<td>makers from the <strong>public and private sector</strong></td>
</tr>
<tr>
<td>16</td>
<td>May 4th</td>
<td><strong>Final Report Due</strong></td>
<td></td>
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</tbody>
</table>
Mark,

The Bush School supports BAEN 642 and CVEN 642 Water-Energy-Food-Nexus courses without reservation.

Leonard,

Leonard Bright, Ph.D.
Assistant Professor
Assistant Dean of Graduate Education
Public Service and Administration Department
Bush School of Government and Public Service
Texas A&M University
College Station, TX
lbright@tamu.edu
Phone: 979-862-3028

I will defer to and concur with Kent.

Jeryl

Sent from my Verizon Wireless 4G LTE DROID
On Dec 10, 2015 9:30 AM, "Bright Jr, Leonard A" <lbright@tamu.edu> wrote:

Excellant
------ Original message------
From: Portney, Kent E
Date: Thu, 12/10/2015 9:28 AM
To: Bright Jr, Leonard A; Mumpower, Jeryl L; Vedlitz, Arnold;
Subject: RE: GC Friendly Amendment

Leonard,

Thanks for your note about the cross-listed nexus courses. I am familiar with what prof mohtar is doing with these and have consulted with him on some of the content. His efforts are mostly fairly technical, and I am very supportive of what he is trying to do. Eventually we at the Bush school might want to do some sort of nexus policy and management course but for now incorporating these issues into existing environment, water, and science and technology policy courses will suffice.
Hope this helps. Let me know if you need anything else.

-- kent

Sent via the Samsung GALAXY S® 5, an AT&T 4G LTE smartphone

-------- Original message --------
From: "Bright Jr, Leonard A" <lbright@tamu.edu>
Date: 12/10/2015 10:12 AM (GMT-05:00)
To: "Mumpower, Jeryl L" <jmumpower@tamu.edu>, "Portney, Kent E" <kportney@tamu.edu>, "Vedlitz, Arnold" <avedlitz@tamu.edu>
Subject: FW: GC Friendly Amendment

Jeryl, Kent, and Arnie

Attached are two cross-listed courses that have been proposed as new courses on the water, energy, and food nexus. Since we also teach courses in this area, we should provide a letter of support. Let me know as soon as you can, if you have any issue with them.

Leonard

Leonard Bright, Ph.D.
Associate Professor
Assistant Dean of Graduate Education
Public Service and Administration Department
Bush School of Government and Public Service
Texas A&M University
College Station, TX
lbright@tamu.edu
Phone: 979-862-3028

From: Mark Zoran
Sent: Wednesday, December 09, 2015 2:54 PM
Hello Matt,

At last Thursday’s GC meeting it was amended that BAEN and CVEN would get letters (or emails) of support from Dr. Bright at the Bush School regarding BAEN 642 and CVEN 642 Water-Energy-Food-Nexus. Can you work with the programmatic coordinator (or department head) in charge of this course request to reach out to Dr. Bright for this approval? Unfortunately, we need this as soon as possible.

Thanks,

Mark

Mark J. Žoran, PhD
Professor of Biology and Neuroscience
Department of Biology
Associate Dean for Faculty Affairs and Graduate Studies
College of Science
Chair, Graduate Council
Texas A&M University
College Station, TX 77843-3257
Tel. 979-845-8099 (Biology)
Tel. 979-458-8001 (Science)
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

Form Instructions
1. Course request type:
   □ Undergraduate  ✔ Graduate  □ First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Biomedical Engineering
   BMEN 637, Pathologic Basis of Implantable Devices

3. Course prefix, number and complete title of course:

4. Catalog course description (not to exceed 50 words):
   Understanding the relationship that clinical presentation has for patients with primary heart disease; inflammation and repair, systemizing pathology emphasis on cardiovascular disease, and the implantable device intervention as a therapeutic adjunct in the heart.

5. Prerequisite(s):
   Graduate classification or approval of instructor
   Cross-listed with:
   Stacked with:
   Cross-listed courses require the signature of both department heads.

6. Is this a variable credit course?
   □ Yes  ✔ No
   If yes, from _____ to _____

7. Is this a repeatable course?
   □ Yes  ✔ No
   If yes, this course may be taken _____ times.
   Will this course be repeated within the same semester?
   □ Yes  ✔ No

8. Will this course be submitted to the Core Curriculum Council?
   □ Yes  ✔ No

9. How will this course be graded?
   ✔ Grade  □ S/U  □ P/F (CLMD)

10. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. ✔ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix  Course *  Title (excluding punctuation)

<table>
<thead>
<tr>
<th>BMEN</th>
<th>637</th>
<th>PATHOL BASIS IMPLANT DEVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec</td>
<td>Lab</td>
<td>Other</td>
</tr>
<tr>
<td>3.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Approval recommended by:

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)

Chair, GC or UCC Date

Submit 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 – 07/14
Course: BMEN 637  
M/W, 4:10 – 5:25 pm, ETB 1006

Course Title: Pathologic Basis of Implantable Devices

Instructor: Fred J. Clubb, Jr., DVM, PhD,  
Office: bldg 1040,  
Phone: 979/229-9852,  
E-mail: deadbeatdoc@tamu.edu

Textbook: Robbins and Cotran Pathologic Basis of Disease (Inkling Chapters: 1-4, 6, 7, 11 & 12)  
Kumar, Robbins and Cotran Pathologic Basis of Disease (5th Ed, TAMU eBook)  
Robbins Basic Pathology, by Vinay Kumar, Adul Abbas, Nelson Fausto and Richard Mitchell.

Reference Texts:  
An Introduction to Tissue-Biomaterial Interactions, by Kay Dee, David Puleo and Rena Bizios.  
Handbook of Cardiac Anatomy, Physiology and Devices, by Paul Iaizzo.

Course Description:  
This course will provide an understanding of the relationship that clinical presentation has for patients with primary heart disease; including lectures focused on general categories of inflammation and repair, systemic pathology emphasis on cardiovascular disease, and the importance elucidated on implantable device intervention as a therapeutic adjunct in heart disease.

Objectives and learning outcomes:  
- Students will understand the physiological response of biological systems to implantable devices.  
- Students will be able to describe the methods used in the pathology of medical devices and the tools used to study the interactions between biological systems and implantable devices.

Prerequisites: Graduate school classification or approval of instructor.

Outline of Subject Matter

| Basic Pathology (Introduction) .................................................................. | 1 |
| Basic Pathology (Cellular and Tissue Responses) ........................................ | 1-3 |
| Basic Pathology (Inflammation, Immunity) ................................................ | 4-5 |
| Basic Pathology (Hemodynamic Disorders) .................................................. | 6 |
| Basic Pathology (Healing and Repair) .......................................................... | 7 |
| Midterm Exam – October 14 ......................................................................... | 7 |
| Basic Pathology (Neoplasia) ....................................................................... | 8 |
| Systemic Pathology (Cardiovascular – Anatomy and Physiology) ................. | 9 |
| Systemic Pathology (Cardiovascular – Heart Failure) .................................... | 9 |
| Systemic Pathology (Cardiovascular – Congenital Heart Disease) .................. | 10 |
| Systemic Pathology (Cardiovascular – Pericardial, Epi- and Endocardial Diseases) | 10 |
| Systemic Pathology (Cardiovascular – Myocardial Diseases) .......................... | 11 |
| Systemic Pathology (Cardiovascular – Peripheral Vascular Diseases) .......... | 12 |
| Therapeutic use of Implantable Devices (Pathophysiologic Overview) .......... | 13 |
| Course Review ......................................................................................... | 14 |
| Final Exam – December 14 .......................................................................... | 15 |

Evaluation:  
Class Participation: 20%  
Exams: 80% (mid-term 40%/final 40%)  

Grading Scale:  
100-90%........A  
80-89%..........B
70-79%...........C
60-69%...........D
<60%.............F

• Attendance: Only University excused absences will be accepted for makeup exams/quizzes to be given. In accordance with University policies which can be found online at http://student-rules.tamu.edu/rule7.htm.

• Note: It is the student's responsibility to make arrangements to reschedule exams/quizzes. Exams and quizzes must be completed in accordance with University policies which can be found online at http://student-rules.tamu.edu/rule7.htm.

Americans with Disabilities Act

The American with Disabilities Act (ADA) is a federal antidiscrimination 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 B118 of Cain Hall, or call 845-1637.

Academic Integrity

Aggie Code of Honor: "Aggies do not lie, cheat, or steal, nor do they tolerate those who do."

It is the responsibility of students to help maintain scholastic integrity at the university by refusing to participate in or tolerate scholastic dishonesty, which can be found online at http://aggiehonor.tamu.edu.
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Course request type:
   □ Undergraduate  □ Graduate  □ First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Biomedical Engineering

3. Course prefix, number and complete title of course:
   BMEN 676- Professional Development for Biomedical Engineering

4. Catalog course description (not to exceed 50 words):
   Advanced concepts in professional interactions including oral and written communications; skills related to interviewing and obtaining job offers and understanding employment compensation and benefits; professional ethics.

5. Prerequisite(s):
   Graduate classification or approval of instructor.
   Cross-listed with:  
   Stacked with:  
   Cross-listed courses require the signature of both department heads.

6. Is this a variable credit course?
   □ Yes  □ No
   If yes, from _______ to _______.

7. Is this a repeatable course?
   □ Yes  □ No
   If yes, this course may be taken _______ times.
   Will this course be repeated within the same semester?
   □ Yes  □ No

8. Will this course be submitted to the Core Curriculum Council?
   □ Yes  □ No
   □ P/F (CLMD)

9. How will this course be graded:
   □ Grade  □ S/U

10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
    required for MEng in biomedical engineering
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
    MS/PhD in biomedical engineering

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. □ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix  Course #:  Title (excluding punctuation)
    BMEN  676  PROF DEV FOR BMEN

Preparatory

Lect.  Lab  Other  SCH  CP and Fund Code  Admin. Unit  Acad. Year  HCL Code
3.00  0.00  3.00  1405010006  0450  16  17  3  3  2

Approval recommended by:

[Signature]  [Date]
Department Head or Program Chair

[Signature]  [Date]
Department Head or Program Chair (if cross-listed course)

Submitted to Coordinating Board by:

[Signature]  [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 – 07/14
Course Title and Number: BMEN 676 – Professional Development for Biomedical Engineers

Term: Spring 2016
Class Time and Location: M 1:00-3:30 in ETB 5039

Course Description: Course will cover general concepts in professional interactions including oral and written communications; skills related to interviewing and obtaining job offers and understanding employment compensation and benefits; professional ethics.

Learning Outcomes:

1. Students will be able to apply written and oral communication principles to form concise and well-formed thoughts in a professional environment to achieve desired outcomes.

2. Students will be able to use evaluation factors to critically review the structure, content, and data analysis of professional documents.

3. Students will be able to construct oral communication structures to obtain desired responses when interviewing, being interviewed, or when providing micro-communication (such as an elevator pitch) relevantly and dependent on situational context.

4. Students will develop a general knowledge around the role of biomedical engineers in the medical device industry or research organizations, the hiring patterns in these organizations, career paths, and compensation structures.

Rationale:
This is a required course for Masters of Engineering Program students. This course is timed to support ME students in seeking the mandatory internship that typically occurs in the summer of the same academic year. This course is designed to support Masters of Engineering (ME) students who are within 6-18 months of seeking employment in biomedical related professions.

Course Materials:
Required Textbook: None, all required materials will be provided as part of the course in the form of handouts, and online links for papers, and other industry related journals.

References:
Interviewing: Principles and Practices 14th Edition by Charles Stewart (Author), William Cash (Author)
Style and Ethics of Communication in Science and Engineering, Jay D. Humphrey and Jeffrey W. Holmes,

Last modified: 1/14/15 @ 1:00 PM
Prerequisites: Graduate classification, or approval of instructor.

Instructor: Dr. Balakrishna Haridas, PhD
E-mail: bharidas@tamu.edu
979.845.3348
Office Hours: by appointment only

Grading Policies All assignments will receive a combined score based on instructor and peer-review assessment

<table>
<thead>
<tr>
<th>Grade Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100%...........A</td>
</tr>
<tr>
<td>80-89.99%.........B</td>
</tr>
<tr>
<td>70-79.99%.........C</td>
</tr>
<tr>
<td>60-69.99%.........D</td>
</tr>
<tr>
<td>&lt;60%...............F</td>
</tr>
</tbody>
</table>

BMEN 689
Writing Assignments: 60%
Oral Assignment: 40%

Course Policies:
Assignments turned in late will be marked down up to 50% within 24 hours of the deadline, after which they will not be accepted; exceptions to this rule will only be made in extreme cases
Grade Disputes: If you wish to dispute the grading of a specific assignment, quiz, or exam, please approach the instructor within 1 week of the grade being handed back to the class; thereafter the grade will not be changed. If you want to dispute the final grade you will need to quickly see the instructor before they are submitted by the end of the semester.

Attendance
• In accordance with Texas A&M University policies, only University-excused absences will be accepted for missing classes and for any makeup exams to be given.
• It is the student's responsibility to make arrangements to reschedule exams.
• If an absence is excused, the instructor will either provide the student an opportunity to make up any quiz, exam or other work that contributes to the final grade or provide a satisfactory alternative by a date agreed upon by the student and instructor.
• If the instructor has a regularly scheduled makeup exam, students are expected to attend unless they have a university approved excuse.
• The make-up work must be completed in a timeframe not to exceed 30 calendar days from the last day of the initial absence.
• Refer to http://student-rules.tamu.edu/rule07 for ALL policies regarding excused absences. Please note: "The student is responsible for providing satisfactory evidence to the instructor to substantiate the reason for absence." In the case of injury or illness of 3 or more days,
“The medical confirmation note must contain the date and time of the illness and medical professional’s confirmation of needed absence.”

- Also, in case of injury or illness of less than 3 days, it is the policy of this class that the student, likewise will provide a medical confirmation note containing the date and time of the illness and medical professional’s confirmation of needed absence. The Texas A&M University Explanatory Statement for Absence from class form (http://attendance.tamu.edu/) WILL NOT be accepted as evidence of an excused absence for this course.

- Having a legitimate University-excused absence does not relieve the student of responsibility for prior notification and documentation. Failure to notify and/or document properly may result in an unexcused absence. Allowable excuses and documentation thereof must be provided to the professor in a timely manner.

- Other absences may be excused at the discretion of the instructor with prior notification and proper documentation. In cases where prior notification is not feasible (e.g., accident or emergency) the student must provide notification by the end of the second working day after the absence, including an explanation of why notice could not be sent prior to the class

- Falsification of attendance documentation is a violation of the Honor Code.

**Americans with Disabilities Act (ADA) Policy Statement**
The American 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 Statement and Policy**
For additional information, visit http://aggiehonor.tamu.edu/

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

Academic Misconduct: Academic misconduct will not be tolerated and will be dealt with according to University Regulations.

See http://aggiehonor.tamu.edu/RulesAndProcedures/HonorSystemRules.aspx#definitions for the definitions of academic misconduct. Academic misconduct in ANY quiz, exam, or assignment will automatically result at a minimum in a large grade reduction (minimum of 30 points). A second violation receives an F (fail) grade in the course and an "Honor Violation Probation". Academic misconduct in the take-home exams and/or term projects means an automatic F (fail) grade in the course and an "Honor Violation Probation".

Last modified: 1/15/15 @ 11:00 AM
Course Topics, Calendar of Activities, & Approximate Weekly Schedule
(Preliminary, subject to update)

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear and Concise Introductions:</td>
<td>1-2</td>
</tr>
<tr>
<td>Assignments: introductory email, 60 second elevator pitch (oral)</td>
<td></td>
</tr>
<tr>
<td>Medical Device Market/Companies and Segmentation by various perspectives</td>
<td>3-4</td>
</tr>
<tr>
<td>Bioengineering Research Organization segmentation</td>
<td></td>
</tr>
<tr>
<td>Medical Device Companies – organization, structure, engineering career paths</td>
<td>4-5</td>
</tr>
<tr>
<td>Biomedical Engineering Research Organizations – organization, structure, and career paths</td>
<td></td>
</tr>
<tr>
<td>Salary and compensation structures; options vs stock; benefits</td>
<td>6-7</td>
</tr>
<tr>
<td>Hiring patterns in companies; how do companies plan staffing needs; human resources departments and their approach to recruiting</td>
<td>8-9</td>
</tr>
<tr>
<td>Resume Creation / Story Telling preparing your pitch</td>
<td>10-11</td>
</tr>
<tr>
<td>Oral presentations: Know your audience, minimize distractions</td>
<td>12-13</td>
</tr>
<tr>
<td>Assignments: 10 minute technical lecture/pitch</td>
<td></td>
</tr>
<tr>
<td>Ethics Introduction to ethics: Ethical issues in R&amp;D, Marketing, Sales, and Scientific misconduct and plagiarism</td>
<td>14-15</td>
</tr>
</tbody>
</table>

Last modified: 1/15/15 @ 11:00 AM
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

Form Instructions
1. Course request type:  ☑ Graduate  ☐ First Professional (DDS, MD, JD, PharmD, DVM)
2. Request submitted by (Department or Program Name):  Zachary Department of Civil Engineering
3. Course prefix, number and complete title of course:  CVEN 602, Remote Sensing in Hydrology

4. Catalog course description (not to exceed 50 words):
Precipitation; evapotranspiration; soil moisture; snow and ice; terrestrial water storage variations; land surface properties; water quality.

5. Prerequisite(s):
Cross-listed with:  
Stacked with:  

6. Is this a variable credit course?  ☑ No
If yes, from _____ to _____
7. Is this a repeatable course?  ☑ No
If yes, this course may be taken _____ times.

Will this course be repeated within the same semester?  ☑ No
8. Will this course be submitted to the Core Curriculum Council?  ☑ No

9. How will this course be graded?  ☑ Grade  ☐ S/U  ☐ P/F (CLMD)

10. This course will be:
a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

MEN, M.S., Ph.D. in Civil Engineering

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. ☑ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. [Approval form table with data]

Approval recommended by:
Dr. Robin Autenrieth  11-1-15
Department Head or Program Chair (Type Name & Sign)

Date
Chair, College Review Committee
Date

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

Date
Dean of College
Date

Submitted to Coordinating Board by:

Date
Chair, QC or UCE
Date

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 – 07/14
CVEN 602: Remote Sense in Hydrology
Spring Semester
Tuesdays and Thursdays, 2:20-3:35pm
Civil Building, 115

Instructor: Dr. Huilin Gao
Office: CE/TTI 410A
Office Hours: 4:00-5:00pm, Monday, Wednesday
Telephone: (979) 862-2581
Email: hgaocivil.tamu.edu
Website: http://ceprofs.tamu.edu/hgao

Course Objectives
Satellite remote sensing is a viable source of observations of land surface hydrologic fluxes and state variables, particularly in regions where in situ networks are sparse. Over the past several decades, the study of land surface hydrology using remote sensing techniques has advanced greatly. This is primarily due to the launch of a suite of research satellite platforms, and to the development of more sophisticated retrieval algorithms. This course focuses on introducing the satellite platforms, retrieval algorithms, data products, and applications for constituent variables in the land surface water balance that are observable via remote sensing (at varying spatial and temporal resolutions and accuracy). Specifically, after completing this course, you should be able to know how to use remote sensing products to enhance your own academic research.

Course Details

Catalog Description: Remote Sensing in Hydrology (3-0). Credit 3. Precipitation; evapotranspiration; soil moisture; snow and ice; terrestrial water storage variations; land surface properties; water quality.
Prerequisites: CVEN 463 and/or CVEN 627 or registration therein. Basic programming skills recommended. If you are at all uncertain about your preparation for this course, please contact Dr. Gao.

Course Website: http://ecampus.tamu.edu

Course Assignments, Grading, and Policies

<table>
<thead>
<tr>
<th>Task</th>
<th>Percentage of Grade</th>
<th>Grade Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class participation</td>
<td>5%</td>
<td>A ≥ 90%</td>
</tr>
<tr>
<td>Homework</td>
<td>40%</td>
<td>80% ≤ B &lt; 90%</td>
</tr>
<tr>
<td>Midterm</td>
<td>20%</td>
<td>70% ≤ C &lt; 80%</td>
</tr>
<tr>
<td>Final project</td>
<td>35%</td>
<td>60% ≤ D &lt; 70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F &lt; 60%</td>
</tr>
</tbody>
</table>

Grading Policies: Requests for regrading must be completed within one week after the exam or homework is returned.
Absences and Course Participation: All absences will be handled according to TAMU Student Rule 7 (http://student-rules.tamu.edu/rule07), which states: "The university views class attendance as an individual student responsibility. Students are expected to attend class and to complete all assignments. Instructors are expected to give adequate notice of the dates on which major tests will be given and assignments will be due [i.e. this syllabus]." Homework assignments will have due dates extended by the number of days of excused absence. All excused absences must have appropriate documentation submitted to the instructor.

ADA 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 or call 845-1637. Students already registered with Disability Services are encouraged to contact me as soon as possible, to make appropriate arrangements.

Academic Integrity Statement: "An Aggie does not lie, cheat, or steal or tolerate those who do." Texas A&M students, as part of their professional training, are expected to understand and follow the Aggie honor code, which may be found at www.tamu.edu/aggiehonor. The Dean of Faculties asks us to remind you that, "Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements of the processes of the Honor System."

Tentative Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/19, 1/21</td>
<td>Introduction and physical principles</td>
</tr>
<tr>
<td>2</td>
<td>1/26, 1/28</td>
<td>Remote sensing application to hydrologic monitoring and modeling – an overview</td>
</tr>
<tr>
<td>3</td>
<td>2/2, 2/4</td>
<td>Precipitation: ground-based and space-borne radar</td>
</tr>
<tr>
<td>4</td>
<td>2/10, 2/12</td>
<td>Precipitation: single and multiple satellite precipitation</td>
</tr>
<tr>
<td>5</td>
<td>2/16, 2/18</td>
<td>Landsat&amp;AVHRR; Moderate Resolution Imaging Spectroradiometer (MODIS)</td>
</tr>
<tr>
<td>6</td>
<td>2/23, 2/25</td>
<td>Cloud and radiation; Evapotranspiration</td>
</tr>
<tr>
<td>7</td>
<td>3/1, 3/3</td>
<td>Evapotranspiration; Soil moisture</td>
</tr>
<tr>
<td>8</td>
<td>3/8, 3/10</td>
<td>Soil moisture; Snow and Ice</td>
</tr>
<tr>
<td>9</td>
<td>3/22, 3/24</td>
<td>Midterm; Surface water</td>
</tr>
<tr>
<td>10</td>
<td>3/29, 3/31</td>
<td>Surface water; Flood detection</td>
</tr>
<tr>
<td>11</td>
<td>4/5, 4/7</td>
<td>Groundwater; Remote sensing data &amp; products</td>
</tr>
<tr>
<td>12</td>
<td>4/12, 4/14</td>
<td>Closing the water budget through remote sensing; Remote sensing in hydrologic monitoring and forecasting</td>
</tr>
<tr>
<td>13</td>
<td>4/19, 4/21</td>
<td>Land-use and catchment characteristics</td>
</tr>
<tr>
<td>14</td>
<td>4/26, 4/28</td>
<td>Water quality; future perspectives</td>
</tr>
<tr>
<td>15</td>
<td>5/3</td>
<td>Review and Wrap-up</td>
</tr>
</tbody>
</table>
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional

Submit original form and attach a course syllabus.

Form Instructions:
1. Course request type: □ Undergraduate ✓ Graduate □ First Professional (DDS, MD, JD, PharmD, DVM)
2. Request submitted by (Department or Program Name): Zachry Department of Civil Engineering
3. Course prefix, number and complete title of course: CVEN 642 Water-Energy-Food Nexus: Toward Sustainable Resource Management
4. Catalog course description (not to exceed 50 words):
   Study the principles and application of the Water-Energy-Food nexus to state, national and international Water-Energy-Food securities and the interlinkages between them. Explore a quantitative framework to develop and assess sustainable tradeoffs of resources. Hands on experiences: following subject matter fundamentals, students will work on relevant real world projects or case studies.

5. Prerequisite(s):
   Strong analytical background; with consent of Instructor

6. Is this a variable credit course? □ Yes ✓ No
7. Is this a repeatable course? □ Yes ✓ No
   If yes, from ______ to ______
   If yes, this course may be taken ______ times.

8. Will this course be repeated within the same semester? □ Yes □ No
   If yes, this course may be taken ______ times.

9. Will this course be submitted to the Core Curriculum Council? □ Yes ✓ No
   If yes, this course may be taken ______ times.

10. How will this course be graded? ✓ Grade □ S/U □ P/F (CLMD)

11. This course will be:
   a. required for students enrolled in the following degree programs(s) (e.g., B.A. in history)
   MS CVEN, ME CVEN, PhD CVEN
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

12. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

13. Approval recommended by:

   Robin Autenleh
   Department Head or Program Chair (Type Name & Sign) Date
   Stephen W. Searcy
   Department Head or Program Chair (Type Name & Sign) Date

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 - 07/14
Water-Energy-Food Nexus: Toward Sustainable Resource Management
Spring 2017 Course Syllabus (CVEN 642-BAEN 642)

Instructor: Dr. Rabi H. Mohtar
E-mail: mohtar@tamu.edu
Office: Civil Engineering 401B and Scoates Hall 306B
Phone: 979-458-9886
Website: www.wefnexus.tamu.edu
Office Hours: by appointment
Class Day, Time, & Location: TR 9:35-10:50 SCTS 144

Course Description (3 lectures)
Study the principles and application of the Water-Energy-Food nexus to state, national and international Water-Energy-Food securities and the interlinkages between them. Explore a quantitative framework to develop and assess sustainable tradeoffs of resources. Hands on experiences: following subject matter fundamentals, students will work on relevant real world projects or case studies.

Prerequisites: Strong analytical background; with consent of instructor

Textbook/Resource Materials: Current literature will be used. In addition, the Water-Energy-Food nexus tool developed by Mohtar and Daher (2014) will be used in this course. The tool designed off a scenario-based framework that quantifies the interlinkages and tradeoffs between these resources. Reading material will be available on the course website.

Grading Policies:
Grading scale (A=90-100, B=80-89, C <80).
Final project/paper = 40%
Presentation(s) = 20%
Biweekly progress reports = 30%
Class attendance and participation = 10%

Learning Outcomes:
By the end of the semester, you should be able to:
> Understanding of the global risks and the how the nexus can drive sustainability of the resources management and allocation
> Explicitly quantify the inter-linkages of the Water, Energy, Food systems and how to identify a nexus hot spot for a specific condition
> Competent in running the nexus tool to simulate and conduct tradeoff analysis for the scenario of interest
> Understand how engineering and analytics interface with economics, policy and supply chain at local and global scale.
> Explore nexus friendly solutions for a specific case study towards a more sustainable resource nexus
Homework Assignments, test dates
Weekly assignments are expected and are listed by week on the syllabus.

Sample Lab/Case Studies: The instructor will meet potential students prior to the beginning of the semester to explore case studies and data gathering.
The Water-Energy-Food nexus is a crosscutting theme. We therefore aim to provide at least two case studies to connect domestic water use with industrial and agricultural use. The scope of the case studies is to provide the young generation with improved knowledge on water use all along the food supply chain. The following themes would be explored:

1. Securing clean water: Providing access to safe drinking water, revealing the extent of water use and thereby teaching a new generation on how to reduce water stress in the food value chain
2. Green agriculture: Growing agricultural production through innovative clean energy technologies and reduced carbon emissions
3. Role of renewable energy in energy portfolio and in bridging water and food gap.

Sample Case Studies to be explored through students projects:
   a. Solar-Desalination
   b. Soil - Water – Food
   c. Water-wastewater reuse
   d. Transportation- fracking- water
   e. Energy-Food (bioenergy)

Calendar of activities, major assignments, test dates
Course will meet three hours weekly, biweekly written progress reports, and Final report due last meeting of class

Attendance and make-up policies
If an absence is excused, the instructor will either provide an opportunity to make up any quiz, exam or other work that contributes to the final grade or provide a satisfactory alternative by a date agreed upon by the student and instructor. The make-up work must be completed in a timeframe not to exceed 30 calendar days from the last day of the initial absence. See Student Rule 7 http://student-rules.tamu.edu/rule07 for details of excused absences. The fact that these are university-excused absences does not relieve the student of responsibility for prior notification and documentation. Failure to notify and/or document properly may result in an unexcused absence. Falsification of documentation is a violation of the Honor Code.

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 845-1637. For additional information visit http://disability.tamu.edu.

Academic Integrity Statement and Policy - website link http://aggishonor.tamu.edu
"An Aggie does not lie, cheat or steal, or tolerate those who do."
<table>
<thead>
<tr>
<th>Week 1</th>
<th>Resource scarcity and spatial variability</th>
</tr>
</thead>
</table>
| Jan 31st | a. Introduction to ecosystems and ecosystem services  
b. Introduction to system's theory  
c. Situational analysis of water, energy, and food resources at the state, national and international levels  
Stresses on the resources (climate change, population, financial, health, governance, etc.) |
| Assignment | What are the nexus hotspots in the water, energy, food areas locally or worldwide (2-3 pages) |
http://unesdoc.unesco.org/images/0022/002257/225741e.pdf  
### Week 2  Jan 28th  Interdependencies in resources I

<table>
<thead>
<tr>
<th>Content</th>
<th>Nexus elements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Water for food</td>
</tr>
<tr>
<td></td>
<td>b. Water for energy</td>
</tr>
<tr>
<td>Assignment</td>
<td>Individual Semester Class Project Scope</td>
</tr>
<tr>
<td></td>
<td>Online data resources for water-energy-food</td>
</tr>
</tbody>
</table>

### Week 3  Feb 2nd  Interdependencies in resources II

<table>
<thead>
<tr>
<th>Content</th>
<th>Nexus elements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Energy for water</td>
</tr>
<tr>
<td></td>
<td>b. Energy for food</td>
</tr>
<tr>
<td></td>
<td>c. Food for energy</td>
</tr>
<tr>
<td></td>
<td>Introduction to the nexus</td>
</tr>
<tr>
<td>Assignment</td>
<td>Project Groups and Project Timeline</td>
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</tbody>
</table>


<table>
<thead>
<tr>
<th>Week 4</th>
<th>Feb 9th</th>
<th>Virtual Water (guest lecture by Tony Allan, King’s College London)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>History of the virtual water concept</td>
<td>What is food-water Analysis of the nexus through a supply chain framework</td>
</tr>
<tr>
<td>Assignment</td>
<td>Articulate research questions</td>
<td>Outline project timeline Describe system inter-dependencies</td>
</tr>
<tr>
<td>Readings</td>
<td>Virtual Water by Tony Allan</td>
<td><a href="http://www.amazon.com/gp/offer-listing/1845119843/ref=tmm_pap_used_olp_%7Bsr?ie=UTF8&amp;condition=used&amp;sr=%7D&amp;qid=">http://www.amazon.com/gp/offer-listing/1845119843/ref=tmm_pap_used_olp_{sr?ie=UTF8&amp;condition=used&amp;sr=}&amp;qid=</a></td>
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</tbody>
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<table>
<thead>
<tr>
<th>Week 5</th>
<th>Feb 16th</th>
<th>Nexus Success Stories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>. Energy (renewables, example solar farm)Water (alternative water,</td>
<td></td>
</tr>
</tbody>
</table>
Singapore

- Food (low input farming, Nebraska, ICARDA or ICBA)
- Sahara Forest Project
- Stewart Orr (Water Stewardship Concept)

**Assignment**
Describe full data and data gaps for all the system interconnectedness

**Readings**
Water Stewardship


<table>
<thead>
<tr>
<th>Week 6</th>
<th>Feb 23rd</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td>Localizing water and food security</td>
</tr>
<tr>
<td></td>
<td>Localizing water and food security</td>
</tr>
<tr>
<td></td>
<td>Conceptual modelling (local-global nexus)</td>
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<tr>
<td></td>
<td>Green water definition and accounting</td>
</tr>
<tr>
<td></td>
<td>Water reuse</td>
</tr>
<tr>
<td></td>
<td>Water conservation</td>
</tr>
<tr>
<td></td>
<td>Technology (supplementary irrigation, genetics and breeding...)</td>
</tr>
</tbody>
</table>

| **Assignment** | Development of scenarios and analysis framework |
| **Readings** | UN Concept paper (Mohtar, Assi, Daher) |
|              | Integrative Modeling (Braudeau and Mohtar) |


<table>
<thead>
<tr>
<th>Week 7</th>
<th>March 2nd</th>
<th>Energy security and role of renewable energy in bridging the water and food gap</th>
</tr>
</thead>
</table>
| Content | Tradeoffs and Nexus solutions  
        Systems Modelling  
        Introduction to Nexus Tools | |
| Assignment | Initial simulation/analytics/analysis | |
| Readings | IRENA Report | |

<table>
<thead>
<tr>
<th>Week 8</th>
<th>March 9th</th>
<th>Quantitative Nexus Framework</th>
</tr>
</thead>
</table>
| Content | Tradeoffs and Nexus solutions  
        Systems Modelling  
        Introduction to Nexus Tools | |
| Assignment | Analytics and analysis | |
| Readings | Nexus Tool Chatham house (Mohtar and Daher)  
        Nexus Tool paper (Daher and Mohtar, SP WI) | |

| Week 9 | March 16-20 | Monday: Today, Spring Break (Wed-Fri Faculty and Staff holiday) |

| Week 10 | March 23rd | Mid-Year Class Presentations |

<table>
<thead>
<tr>
<th>Week 11</th>
<th>March 30th</th>
<th>Nexus Tool 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Examples case studies using the nexus tools by the instructor. Data preparation and file management</td>
<td></td>
</tr>
<tr>
<td>Assignment</td>
<td>Updated report draft</td>
<td></td>
</tr>
<tr>
<td>Readings</td>
<td>Same as above</td>
<td></td>
</tr>
</tbody>
</table>

| Week 12 | April 6th | Catching up with unfinished material from Nexus Analytics |

<table>
<thead>
<tr>
<th>Week 13</th>
<th>April 13th</th>
<th>Environmental policy (guest lecture by Gabe Eckstein, Ray Stephan, Ron Kaiser)</th>
</tr>
</thead>
</table>
| Content | Environmental policy  
        Regulations  
        Policy reform | |
<p>| Assignment | Report draft | |
| Readings | TBD | |</p>
<table>
<thead>
<tr>
<th>Week 14  April 20th</th>
<th>Lessons learned and current gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>From Science to policy (framework elaborated)</td>
</tr>
<tr>
<td></td>
<td>Lessons learned</td>
</tr>
<tr>
<td></td>
<td>Future Nexus governance</td>
</tr>
<tr>
<td>Assignment</td>
<td>Enhanced project report</td>
</tr>
<tr>
<td>Readings</td>
<td>No reading assignment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 15  April 27th</th>
<th>One Day Symposium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Student presentations</td>
</tr>
<tr>
<td></td>
<td>Nexus stakeholder panel discussion between students and decision-makers from the public and private sector</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 16  May 4th</th>
<th>Final Report Due</th>
</tr>
</thead>
</table>
Mark,

The Bush School supports BAEN 642 and CVEN 642 Water-Energy-Food-Nexus courses without reservation.

Leonard,

Leonard Bright, Ph.D.
Associate Professor
Assistant Dean of Graduate Education
Public Service and Administration Department
Bush School of Government and Public Service
Texas A&M University
College Station, TX
lbright@tamu.edu
Phone: 979-862-3028

I will defer to and concur with Kent.

Jeryl

Sent from my Verizon Wireless 4G LTE DROID
On Dec 10, 2015 9:30 AM, "Bright Jr, Leonard A" <lbright@tamu.edu> wrote:

Excellent
------ Original message------
From: Portney, Kent E
Date: Thu, 12/10/2015 9:28 AM
To: Bright Jr, Leonard A; Mumpower, Jeryl L; Vedlitz, Arnold;
Subject: RE: GC Friendly Amendment

Leonard,

Thanks for your note about the cross-listed nexus courses. I am familiar with what prof mohtar is doing with these and have consulted with him on some of the content. His efforts are mostly fairly technical, and I am very supportive of what he is trying to do. Eventually we at the Bush school might want to do some sort of nexus policy and management course but for now incorporating these issues into existing environment, water, and science and technology policy courses will suffice.
Hope this helps. Let me know if you need anything else.

- kent

Sent via the Samsung GALAXY S® 5, an AT&T 4G LTE smartphone

-------- Original message --------
From: "Bright Jr, Leonard A" <lbright@tamu.edu>
Date: 12/10/2015 10:12 AM (GMT-05:00)
To: "Mumpower, Jeryl L" <jmumpower@tamu.edu>, "Portney, Kent E" <kportney@tamu.edu>, "Vedlitz, Arnold" <avedlitz@tamu.edu>
Subject: FW: GC Friendly Amendment

Jeryl, Kent, and Arnie

Attached are two cross-listed courses that have been proposed as new courses on the water, energy, and food nexus. Since we also teach courses in this area, we should provide a letter of support. Let me know as soon as you can, if you have any issue with them.

Leonard

Leonard Bright, Ph.D.
Associate Professor
Assistant Dean of Graduate Education
Public Service and Administration Department
Bush School of Government and Public Service
Texas A&M University
College Station, TX
lbright@tamu.edu
Phone: 979-862-3028

From: Mark Zoran
Sent: Wednesday, December 09, 2015 2:54 PM
To: Matthew Pariyothorn <mattp@tamu.edu>
Cc: Prasad Enjeti <enjeti@tamu.edu>; Bright Jr, Leonard A <lbright@tamu.edu>; Johnson, LaRhesa J <lrjohnson@tamu.edu>

Subject: GC Friendly Amendment

Hello Matt,

At last Thursday's GC meeting it was amended that BAEN and CVEN would get letters (or emails) of support from Dr. Bright at the Bush School regarding BAEN 642 and CVEN 642 Water-Energy-Food-Nexus. Can you work with the programmatic coordinator (or department head) in charge of this course request to reach out to Dr. Bright for this approval? Unfortunately, we need this as soon as possible.

Thanks,

Mark

----------------------------------------

Mark J. Zoran, PhD
Professor of Biology and Neuroscience
Department of Biology
Associate Dean for Faculty Affairs and Graduate Studies
College of Science
Chair, Graduate Council
Texas A&M University
College Station, TX 77843-3257
Tel. 979-845-8099 (Biology)
Tel. 979-458-8001 (Science)
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Course request type:
   - Undergraduate
   - Graduate
   - First Professional (DDS, MD, JD, PharmD, D.V.M.)

2. Request submitted by (Department or Program Name):
   Zachary Department of Civil Engineering

3. Course prefix, number and complete title of course:
   CVEN 650 Stochastic Mechanics

4. Catalog course description (not to exceed 50 words):
   This course introduces the use of Bayesian inference methods to solve mechanical inverse problems with varying evidence conditions: experimental observations, model complexity and expert beliefs. This solution represents the probabilistic calibration of models with varying parameters in space and time, in the form of boundary conditions, material properties, and even numerical parameters. The course is intended to improve significantly the scientific and engineering inferences stemmed from research practice.

5. Prerequisite(s):
   STAT 201
   Cross-listed with: N/A
   Stacked with: N/A

6. Is this a variable credit course?
   - Yes
   - No
   If yes, from _______ to _______

7. Is this a repeatable course?
   - Yes
   - No
   If yes, this course may be taken _______ times.

8. Will this course be repeated within the same semester?
   - Yes
   - No

9. Will this course be submitted to the Core Curriculum Council?
   - Yes
   - No

10. How will this course be graded?
    - Grade
    - S/U
    - P/F (CLAD)

11. This course will be:
    a. required for students enrolled in the following degree programs(s) (e.g., B.A. in history)
       N/A
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
       N/A

12. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

13. Designation

   CVEN 650 Stochastic Mechanics

   Instructor
   Title (including pronunciation)

   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)

   Dean of College  Date

   Submitted to Coordinating Board by:
   Chair, GC or UCC  Date

   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 – 07/14
SVLLABUS

CVEN-650: Stochastic Mechanics
Spring 2016

Instructor
Prof. Zenon Medina-Cetina
808 'S' CVLB Building
Office Hours: TBA, or by appointment
Office phone number: (979) 845-6567

Schedule and Location
TBA

Prerequisites
Statistics and Probability at the undergraduate level
Advanced Mechanics at the graduate level (can vary depending on the student's specialty)

Lecture Periods
Lecture period = 3 hours/week

E-mail, class communications, notes, grade reports
Only via e-campus at http://ecampus.tamu.edu

Course Objective
This course is oriented towards the application of probabilistic techniques for solving inverse problems of mechanical nature. The course focus is in simulating realistic scenarios where both the forward model predictions and the conditioning experimental observations used to parameterize it, may vary. Varying scenarios for the forward model include initial and boundary conditions, loading and excitations, material composition, number of 'physics' (mechanics, thermal, hydro, bio, chemical), for the model's numerical parameters (e.g. mesh resolution, time integration, etc.), and even for the numerical probabilistic sampling (e.g. probabilistic hyper-parameters, sampling step, correlation parameters, etc.). Varying scenarios for the experimental observations may vary in type (e.g. temperature, displacements, pressure, solution content, etc.). Furthermore, the elements of the forward model, the experimental observations, and the numerical probabilistic sampling may vary in space and time. The aim is to measure the impact of formulating mechanistic predictions based on available evidence via Uncertainty Quantification techniques.

Approach
The proposed approach aim at generating measurable impacts of evidence in the understanding of mechanistic processes, to provide improved inferences that can facilitate decision making when these are addressed in terms or reliability or risk. For this purpose, a 'hands on' approach is considered, implying the use of computational coupling between probabilistic assessment techniques, and
current mechanical solvers. This means that a non-intrusive approach will be privileged (i.e. all what will be required is an input, executable solver, and output file), although theoretical considerations will be outlined, to formulate an intrusive approach (i.e. when the varying processes are handled inside the mechanistic solvers, and access to their code is permitted).

**Course Contents**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stochastic Mechanics as an Evidence-Based Approach for Improved Decision-Making: The impact of incorporating evidence in the understanding of a given mechanical problem as it becomes available (i.e. model predictions, experimental observations, and expert's beliefs).</td>
<td>1</td>
</tr>
<tr>
<td>Elements of Statistics and Probability.</td>
<td>2</td>
</tr>
<tr>
<td>Design of Experiments</td>
<td>3</td>
</tr>
<tr>
<td>Simulation of Random Fields and Stochastic Processes:</td>
<td>4</td>
</tr>
<tr>
<td>From Spatial and Temporal to Spatio-Temporal; from Single to Multivariate; from Stationary Gaussian to Non-Stationary Non-Gaussian</td>
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<tr>
<td>Spectral Methods</td>
<td>5</td>
</tr>
<tr>
<td>Geostatistical Methods</td>
<td>6</td>
</tr>
<tr>
<td>Series Expansion Methods: Karhunen-Loeve and Polynomial Chaos</td>
<td>7</td>
</tr>
<tr>
<td>Kalman Filtering</td>
<td></td>
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<tr>
<td>Bayesian Forecasting</td>
<td></td>
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<tr>
<td>Causal Probability</td>
<td>8</td>
</tr>
<tr>
<td>Bayesian Networks</td>
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<tr>
<td>Inverse Problem Theory: Deterministic and Probabilistic</td>
<td>9</td>
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<tr>
<td>Elements of Inverse Theory</td>
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<tr>
<td>Experimental Observations</td>
<td>10</td>
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<tr>
<td>Optimization-Based Approach</td>
<td>11</td>
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<tr>
<td>Bayesian Approach</td>
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<tr>
<td>Tarantola's Approach</td>
<td>12</td>
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<tr>
<td>Computational Statistics</td>
<td>13</td>
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<tr>
<td>Markov Chain Monte Carlo</td>
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<tr>
<td>Parallel Computing</td>
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<tr>
<td>Sensitivity Analysis</td>
<td>14</td>
</tr>
<tr>
<td>Use of Surrogate Models</td>
<td>15</td>
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</tbody>
</table>
SYLLABUS

**Professional course outcomes**
Upon completion of the course, students will be able to:

- Identify key uncertainty sources from available scientific evidence for a given engineering process, and formulate what their impacts are on the mechanistic model predictions of interest.
- Understand the fundamental principles of current approaches for the deterministic solution of inverse problems.
- Understand the fundamental principles of current approaches for the simulation of multivariate spatio-temporal processes based on stochastic or random field models.
- Formulate and implement theoretical and computational probabilistic solutions of a given inverse problem, where the domain of interest or/and the participating parameters are multivariate spatio-temporal processes simulated via stochastic or random field models.
- Present results of the probabilistic solution of a given inverse problem in the form of a draft for the publication of a journal paper.

**Method of Evaluation**
This course will be evaluated by the submission of assignments, one midterm and a final examination.

- Weekly assignments will be formulated according to the course contents.
- Midterm and Final
  - Midterm scheduled for the 3\textsuperscript{rd} week of March.
  - Final exam scheduled according to the Registrar’s office: [http://registrar.tamu.edu/](http://registrar.tamu.edu/).

The final grade will be comprised of:

<table>
<thead>
<tr>
<th>Evaluation Method</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>30</td>
</tr>
<tr>
<td>Midterm</td>
<td>30</td>
</tr>
<tr>
<td>Final</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
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</tbody>
</table>

The grading criteria to be applied for each grade are defined as:
SYLLABUS

<table>
<thead>
<tr>
<th>Grade</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Outstanding ability for problem solving, logic and cleanliness in the presentation of results. Greater than or equal to 90 % credit</td>
</tr>
<tr>
<td>B</td>
<td>Acceptable ability for problem solving, logic and cleanliness in the presentation of results. Greater than or equal to 80 % credit and less than 90 % credit</td>
</tr>
<tr>
<td>C</td>
<td>Limited ability for problem solving, logic and cleanliness in the presentation of results. Greater than or equal to 70 % credit and less than 80 % credit</td>
</tr>
<tr>
<td>D</td>
<td>Poor ability for problem solving, logic and cleanliness in the presentation of results. Greater than or equal to 60 % credit and less than 70 % credit</td>
</tr>
<tr>
<td>F</td>
<td>Unacceptable ability for problem solving, logic and cleanliness in the presentation of results. Less than 60 % credit</td>
</tr>
</tbody>
</table>

Additional information regarding student academic rules can be found at http://student-rules.tamu.edu.

References

There is no precedent of a textbook that can capture the integration between stochastic and random field theory with mechanical processes from an engineering perspective. For this reason it is not proposed a specific textbook for the course, for which it is expected to be based on the Instructor’s notes, and supporting references including textbooks and journal papers that are provided below.

- Class Notes, published via e-learning.

- Textbooks:


SYLLABUS


Scientific Journals:


SYLLABUS


Class Rules

- Assignments should be submitted via e-learning. Lack of a grade on any of these will be given automatically zero credit at the end of the course. Students are responsible of checking their grades as these are posted on e-learning.
SYLLABUS

- Late assignments will be penalized 50% only if this is submitted within the week after the deadline. Zero credit will be given after that. In the case of a valid excuse according to University rules (http://student-rules.tamu.edu/rule07), an official document should be submitted to the instructor to arrange for a non-penalized submission.
- In the case of missing a lecture, it is the student's responsibility to follow the course contents through the instructor's notes posted on e-learning, the references provided in this syllabus, and to submit on time the corresponding assignments and final report.
- The use of portable devices for communication during lectures is prohibited.
- The instructor reserves the right to ask a student to leave the classroom if his/her behavior is not acceptable for the standards of excellence expected for an Aggie.
- All assignments must be prepared individually unless otherwise instructed. Copying is not permitted and is considered cheating. Teamwork is strongly advised, in the spirit of collaborating to clarify methods, concepts and procedures needed to advance in the reports, presentations and paper.
- Cheating will not be tolerated. Cheating will be reported and handled in accordance with the Aggie Honor System Process. Examinations will be open book and notes; however "looking at another student's examination or using other external aids (e.g. calculators, conversation with other students, or use of electronic devices)" during these examinations is a violation of Texas A&M Aggie Honor Code, unless specifically allowed in advance by the instructor.
- The handouts used in this course are copyrighted. By "handouts," it is understood all materials generated for this class, which include but are not limited to syllabi, class notes, and class presentations. Because these materials are copyrighted, you do not have the right to copy them unless the instructor expressly grants permission.
- The instructor strongly suggests that the class content be studied before the corresponding lecture. And that notes taken during the lecture be amplified through use of the text and the other referenced material, and by asking him questions during and after class. It is important that the student use a great deal of care in advancing the preparation of the reports and paper.
- The student authorizes the instructor to return graded class material on a specified location (TBA) where all class students can have free access to it as a way to expedite the grading process and avoid using time class for this purpose. The student will collect only his/her graded material.

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 845-1637. For additional information visit http://disability.tamu.edu.
SYLLABUS

University Statement on Harrasment and Discrimination
Texas A&M is committed to the fundamental principles of academic freedom, equality of opportunity and human dignity. To fulfill its multiple missions as an institution of higher learning, Texas A&M encourages a climate that values and nurtures collegiality, diversity, pluralism and the uniqueness of the individual within our state, nation and world. All decisions and actions involving students and employees should be based on applicable law and individual merit. Texas A&M University, in accordance with applicable federal and state law, prohibits discrimination, including harassment on the basis of race, color, national or ethnic origin, religion, sex, disability, age, sexual orientation, or veteran status. Individuals who believe they have experienced harassment or discrimination prohibited by this statement are encouraged to contact the appropriate offices within their respective units. Students should contact the Office of the Dean of Student Life at 845-3111.

Texas A&M academic integrity statement and policy
This course is based on the Aggie academic integrity statement policy:

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

I agree to the terms and conditions described in this course's syllabus and rules:

__________________________________________________________________________
Student's name

__________________________________________________________________________
Student's signature Date
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

1. Course request type:  □ Undergraduate  □ Graduate  □ First Professional (DDS, MD, JD, PharmD, DVM)
2. Request submitted by (Department or Program Name): Department of Electrical and Computer Engineering
3. Course prefix, number and complete title of course: ECEN 765 Machine Learning with Networks
4. Catalog course description (not to exceed 50 words): Scientific analysis of large-scale data may discover useful knowledge. While many machine learning courses focus on analyzing data in a matrix format without taking care of relationships among variables, the major focus of this course is to introduce advanced methods that are designed to analyze structured data represented as networks.

5. Prerequisite(s):
   Approval of instructor

   Cross-listed with:  Stacked with:

6. Is this a variable credit course?  □ Yes  □ No  If yes, from _________ to _________
7. Is this a repeatable course?  □ Yes  □ No  If yes, this course may be taken _________ times.
   Will this course be repeated within the same semester?  □ Yes  □ No
8. Will this course be submitted to the Core Curriculum Council?  □ Yes  □ No
9. How will this course be graded:  □ Grade  □ S/U  □ P/F (CLMD)
10. This course will be:
   a. required for students enrolled in the following degree programs(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

11. Masters and Ph.D. students in Electrical Engineering, and Computer Engineering
12. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.
13. Prefix  Course #  Title (excluding punctuation)
    ECEN  765  MACH LEARN W/ NET

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Approval recommended by: [Signature]

Date: 10/15/2015

Department Head or Program Chair (Type Name & Sign)

Chair, College Review Committee

Date: 12-15-15

Dean of College

Chair, GC or UCC

Date: [Signature]

Effective Date

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 – 07/14
Course title and number  ECEN 765 Machine Learning with Networks
Term  TBD
Meeting times and location  TBD

Course Description and Prerequisites

In the past decades, with two main technology advancements: Internet and high-throughput molecular profiling techniques, we have witnessed the outburst of the unprecedented amount of data from different disciplines, such as biology, engineering, social science, etc. The scientific analysis of these extremely large-scale data is critical to discover useful knowledge that benefits human beings. Machine learning provides a set of important tools to find patterns and generalize rules from data. While many machine learning courses focus on analyzing data in a matrix format without seriously taking care of relationships among variables, the major focus of this course is to introduce basic machine learning techniques together with the advanced methods that are designed to analyze structured data, typically represented as graphs or empirical networks. The course covers the basics of machine learning (supervised and unsupervised learning) focusing on Bayesian reasoning, basic graph theory, as well as some advanced, recent research topics.

Prerequisites:
1. Undergraduate-level linear algebra, multivariate calculus, and probability theory
2. Basic programming skills in any programming language (Matlab, Python, C, C++, Java, etc.)

There will be a lot of math and statistics in this course, please do talk to me about prerequisites if you are not sure.

Learning Outcomes

At the end of this course, the students should
1. Have good knowledge of basic machine learning and Bayesian reasoning methods.
2. Identify and understand real-world applications of machine learning methods.
3. Have hands-on experience on analyzing real-world data with the integration of relationships among different variables.

Instructor Information

Name  Xiaoning Qian
Telephone number  979-845-6268
Email address  xqian@ece.tamu.edu
Office hours  Friday 11:00AM-noon
Office location  WERC214H

Textbook and/or Resource Material

Textbook: Bayesian Reasoning and Machine Learning by D Barber (ISBN 9780521518147)
Recommended Reading:
4. Elements of Statistical Learning by T Hastie, R Tibshirani, and J Friedman (ISBN 0387952845)
6. Other relevant surveys and papers will be distributed in class.

Grading Policies

Grading is relative. The plus/minus grading system will be applied. The final grade will be based on the following weights (tentative):
Homework assignments (50%) + Midterm exam (30%) + Final project (20%)

Grading scale: 90-100 A, 80-89 B, 70-79 C, 60-69 D, below 60 F.
Collaboration Policy: You are welcome to collaborate on homework and the final project. However, you must write the solutions and reports on your own and acknowledge your collaborators.

Attendance and Make-up Policies

Attendance and make-up policies will follow the general student rule of the university: http://student-rules.tamu.edu/rule07.

Course Topics, Calendar of Activities, Major Assignment Dates

| Week 1-2  | Course overview; Math refresher: graph and probability theory |
| Week 3-6  | Learning with unstructured data (supervised and unsupervised linear models) |
| Week 7-10 | Structured sparse models (learning with network prior) |
| Week 11-13| Markov models (network clustering and network diffusion) |
| Week 14-15| Bayesian networks and real-world applications |

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://aggiehonor.tamu.edu

"An Aggie does not lie, cheat, or steal, or tolerate those who do."
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
- Submit original form and attach a course syllabus.

Form Instructions
1. Course request type:  □ Undergraduate  ✔ Graduate  □ First Professional (e.g., MD, DDS, etc.)
2. Request submitted by (Department or Program Name):  Dwight Look College of Engineering
3. Course prefix, number and complete title of course:  ENGR 630  Fundamentals of Subsea Engineering
4. Catalog course description (not to exceed 50 words):
Orientation to subsea engineering fundamentals, including SURF (Subsea, Umbilicals/Controls, Risers, Flowlines) equipment and configurations; exposure to practical, industry focused problems; subsea equipment components; design considerations and design drivers; subsea production operations; integrity critical maintenance activities.

5. Prerequisite(s):
Restriction – graduate classification, Enrolled in Dwight Look College of Engineering or approval of instructor
Cross-listed with:
Stacked with:  SUBS 401

6. Is this a variable credit course?  □ Yes  ✔ No  If yes, from ___ to ___
7. Is this a repeatable course?  □ Yes  ✔ No  If yes, this course may be taken ___ times.
   Will this course be repeated within the same semester?  □ Yes  ✔ No
8. Will this course be submitted to the Core Curriculum Council?  □ Yes  ✔ No
9. How will this course be graded?  ✔ Grade  □ S/U  □ P/F (CLMD)
10. This course will be:
   a. required for students enrolled in the following degree programs(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
      M. Eng. in Engineering

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.
12. ✔ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix  Course #  Title (excluding punctuation)
   SUBS  601  FUND SUBSEA ENGR
   Lect. Lab Other SCH CIP and Fund Code Admin. Unit Acad. Year  HCE Code
   3.00  0.00  0.00  3.00  1424010006  0965  16  -  17  0  0  3  6  3  2
   Level 6

Approval recommended by:
Dr. John Hurtado  11/11/15
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:
Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 07/14
ENGR 630: Fundamentals of Subsea Engineering

Instructor: Mr. Grayum L. Davis
Telephone: (832) 368-7113
Email: g13@tamu.edu
Location: Engineering Activities Building C
Hours: TBA

Course Description:
This course provides a thorough orientation to subsea engineering fundamentals, covering the full suite of SURF (Subsea, Umbilicals/Controls, Risers, Flowlines) equipment and configurations. The course is targeted toward students that desire to further their subsea engineering education or are interested in broadening their skills into the multidisciplinary subsea engineering field. The course is intended to provide exposure to practical, industry focused problems, and will be taught by industry experienced experts. Topics covered will include subsea equipment components, design considerations and design drivers, subsea production operations, and integrity critical maintenance activities.

Prerequisites:
A high level of familiarity and competence in the following areas is strongly recommended: 1) materials, 2) Fluid mechanics, 3) Heat transfer, 4) Structures, 5) Electrical circuits/controls.

Overall Course Learning Outcomes
Upon completion of this course, students will be able to:
1. Describe functional requirements of common SURF (Subsea, Umbilicals, Risers, Flowlines) hardware components and configurations.
2. Describe design considerations, troubleshoot subsea control system components
3. Demonstrate a basic understanding of the types of reservoirs, and how reservoir modelling uncertainties impact subsea field architecture.
4. Demonstrate understanding of design drivers for subsea equipment, subsea systems, and interfaces using actual subsea field design data.
5. Demonstrate familiarity with the scope of the various API SC 17 Recommended Practices.
6. Apply design philosophies to new subsea configurations, evaluate options and summarize design considerations for recommended configuration.
7. Demonstrate familiarity with typical subsea materials, corrosion management, seals, and requirements per industry standards
8. Exercise and demonstrate sound and practical engineering judgments involving complex design tradeoffs presented in reality based scenarios, also demonstrate communication skills.
9. Describe and evaluate typical subsea production operations, maintenance activities, and integrity-critical testing and surveillance.
Getting Started
To get started within this course, you will need to:

- Review the syllabus in its entirety
- Login to the course website, eCampus (see directions below), to:
  - ensure that you have access and the correct plug-ins installed (ie. Blackboard Collaborate Plug-In),
  - update your user profile,
  - spend some time becoming familiar with the course layout, and
  - complete the introductory forum.

*Note: Additional details to complete these activities can be found within the eCampus.*

Resource Materials & Course Technology

Required Textbook and Resource Materials:
The required materials for ENGR 689 can be accessed on the TAMU Course Reserves via eCampus. You will be able to access the readings and save the documents associated with the course from the TAMU Course Reserves.

- Dataset from an existing subsea producing field.
- Additional lecture materials and readings will be provided within the course modules on eCampus.

eCampus:
This course will use the TAMU eCampus, powered by Blackboard Learn, as the virtual classroom. Within eCampus, you can find all course related content and assessments (including but not limited to course materials, content, videos, activities, assessments, etc.). The recommended browsers for eCampus access are Mozilla Firefox or Google Chrome (Internet Explorer is not recommended). For additional information on support browsers for eCampus, please visit [http://tx.ag/eCampusBrowserSupport](http://tx.ag/eCampusBrowserSupport).

To login to eCampus:

- Go to [http://ecampus.tamu.edu](http://ecampus.tamu.edu)
- Click the Login button
- Use your TAMU NetID and password to login

Once logged into eCampus, you will see a list of all courses for which you are enrolled in for the semester. To navigate to this course, click on the name of the course. If you have any problems logging into the course, please see the technology support section below.

To navigate the course with eCampus, use the menu on the left side of the browser window. The syllabus and course introductory materials can be found within the "Getting Started & Syllabus" section of the course menu. The weekly modules will be available live and recorded within the "Module Materials" section of the course website. All assessments (ie. assignments and discussions) to be completed as part of the course can be found with the course menu on the left. Each assessment contains a description of the content that you should have learned prior to completing the assessment. Grades for the course can be access by clicking on "My Grades". The link to the weekly Tuesday 7-8pm sessions, can be found in "Module Materials" folder. If you have any questions about navigating eCampus, please contact the instructor.

Technology Requirements & Recommendations:

Technology Requirements:

- Reliable and frequent access to a computer and to the high-speed Internet. If you do not have frequent and reliable access to a computer with Internet connection, please contact the instructor to discuss your situation and determine an appropriate solution.
- To attend virtual office hours, students will need to make sure they have setup Blackboard Collaborate to run on their computer(s) and mobile devices. Please visit [http://blackboard.force.com/publickbarticlereview?id=kA770000000CbijW](http://blackboard.force.com/publickbarticlereview?id=kA770000000CbijW) to check your system requirements and test your connection.
  - It is required to have a microphone and webcam when using Bb Collaborate. While many students use a built in webcam, it is recommended to have a headset with a microphone, such as a smart phone headset, for the virtual office hours and group collaboration.
Course Support

In addition to contacting the instructor or graduate assistant for course content related questions, there are a variety of campus resources for course support.

Academic Services Support:
The Office of Graduate & Professional Studies (OGAPS) offers graduate student services and advocates for graduate education for Texas A&M students who are both on-campus and at a distance. For additional information regarding OGAPS, visit: [http://ogaps.tamu.edu/Home](http://ogaps.tamu.edu/Home)

Technology Support:
For technological issues related to eCampus and software, contact the TAMU Help Desk:

- TAMU IT Help Desk:
  - Website: [http://hdc.tamu.edu/index.php](http://hdc.tamu.edu/index.php) (Online Chat is available)
  - Phone: (979) 845-8300
  - Email: helpdesk@tamu.edu

The TAMU Help Desk is open 24 hours a day 7 days a week. If your technical problems are unable to be resolved within 48 hours, please contact the instructor for additional assistance.

*Technology issues are not an excuse for missing a course requirement – make sure your computer is configured correctly and address issues well in advance of deadlines.*

Course Assignments

This course is designed to provide an interactive and collaborative environment that fosters the development of engineering. Participation in all activities in considered essential to this development. All specific instructions for each assessment are provided in eCampus.

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<td>Final Exam</td>
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Determination of Final Grades within the Course

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# Course Outline

## Module 1: Introduction and Overview

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<thead>
<tr>
<th>Subsea Engineering Overview; Geology Overview; Reservoir Overview</th>
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<td>Watch: Introduction to Subsea Engineering Part 1, 2 and 3 Videos</td>
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<td>Watch: Geology Overview Video</td>
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<td>Participate: Synchronous Weekly Class Meeting</td>
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<td>Post: Introduce Yourselves Forum</td>
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## Module 1.2: Subsea Well Construction Overview

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<td>Watch: Drilling Basics Part 2 Video</td>
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<td>Interact: Well Heads / Prepared by Cameron &amp; One Subsea</td>
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<tr>
<td>Watch: Drilling Basics Part 3 &amp; 4 Videos</td>
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## Module 2: Subsea Field Architecture

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<td>Read: API 17A - Design and Operation of Subsea Production Systems</td>
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<td>Read: API 17TR13 - General Overview of Subsea Production Systems</td>
</tr>
<tr>
<td>Supplemental: Subsea Engineering Handbook - Part I Subsea Production Systems, Chapters 1 &amp; 2</td>
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<tr>
<td>Interact: Introduction to Subsea Production Systems / Prepared by Cameron &amp; One Subsea</td>
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<tr>
<td>Watch: Subsea Field Development Planning Parts 1 - 4 Videos</td>
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<td>Participate: Synchronous Weekly Class Meeting</td>
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## Module 3: Deepwater Riser Design

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<td>Read: OMAE2014-24240 from the Proceedings of the ASME 2014 33rd International Conference on...</td>
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<td>Read: Deepwater Riser Design, Fatigue Life and Standards Study Report; TA&amp;R Project Number 572...</td>
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<tr>
<td>Read: Drilling Riser Management In Deepwater Environments, Madhu Harirahan, Ricky Thethi, 2H...</td>
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<tr>
<td>Supplemental: API 17A Annex A A.10, A.11</td>
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<td>Supplemental: SHE - Part IV Subsea Umbilicals, Risers, and Flow lines Chapters 25, 26</td>
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<td>Supplemental: OTC 23161 - Subsea Well Intervention Vessel and Systems</td>
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<tr>
<td>Watch: Risers Part 1-5 Videos</td>
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<tr>
<td>Watch: Subsea E&amp;A Subsea Landing String Assembly Video</td>
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<tr>
<td>Participate: Synchronous Weekly Class Meeting</td>
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## Module 4: Flow Assurance and Operability

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<td>Read: World Oil Recommended Practices for Hydrate Control and Remediation, Steven Cochran</td>
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<tr>
<td>Supplemental: Subsea Engineering Handboook – Part II Flow Assurance and Sys Eng, Chapters 12-18</td>
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<tr>
<td>Watch: Flow Assurance Parts 1 - 9 Videos</td>
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<td>Solve: Scenario 5</td>
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<td>Module 5: Deepwater Pipeline Design</td>
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<tr>
<td>Watch: Pipeline Design Parts 1 - 4 Videos</td>
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<tr>
<td>Read: SEH – Part IV Subsea Umbilicals, Risers, and Flowlines Chapter 27 Subsea Pipelines</td>
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<tr>
<td>Read: Red Hawk project drawings – included in eCampus</td>
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<tr>
<td>Watch: SAGE Profile 3D - Subsea Pipeline Analysis Software Video</td>
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<td>Watch: J Lay Virtual Tour Video</td>
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<tr>
<td>Supplemental: Popular Videos - Ormen Lange</td>
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<td>Watch: Ultimate Engineering: Super Pipeline Construction of Ormen Lange Natural Gas Pipeline Video</td>
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<td>Read: RP 17A Annex A A.4</td>
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<td>Read: Subsea Solutions Oilfield Review Article, Winter 2000, Schlumberger</td>
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<tr>
<td>Supplemental: SEH – Pt. I Subsea Prod Sys, Ch. 11 Subsea Equip RBI; Pt. III Subsea Struct and Equip, Ch. 19 - 23</td>
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<tr>
<td>Supplemental: Subsea Structures and Equipment, Chapters 19 - 23</td>
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<tr>
<td>Interact: Subsea Mainfolds / Prepared by Cameron &amp; One Subsea</td>
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<tr>
<td>Interact: Connectors and Well/Flowline Tie-in Jumpers / Prepared by Cameron &amp; One Subsea</td>
</tr>
<tr>
<td>Watch: ROV Orientation Video</td>
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<td>Participate: Synchronous Weekly Class Meeting</td>
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| Assessment: Mid-term Exam |

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<td>Read: API 17TR13 Section 11</td>
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<tr>
<td>Interact: Subsea Mainfolds / Prepared by Cameron &amp; One Subsea</td>
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<tr>
<td>Interact: Connectors and Well/Flowline Tie-in Jumpers / Prepared by Cameron &amp; One Subsea</td>
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<tr>
<td>Watch: Subsea Materials Parts 1 &amp; 2 Video</td>
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<td>Participate: Synchronous Weekly Class Meeting</td>
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<th>Module 9: Subsea Controls, Umbilicals, Distribution System Part I</th>
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<tbody>
<tr>
<td>Read: API 17A A.8, A.9 &amp; ISO 1219-1:2012</td>
</tr>
<tr>
<td>Supplemental: API 17 E Umbilicals, API 17 F Controls &amp; API 17 V Safety Systems</td>
</tr>
<tr>
<td>Watch: Subsea Controls Parts 1, 2 and 3 Videos</td>
</tr>
<tr>
<td>Interact: Introduction to Control Systems / Prepared by Cameron &amp; One Subsea</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Interact: Subsea Control Equipment / Prepared by Cameron &amp; One Subsea</td>
</tr>
<tr>
<td>Interact: Subsea Control Modules / Prepared by Cameron &amp; One Subsea</td>
</tr>
<tr>
<td>Participate: Synchronous Weekly Class Meeting</td>
</tr>
<tr>
<td>Solve: Scenario 10</td>
</tr>
</tbody>
</table>

**Module 10: Subsea Controls, Umbilicals, Distribution System Part II**

- Read: API 17A A.8, A.9 & ISO 1219-1:2012
- Supplemental: API 17 E Umbilicals, API 17 F Controls, API 17 V Safety Systems
- SHE - Pt. I Subsea Prod Systems, Ch. 3,7,8; Pt. IV Umbilicals, Risers, and Flowlines, Ch. 24 Subsea Umbilical Systems
- Interact: Subsea Distribution Assemblies / Prepared by Cameron & One Subsea
- Interact: Hydraulic Flying Leads / Prepared by Cameron & One Subsea
- Interact: Stab Plates / Prepared by Cameron & One Subsea
- Interact: Topside Umbilical Termination Assembly / Prepared by Cameron & One Subsea
- Interact: Subsea Instrumentation / Prepared by Cameron & One Subsea
- Watch: Subsea Controls Parts 1, 2 and 3 Videos
- Participate: Synchronous Weekly Class Meeting
- Solve: Scenario 11

**Module 11: Subsea Operations**

- Read: SEH – Pt. I Subsea Production Systems, Chapters 5, 9, 10
- Watch: Subsea Control System Operations Modules (Lucas)
- Watch: Subsea Modes of Operation
- Watch: Subsea Maintenance Operations
- Watch: Subsea operations – Third Party Devices
- Watch: Subsea Control System Diagnostics
- Watch: Subsea Production Surveillance
- Interact: Master Control / Prepared by Cameron & One Subsea
- Interact: Hydraulic Power Unit / Prepared by Cameron & One Subsea
- Supplemental Interaction: Electrical Power Unit / Prepared by Cameron & One Subsea
- Participate: Synchronous Weekly Class Meeting
- Solve: Scenario 12
- Answer: Quiz 2

**Module 12: Overview of the Class Project and Final Exam**

- Participate: Project Overview and Final Exam Review

**Module 13: Class Project and Final Exam**

- Read: Final Project Instructions and Supporting Files
- Submit: Final Project

**Assessment:** Final Exam
Course Policies

Attendance Policy:
The University views class attendance as the responsibility of an individual student. Attendance is essential to complete the course successfully. University rules related to excused or unexcused absences are located online on the TAMU website. **All students are required to attend the Tuesday Blackboard Collaborate sessions from 7-8pm online.** [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07)

Late Work Policy:
**LATE WORK is not accepted unless student has university approved excuse.** This course relies on discussion, interaction, and group work among class members. Therefore, it is essential that work be completed on schedule. At the beginning of every module, you should spend time planning. Read the learning modules in eCampus very carefully. Please do not wait until the last day to do the work. Punctuality is especially important when assignments impact your classmates. If your schedule impacts others, notify them and make alternative arrangements. Obviously unforeseen events arise and may prevent you from accomplishing a task on time. This may result in the deduction of a point or two from your grade, but if this is a rare occurrence and your work for this class is otherwise excellent, it should make no difference in your final grade for the course. It is only when work is frequently late and/or quality of the work is consistently below standard that your final grade will suffer. In those circumstances where an emergency takes you away from the course for an extended period of time, contact your instructor right away to make arrangements. [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07)

Grades of “INCOMPLETE” will be given only for certifiable medical reasons or in other extraordinary circumstances arranged in advance. If you are planning to be away from your usual location (travel, vacation, etc.) during this course, consider dropping the course or discuss your situation with me and we can see if you will be disadvantaged by your mobility or impacting others’ work.

Course Copyright Statement:
The materials used within this course are copyrighted. These materials include, but are not limited to, the syllabi, quizzes, exams, lab problems, online handouts, course videos, etc. Because these materials are copyrights, you do not have the right to copy or distribute these materials, unless permission is expressly granted.

Incomplete Grade:
Grades of “INCOMPLETE” will be given only for certifiable medical reasons or in other extraordinary circumstances arranged in advance. If you are planning to be away from your usual location (travel, vacation, etc.) during this course, consider dropping the course or discuss your situation with me and we can see if you will be disadvantaged by your mobility or impacting others’ work.

Communication Expectations:
The best way to contact the instructor and graduate assistant for this course is via email (see contact information at the top of the syllabus). Students should expect a response from the instructor or graduate assistant no later than 48 hours after an email is sent or voicemail is left.

Course assignments, projects, and other assessments will be graded no later than 7 days after the due dates posted within the syllabus and eCampus calendar. If dates need to be adjusted based on unforeseen circumstances, an announcement will be sent from eCampus.

Netiquette Expectations:
Netiquette is network etiquette. Netiquette covers both common courtesy online and the informal when communication with other online. TAMU Instructional Technology Services provides some general netiquette rules that students and faculty are expected to follow within this course. For more information on netiquette, please visit [http://its.tamu.edu/Distance_Education/Netiquette_Aggie_Honor_Code.php](http://its.tamu.edu/Distance_Education/Netiquette_Aggie_Honor_Code.php)
Institutional Policies

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, Student Services @White Creek, or call 845-1637. For additional information visit http://disability.tamu.edu.

This course uses Blackboard Learn as its online platform. To know more about its accessibility standards please to their website. http://www.blackboard.com/Platforms/Learn/Resources/Accessibility.aspx

If you find that course content or software are not accessible, please contact your course instructor or disability services so that appropriate accommodations to the learning environment can be made.

Academic Integrity Statement and Policy:
For many years Aggies have followed a Code of Honor, which is stated in this very simple verse:

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

The Aggie Code of Honor is an effort to unify the aims of all Texas A&M men and women toward a high code of ethics and personal dignity. For most, living under this code will be no problem, as it asks nothing of a person that is beyond reason. It only calls for honesty and integrity, characteristics that Aggies have always exemplified. The Aggie Code of Honor functions as a symbol to all Aggies, promoting understanding and loyalty to truth and confidence in each other.

For more information, please visit, http://student-rules.tamu.edu/aggiecodedo and http://aggiehonor.tamu.edu/

Statement of Plagiarism:
All materials generated for this class (which may include but are not limited to syllabi and in-class materials) are copyrighted. You do not have the right to copy such materials unless the instructor expressly grants permission. As commonly defined, plagiarism consists of passing off as one’s own the ideas, words, writing, etc. which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have permission of that person. Plagiarism is one of the worst academic violations, for the plagiarist destroys trust among others. If you have any questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules, under the section “Scholastic Dishonesty.”

Export Control Statement:
United States export control laws regulate the release of goods and technologies that affect U.S. national security or foreign policy interests. Distance education students and course content MUST comply with these U.S. export control laws. If TAMU indicates that you are attempting to access course content from an IP address associated with a country currently subject to economic and trade sanction, your TAMU NetID account will be terminated and you will be contacted by the TAMU Export Control Office and the Office of Identity Management. For additional visit, https://vpr.tamu.edu/resources/export-controls/resources.
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional

Form Instructions

1. Course request type:
   □ Undergraduate  □ Graduate  □ First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Geology and Geophysics
   GEOL 647: Radiogenic Isotope Geology

3. Course prefix, number and complete title of course:

4. Catalog course description (not to exceed 50 words):
The use of radiogenic isotopes in addressing problems in high- and low-temperature geochemistry, including their use as tracers for past and present-day processes at the surface and interior of the Earth.

5. Prerequisite(s):

   permission of instructor

   Cross-listed with:  
   Stacked with:

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

6. Is this a variable credit course?  □ Yes  □ No
   If yes, from _______ to _______

7. Is this a repeatable course?  □ Yes  □ No
   If yes, this course may be taken ______ times.
   Will this course be repeated within the same semester?  □ Yes  □ No

8. Will this course be submitted to the Core Curriculum Council?  □ Yes  □ No

9. How will this course be graded?  □ Grade  □ S/U  □ P/F (CLMD)

10. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. □ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix  Course #  Title (excluding punctuation)
   GEOL 647  Radiogenic Isotope Geology
   Lect Lab Other SCH CIP and Fund Code Admin. Unit Acad. Year HIC Code
   3.00 0.00 3.00

Approval recommended by:

Michael Pope  NOV. 11/15

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

Chair, College/Division Committee Date

Dean of College Date

Chair, GC or UCC Date

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 – 07/14
GEOL 647—Radiogenic Isotope Geology

Instructor: Franco Marcantonio (979-845-9240)  
marcantonio@tamu.edu
Meeting times/location: TR 2:20-3:35 / 327 HALB
Office hours: Mondays 8-10 am
Office location: Rm 257 Hrbouty

Course Description and Prerequisites

The use of radiogenic isotopes in addressing problems in high- and low-temperature geochemistry, including their use as tracers for past and present-day processes at the surface and interior of the Earth.

Learning Outcomes

Graduates will be able to:
- describe the role that radiogenic isotope geochemistry plays in Earth Sciences
- solve Earth Science problems using radiogenic isotope data sets
- explain processes that take place at depth and at the surface of our planet using radiogenic isotope systematics

Textbook


Grading {A: 90-100%, B: 80-89.99%, C: 70-79.99%, D:60-60.99%, F<60%}

100 points total

<table>
<thead>
<tr>
<th>Problem Sets</th>
<th>50 points</th>
<th>will involve quantitative manipulation and analysis of isotope geochemical data sets.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentations</td>
<td>25 points</td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>25 points</td>
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</tr>
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</table>

Course Topics, Tentative Calendar of Activities

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to nuclear systematics; decay modes of radionuclides</td>
</tr>
<tr>
<td>2</td>
<td>Atom physics problem set</td>
</tr>
<tr>
<td>3</td>
<td>Introduction to radioactive decay; geochronometry; mass spectrometry</td>
</tr>
<tr>
<td>4</td>
<td>Rb-Sr, Sm-Nd methods</td>
</tr>
<tr>
<td>5</td>
<td>K-Ar, $^{40}$Ar*/$^{39}$Ar methods</td>
</tr>
<tr>
<td>6</td>
<td>U-Th-Pb, Re-Os methods</td>
</tr>
<tr>
<td>7</td>
<td>Radiogenic isotope mixing theory; radiogenic isotopes in rivers</td>
</tr>
<tr>
<td>8</td>
<td>Radiogenic isotopes in the oceans</td>
</tr>
<tr>
<td>9</td>
<td>Short-lived radionuclides; U-Th disequilibrium;</td>
</tr>
</tbody>
</table>
Scientists used U-Th Bateman equations; Cosmogenic radionuclides
Radiogenic isotopes and the origin of igneous rocks
Student Presentations
Student Presentations
Student Presentations
Student Presentations

Americans with Disabilities Act

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."

Attendance and Makeup Policy

Student absences will be administered in accordance with Student Rule #7. All deadlines for problem sets and presentations/papers are strict. There will be no opportunities for makeups.
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

Form Instructions

1. Course request type:
   - [ ] Undergraduate
   - [✓] Graduate
   - [ ] First Professional (D.D.S., M.D., J.D., PharmD, D.V.M.)

2. Request submitted by (Department or Program Name):
   Department of Geology and Geophysics
   GEOP 618 Numerical Methods for the Geosciences

3. Course prefix, number and complete title of course:

4. Catalog course description (not to exceed 50 words):
   Mathematical theory and numerical techniques for modeling physical systems and processes in the Geosciences; discretization of continuum equations for solids and fluids; finite difference methods, convergence, consistency, and stability; finite element and spectral methods in fluid dynamics and seismology; iterative solvers; implicit and explicit methods for diffusion and advection.

5. Prerequisite(s):
   Graduate classification or approval of instructor.

   Cross-listed with: ATMO 618 and OCNG 618
   Stacked with:

   Cross-listed courses require the signature of listed department heads.

6. Is this a variable credit course?
   - [ ] Yes
   - [✓] No
   If yes, from ________ to ________

7. Is this a repeatable course?
   - [ ] Yes
   - [✓] No
   If yes, this course may be taken ________ times.
   Will this course be repeated within the same semester?
   - [ ] Yes
   - [✓] No

8. Will this course be submitted to the Core Curriculum Council?
   - [ ] Yes
   - [✓] No

   How will this course be graded:
   - [✓] Grade
   - [ ] S/U
   - [ ] P/F (CLMD)

9. This course will be:
   - a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   - b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

   M.S., Ph.D. in all Geosciences majors.

10. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

11. I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

12. Prefix Course # Title (excluding punctuation)
   
<table>
<thead>
<tr>
<th>GEOP</th>
<th>618</th>
<th>NUMERICAL METHODS GEOSCIENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec.</td>
<td>Lab</td>
<td>Other</td>
</tr>
<tr>
<td>03</td>
<td>00</td>
<td>00</td>
</tr>
</tbody>
</table>

13. Approval recommended by:
   Michael Pope
   [Signature]
   11/09/15
   Chair, College Review Committee
   [Signature]
   11/1/15
   Dean of College
   [Signature]
   12-15-15
   Chair, GC or UCC
   [Signature]
   [Effective Date]

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sunda-williams@tamu.edu.
Curricular Services – 07/14
Supporting statement for GEOP 618

We request to create a new course, GEOP 618 – Numerical Methods for the Geosciences, which will duplicate the requested OCNG 618 for cross-listing purposes. This course has been developed to fulfill the requirements of the certificate program in Computational Geosciences that is being created within the College of Geosciences.

We request cross-listing GEOP 618 with ATMO 618 and OCNG 618 to improve interdisciplinary exchanges among graduate students and between college programs, and to provide a common knowledge set emphasizing shared aspects of computational modeling to graduate students of different disciplines and backgrounds.
Course title and number  Numerical Methods for the Geosciences, GEOP 618
Term (e.g., Fall 200X)  Fall 201X
Meeting times and location  TBD

Course Description and Prerequisites

Mathematical theory and numerical techniques for modeling physical systems and processes in the Geosciences; discretization of continuum equations for solids and fluids; finite difference methods, convergence, consistency, and stability; finite element and spectral methods in fluid dynamics and seismology; iterative solvers; implicit and explicit methods for diffusion and advection.

The goal of this course is to provide students with the mathematical and numerical foundations required to understand how to develop numerical models in the various disciplines of the Geosciences that employ the continuum approximation to study systems with a large number of degrees of freedom.

Students in this course are assumed to have a graduate-level working knowledge of and experience with continuum dynamics.

Prerequisites: Graduate classification or approval of instructor.

Learning Outcomes

By the end of this course, students will be able to:

1. Apply fundamental discretization techniques to the continuum partial differential equations (PDEs) used in the Geosciences to describe the physical behavior of solids and fluids;
2. Evaluate convergence, consistency, and stability of numerical solutions of initial value problems obtained by finite difference methods;
3. Identify problems of interest in the Geosciences whose solution may be approximated by using the finite element or spectral method and create a simplified numerical scheme based on the selected method;
4. Apply iterative methods to solve systems of linear equations resulting from discretized PDEs and address convergence issues;
5. Create one or more numerical models for specific physical processes in the Geosciences by identifying and applying the most suitable numerical techniques learned in the course;
6. Write a comprehensive technical report.

Instructor Information

Name  Ping Chang
Telephone number  979-845-8196
Email address  ping@tamu.edu
Office hours  Open
Office location  O&M 624

Textbook and/or Resource Material

Course material will be provided to the students in the form of lecture notes and handouts.

Students are encouraged, but not required, to read the following:
   Berlin Heidelberg, 2002
   Techniques, Springer-Verlag, Berlin, 1988
   Different Flow Categories, Springer-Verlag, Berlin, 1988
7. Haidvogel, D.B, Beckmann, A., Numerical Ocean Circulation Modeling, Imperial College Press,
   1999
   Publication Series No. 17, August 1976
11. Washington, W.M., Parkinson, C.L., An Introduction to Three-Dimensional Climate Modeling, 2nd
    Ed., University Science Books, 2005
    2003

**Grading Policies**

Final grades will be based on the following weights:

1) Assignments (30% of course grade)
2) Midterm exam (20% of course grade)
3) Final project (50% of course grade)

Assignments will be due at the beginning of class on the scheduled week, unless stated otherwise by the
instructor. Late homework will be assessed a penalty equal to 20% of its grade per day unless the students
submits a university-excused absence (see Attendance and Make-up Policies section). An unexcused delay
longer than 4 working days will automatically result in receiving zero points on the assignment.

Midterm. There will be a two-hour long in-class midterm exam.

Final Project. A final modeling project will be due by 5pm on the last day of the university’s Final
Examination Schedule for the semester, available at [http://registrar.tamu.edu/Courses-,Registration,-
Scheduling/Final-Exam-Schedule](http://registrar.tamu.edu/Courses-,Registration,-Scheduling/Final-Exam-Schedule).
This final project must include a 10-page written scientific report that comprehensively summarizes foundations, methods, and results of the modeling project in the style of the American Geophysical Union Geophysical Research Letters Journal

Final course grades will be posted on [http://elearning.tamu.edu](http://elearning.tamu.edu)

Please consult University Student Rule 10 (Grading) at [http://student-rules.tamu.edu/rule10](http://student-rules.tamu.edu/rule10) for additional details on grading policies.

**Grading Scale**

A final percentage grade will be calculated based on your total weighted scores as listed above. A final letter grade will be assigned as follows:

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = <60%
Attendance and Make-up Policies

The university views class attendance as an individual student responsibility. You are expected to attend class and to complete all assignments. Attendance is essential to complete the course successfully.

Please consult the University Student Rule 7 at [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07) for details on university-excused absences and make-up policies.

Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to fundamental physical systems and processes in Geosciences that can be represented using continuum partial differential equations (PDEs). Basic concepts in numerical modeling.</td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td>Mathematical description of continuum media and key physical properties: Fluids – Continuity equation; viscosity; classification of flow regimes; Eulerian and Lagrangian descriptions; advection. Solids – Deformation and stresses; stress and strain tensors; equations of motion; gravity and gravitational potential.</td>
<td></td>
</tr>
<tr>
<td>Week 4</td>
<td>Boundary value problems in the Geosciences. Dynamic and thermodynamic boundary conditions. Elliptic (Laplace’s equation), parabolic (diffusion equation), and hyperbolic (wave equation) PDEs. Examples of common transition cases between PDE types in solids (e.g. homogenous to localized deformation) and fluids (e.g. steady, irrotational, isentropic, compressible flow below and above the speed of sound).</td>
<td></td>
</tr>
<tr>
<td>Week 5-6</td>
<td>Discretization techniques for PDEs: Finite Difference Method (FDM), Finite Element Method (FEM), Spectral Method, Pseudospectral Method.</td>
<td></td>
</tr>
<tr>
<td>Week 7</td>
<td>Consistency, convergence, and stability of numerical solutions of initial value problems by FDMs. Equivalence theorem.</td>
<td></td>
</tr>
<tr>
<td>Week 8</td>
<td>Iterative solvers for discretized linear PDEs used in large three-dimensional problems: Jacobi method, Gauss-Seidel (GS) iteration, Successive Over Relaxation (SOR) method, Conjugate Gradient Method (CGM), Steepest Descent method. Convergence and preconditioning.</td>
<td></td>
</tr>
<tr>
<td>Week 8</td>
<td></td>
<td>Midterm Exam</td>
</tr>
<tr>
<td>Week 9</td>
<td>Modeling diffusive processes: explicit and implicit methods.</td>
<td></td>
</tr>
</tbody>
</table>
Week 10  Modeling linear advective processes: explicit and implicit methods.
          Modeling transport.
          
Week 11-12  Modeling nonlinear advective processes: Burger's equation.
          Positive-definite processes and flux-corrected methods.
          Nonlinear wave processes: Korteweg-de Vries equation.
          
Week 13  Elliptic boundary-value problems in the Geosciences.
          Energy- and enstrophy-conserving space finite-difference schemes.
          
Week 14  Basic models of physical systems in the Geosciences:
          spectral model for a homogeneous, non-divergent, incompressible flow on the surface of a sphere;
          quasi-geostrophic ocean model; spectral-element model for seismic wave propagation;
          
Assignment #1 due
Assignment #2 due
Assignment #3 due

Final project due by 5pm on the last day of the university's Final Examination Schedule for the semester.

Please note that the above schedule and topics are subject to change.

Other Pertinent Course Information

Copyright Policy. All materials used in this class are copyrighted. These materials include but are not limited to syllabi, quizzes, exams, 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 permission is expressly granted.

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, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity

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

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

Students are encouraged to study together and discuss the information presented in the course lectures and material with other students. However, all coursework submitted to the instructor must be the result of the original work of the student. Intentional or careless appropriation of someone else's work or ideas, even with their explicit consent, violates the Aggie Honor System Rules (Student Rule 20.1.2) and will result in all the students involved automatically receiving zero points for the assignment as well as mandatory reporting of the violation.

Each student is responsible for authenticating all submitted work and, if asked, to produce proof that the item submitted is indeed the work of that student. The inability to authenticate one's work upon the instructor's request is sufficient grounds to initiate an academic dishonesty case.
Course title and number  Numerical Methods for the Geosciences, ATMO 618
Term (e.g., Fall 200X) Fall 201X
Meeting times and location TBD

Course Description and Prerequisites

Mathematical theory and numerical techniques for modeling physical systems and processes in the Geosciences; discretization of continuum equations for solids and fluids; finite difference methods, convergence, consistency, and stability; finite element and spectral methods in fluid dynamics and seismology; iterative solvers; implicit and explicit methods for diffusion and advection.

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Students in this course are assumed to have a graduate-level working knowledge of and experience with continuum dynamics.

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By the end of this course, students will be able to:

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2. Evaluate convergence, consistency, and stability of numerical solutions of initial value problems obtained by finite difference methods;
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6. Write a comprehensive technical report.

Instructor Information

Name  Ping Chang
Telephone number  979-845-8196
Email address  ping@tamu.edu
Office hours  Open
Office location  O&M 624

Textbook and/or Resource Material

Course material will be provided to the students in the form of lecture notes and handouts.

Students are encouraged, but not required, to read the following:

Grading Policies

Final grades will be based on the following weights:

1) Assignments (30% of course grade)
2) Midterm exam (20% of course grade)
3) Final project (50% of course grade)

Assignments will be due at the beginning of class on the scheduled week, unless stated otherwise by the instructor. Late homework will be assessed a penalty equal to 20% of its grade per day unless the students submits a university-excused absence (see Attendance and Make-up Policies section). An unexcused delay longer than 4 working days will automatically result in receiving zero points on the assignment.

Midterm. There will be a two-hour long in-class midterm exam.

Final Project. A final modeling project will be due by 5pm on the last day of the university’s Final Examination Schedule for the semester, available at http://registrar.tamu.edu/Courses-,Registration-,Scheduling/Final-Exam-Schedule. This final project must include a 10-page written scientific report that comprehensively summarizes foundations, methods, and results of the modeling project in the style of the American Geophysical Union Geophysical Research Letters journal (http://agupubs.onlinelibrary.wiley.com/agu/journal/10.1002/(ISSN)1944-8007/).

Final course grades will be posted on http://elearning.tamu.edu

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Grading Scale

A final percentage grade will be calculated based on your total weighted scores as listed above. A final letter grade will be assigned as follows:

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = <60%
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### Course Topics, Calendar of Activities, Major Assignment Dates

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<td>Midterm Exam</td>
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<td>Week 9</td>
<td>Modeling diffusive processes: explicit and implicit methods.</td>
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Week 10
Modeling linear advective processes: explicit and implicit methods.
Modeling transport.

Assignment #1 due

Week 11-12
Modeling nonlinear advective processes: Burger's equation.
Positive-definite processes and flux-corrected methods.
Nonlinear wave processes: Korteweg-de Vries equation.

Assignment #2 due

Week 13
Elliptic boundary-value problems in the Geosciences.
Energy- and enstrophy-conserving space finite-difference schemes.

Assignment #3 due

Week 14
Basic models of physical systems in the Geosciences:
spectral model for a homogeneous, non-divergent, incompressible flow on the surface of a sphere;
quasi-geostrophic ocean model; spectral-element model for seismic wave propagation;

Final project due by 5pm on the last day of the university's Final Examination Schedule for the semester.

Please note that the above schedule and topics are subject to change.

Other Pertinent Course Information

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Each student is responsible for authenticating all submitted work and, if asked, to produce proof that the item submitted is indeed the work of that student. The inability to authenticate one's work upon the instructor's request is sufficient grounds to initiate an academic dishonesty case.
Course title and number  Numerical Methods for the Geosciences, OCNG 618
Term (e.g., Fall 200X)  Fall 201X
Meeting times and location  TBD

Course Description and Prerequisites

Mathematical theory and numerical techniques for modeling physical systems and processes in the Geosciences; discretization of continuum equations for solids and fluids; finite difference methods, convergence, consistency, and stability; finite element and spectral methods in fluid dynamics and seismology; iterative solvers; implicit and explicit methods for diffusion and advection.

The goal of this course is to provide students with the mathematical and numerical foundations required to understand how to develop numerical models in the various disciplines of the Geosciences that employ the continuum approximation to study systems with a large number of degrees of freedom.

Students in this course are assumed to have a graduate-level working knowledge of and experience with continuum dynamics.

Prerequisites: Graduate classification or approval of instructor.

Learning Outcomes

By the end of this course, students will be able to:

1. Apply fundamental discretization techniques to the continuum partial differential equations (PDEs) used in the Geosciences to describe the physical behavior of solids and fluids;
2. Evaluate convergence, consistency, and stability of numerical solutions of initial value problems obtained by finite difference methods;
3. Identify problems of interest in the Geosciences whose solution may be approximated by using the finite element or spectral method and create a simplified numerical scheme based on the selected method;
4. Apply iterative methods to solve systems of linear equations resulting from discretized PDEs and address convergence issues;
5. Create one or more numerical models for specific physical processes in the Geosciences by identifying and applying the most suitable numerical techniques learned in the course;
6. Write a comprehensive technical report.

Instructor Information

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Supporting statement for ATMO 618

We request to create a new course, ATMO 618 – Numerical Methods for the Geosciences, which will duplicate the requested OCNG 618 for cross-listing purposes. This course has been developed to fulfill the requirements of the certificate program in Computational Geosciences that is being created within the College of Geosciences.

We request cross-listing ATMO 618 with OCNG 618 and GEOP 618 to improve interdisciplinary exchanges among graduate students and between college programs, and to provide a common knowledge set emphasizing shared aspects of computational modeling to graduate students of different disciplines and backgrounds.
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

Form Instructions

1. Course request type:
   - □ Undergraduate
   - ✔ Graduate
   - □ First Professional (DOS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Geology and Geophysics
   GEOP 634 - Fundamentals of High Performance Computing for the Geosciences

3. Course prefix, number and complete title of course:

4. Catalog course description (not to exceed 50 words):
   Architecture of High Performance Computing (HPC) systems; Unix operating system, shell environment; algorithms and programming languages for the Geosciences; concurrency, dependency, parallelism; parallel performance, scalability; structured programming; serial, parallel patterns; parallel programming models; parallel algorithms and software design for the Geosciences; techniques for empirical parallel performance analysis.

5. Prerequisite(s):
   Graduate classification or approval of instructor.

   Cross-listed with: ATMO 634 and OCNG 634
   Stacked with: 

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

6. Is this a variable credit course?
   □ Yes
   ✔ No
   If yes, from _______ to _______

7. Is this a repeatable course?
   □ Yes
   ✔ No
   If yes, this course may be taken ______ times.

   Will this course be repeated within the same semester?
   □ Yes
   ✔ No

8. Will this course be submitted to the Core Curriculum Council?
   □ Yes
   ✔ No

9. How will this course be graded?
   ✔ Grade
   □ S/U
   □ P/F (CLMD)

10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

   M.S., Ph.D. in all Geosciences majors.

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. ✔ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix Course# Title (excluding punctuation)

   GEOP 634 FUND HPC GEOSCIENCES

<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>Other</th>
<th>S/CH</th>
<th>G/L and Fund Code</th>
<th>Admin. Unit</th>
<th>Acad. Year</th>
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   Approval recommended by:
   Michael Pope
   Chair, College Policy Committee
   Date

   Department Head or Program Chair (Type Name & Sign) Date
   Chair, College Policy Committee
   Date

   Dean of College
   Date
   Chair, CC or UCC
   Date

   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 - 07/14
Supporting statement for GEOP 634

We request to create a new course, GEOP 634 – Fundamentals of High Performance Computing for the Geosciences, which will duplicate the new requested ATMO 634 for cross-listing purposes. This course has been developed to fulfill the requirements of the certificate program in Computational Geosciences that is being created within the College of Geosciences.

We request cross-listing GEOP 634 with ATMO 634 and OCNG 634 to improve interdisciplinary exchanges among graduate students and between college programs, and to provide a common knowledge set emphasizing shared aspects of computational modeling to graduate students of different disciplines and backgrounds.
Course title and number
Fundamentals of High Performance Computing for the Geosciences,
GEOP 634
Term (e.g., Fall 200X)
Spring 201X
Meeting times and location
Lectures: TBD (3 hours); Laboratory: TBD (2 hours).

Course Description and Prerequisites

This course will present the architectural concepts, theoretical basis, common tools, and practical knowledge required to use current, state-of-the-art High-Performance Computing (HPC) systems to accurately and efficiently solve large-scale problems in the Geosciences.

The basic architecture of HPC systems will be discussed, and you will become familiar with Unix-based operating systems and shell environments. The main part of the course will focus on how to design and implement serial and parallel algorithms specific to Geosciences’ problems by using structured, pattern-based programming techniques along with computer languages and widely used models in the Geosciences’ research community. Concepts such as concurrency, dependency, and parallelism will be used as basis for understanding parallel code performance and techniques for empirical performance analysis.

The course will specifically focus on programming languages such as Fortran and deal with design and implementation concepts present in current models for general circulation, regional climate and weather, seismic wave propagation, data inversion, and others, as used on HPC systems. Dominant performance bottlenecks deriving from the data-intensive nature of computations in the Geosciences will be discussed, including disk I/O.

The course includes a laboratory section designed to improve the understanding of the topics presented during lecture hours and to further develop your computational skills. Through lab exercises you will become familiar with available computing environments, software and tools, and gain realistic, hands-on experience on HPC systems that may be applied to your future research work.

The intent of this course is to provide Geosciences students with diverse backgrounds a common knowledge set that will help them advance more effectively in their discipline, and to emphasize shared aspects of computational modeling in the Geosciences that may be leveraged to foster interdisciplinary exchanges.

There are no course prerequisites, but basic knowledge of programming is required.

Prerequisites: Graduate classification or approval of instructor.

Learning Outcomes

By the end of this course, you will be able to:

1. Describe the basic architecture and design features of a modern HPC system;
2. Understand the structure of the Unix operating system and make use of its main capabilities;
3. Break down a given computational task into primary steps and design a basic algorithm to carry out the work;
4. Use a programming language (Fortran) and leverage its main features to implement serial and parallel Geosciences-oriented computer codes;
5. Understand structured, pattern-based serial and parallel programming;
6. Identify and apply parallel programming patterns to parallel code design for modeling in the Geosciences;
7. Understand the concepts of concurrency, dependency, and parallelism;
8. Evaluate the performance of a parallel code on a HPC system;
9. Develop a parallel computer code to simulate a basic physical process relevant to the Geosciences;
10. Give an oral presentation of your programming project;
11. Write a comprehensive technical report of your programming project.

Instructor Information

Name: Raffaele Montuoro
Telephone number: 979-862-3182
Email address: rmontuoro@tamu.edu
Office hours: Open
Office location: O&M 1017B

Textbook and/or Resource Material

Course material will be provided in the form of lecture notes and handouts.

I encourage you to consult the following reference material:


Grading Policies

Your final grade will be determined based on the following categories and weights:

1) Programming assignments (20% of course grade)
2) Midterm exam (30% of course grade)
3) Final project (50% of course grade)

Assignments. Assignments will be due at the beginning of class on the scheduled week, unless stated otherwise by the instructor. Late homework without a university-excused absence (see Attendance and Make-up Policies section) will be assessed a penalty equal to 20% of its grade per day. An unexcused delay longer than 4 working days will automatically result in receiving zero points on the assignment.
Midterm Exam. There will be a two-hour, in-class midterm exam.

Final Project. A final programming project will be due by 5pm on the last day of the university's Final Examination Schedule for the semester, available at http://registrar.tamu.edu/Courses.-Registration.-Scheduling/Final-Exam-Schedule.

This final project must include:
1) a 10-page technical report written in the style of the Institute of Electrical and Electronics Engineers (IEEE) Transactions (https://www.ieee.org/publications_standards/publications/authors/authors_templates.html). The report must comprehensively summarize and explain the objectives and technical approach, software design and implementation, and computational results of your project;
2) a presentation during last week of class.

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Grading Scale

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<td>Week 2</td>
<td>Description of the UNIX operating system, including the shell environment.</td>
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<td>Week 3</td>
<td>Algorithm design and basic principles of computer programming.</td>
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<tr>
<td>Week 4-5</td>
<td>Fundamentals of Fortran programming language.</td>
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<td>Week 6</td>
<td>Advanced Fortran features for computational Geosciences. Introduction to structured programming. Pattern-based serial programming.</td>
<td>Assignment #1 due: Serial codes for one-dimensional physical models</td>
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Week 7  Concepts of concurrency, dependency, and parallelism. Potential and actual parallelism, data locality, parallel efficiency, speedup, and scalability.

Assignment #2 due: Apply structured programming techniques and serial patterns to design and implement simple models.

Midterm Exam

Week 8

Week 10  Pattern-based parallel programming in the Geosciences. Examples include: geometrical decomposition and communication patterns in climate models, sequences in coupled models and reservoir simulations, map/reduce operations for convergence testing or large matrix operations.

Assignment #3 due: Design a pattern-based parallel code for a two dimensional problem

Week 11  Description of the main parallel programming models used in computational Geosciences. Shared-memory parallelism with OpenMP.

Assignment #4 due: Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.

Week 12-13  Distributed-memory parallelism with the Message Passing Interface (MPI)

Assignment #5 due: Use MPI to create a distributed-memory parallel code. Evaluate parallel efficiency.

Week 14  Concepts and tools for empirical performance analysis of parallel codes.

Final project due by 5pm on the last day of the university’s Final Examination Schedule for the semester.

Please note that the schedule and topics of lectures and laboratory assignments are subject to change.

Other Pertinent Course Information

Email. All Texas A&M students are expected to use their official TAMU email account for all the communications regarding this course. It is the student’s responsibility to check your TAMU email account regularly throughout the course.

Cell Phones/Mobile devices. You should set your mobile devices to silent and refrain from texting during class.

Access to HPC systems. You should have a working account on one of Texas A&M HPC systems to take full advantage of this course and successfully complete your assignments. You may apply for a basic supercomputing account by contacting High Performance Research Computing (http://sc.tamu.edu) before the beginning of the course. I am also available to help you obtaining a supercomputing account if you contact me during the first week of class.

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Supporting statement for ATMO 634

We request to create a new course, ATMO 634 – Fundamentals of High Performance Computing for the Geosciences. This course has been developed to fulfill the requirements of the certificate program in Computational Geosciences that is being created within the College of Geosciences.

We request cross-listing ATMO 634 with OCNG 634 and GEOP 634 to improve interdisciplinary exchanges among graduate students and between college programs, and to provide a common knowledge set emphasizing shared aspects of computational modeling to graduate students of different disciplines and backgrounds.
Fundamentals of High Performance Computing for the Geosciences, ATMO 634
Spring 201X
Lectures: TBD (3 hours); Laboratory: TBD (2 hours).

Course Description and Prerequisites

This course will present the architectural concepts, theoretical basis, common tools, and practical knowledge required to use current, state-of-the-art High-Performance Computing (HPC) systems to accurately and efficiently solve large-scale problems in the Geosciences.

The basic architecture of HPC systems will be discussed, and you will become familiar with Unix-based operating systems and shell environments. The main part of the course will focus on how to design and implement serial and parallel algorithms specific to Geosciences’ problems by using structured, pattern-based programming techniques along with computer languages and widely used models in the Geosciences’ research community. Concepts such as concurrency, dependency, and parallelism will be used as basis for understanding parallel code performance and techniques for empirical performance analysis.

The course will specifically focus on programming languages such as Fortran and deal with design and implementation concepts present in current models for general circulation, regional climate and weather, seismic wave propagation, data inversion, and others, as used on HPC systems. Dominant performance bottlenecks deriving from the data-intensive nature of computations in the Geosciences will be discussed, including disk I/O.

The course includes a laboratory section designed to improve the understanding of the topics presented during lecture hours and to further develop your computational skills. Through lab exercises you will become familiar with available computing environments, software and tools, and gain realistic, hands-on experience on HPC systems that may be applied to your future research work.

The intent of this course is to provide Geosciences students with diverse backgrounds a common knowledge set that will help them advance more effectively in their discipline, and to emphasize shared aspects of computational modeling in the Geosciences that may be leveraged to foster interdisciplinary exchanges.

There are no course prerequisites, but basic knowledge of programming is required.

Prerequisites: Graduate classification or approval of instructor.

Learning Outcomes

By the end of this course, you will be able to:

1. Describe the basic architecture and design features of a modern HPC system;
2. Understand the structure of the Unix operating system and make use of its main capabilities;
3. Break down a given computational task into primary steps and design a basic algorithm to carry out the work;
4. Use a programming language (Fortran) and leverage its main features to implement serial and parallel Geosciences-oriented computer codes;
5. Understand structured, pattern-based serial and parallel programming;
6. Identify and apply parallel programming patterns to parallel code design for modeling in the Geosciences;
7. Understand the concepts of concurrency, dependency, and parallelism;  
8. Evaluate the performance of a parallel code on a HPC system;  
9. Develop a parallel computer code to simulate a basic physical process relevant to the Geosciences;  
10. Give an oral presentation of your programming project;  
11. Write a comprehensive technical report of your programming project.

Instructor Information

Name: Raffaele Montuoro  
Telephone number: 979-862-3182  
Email address: rmontuoro@tamu.edu  
Office hours: Open  
Office location: O&M 1017B

Textbook and/or Resource Material

Course material will be provided in the form of lecture notes and handouts.

I encourage you to consult the following reference material:


Grading Policies

Your final grade will be determined based on the following categories and weights:

1) Programming assignments (20% of course grade)  
2) Midterm exam (30% of course grade)  
3) Final project (50% of course grade)

Assignments. Assignments will be due at the beginning of class on the scheduled week, unless stated otherwise by the instructor. Late homework without a university-excused absence (see Attendance and Make-up Policies section) will be assessed a penalty equal to 20% of its grade per day. An unexcused delay longer than 4 working days will automatically result in receiving zero points on the assignment.
Midterm Exam. There will be a two-hour, in-class midterm exam.

Final Project. A final programming project will be due by 5pm on the last day of the university's Final Examination Schedule for the semester, available at http://registrar.tamu.edu/Courses. Registration.-Scheduling/Final-Exam-Schedule.

This final project must include:
1) a 10-page technical report written in the style of the Institute of Electrical and Electronics Engineers (IEEE) Transactions (https://www.ieee.org/publications_standards/publications/authors/author_templates.html). The report must comprehensively summarize and explain the objectives and technical approach, software design and implementation, and computational results of your project;
2) a presentation during last week of class.

Final course grades will be posted on http://elearning.tamu.edu

Please consult University Student Rule 10 (Grading) at http://student-rules.tamu.edu/rule10 for additional details on grading policies.

Grading Scale
You will be assigned a final letter grade based on your final percentage grade according to the following scale:

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = <60%

Your final percentage grade will be calculated by adding your weighted scores, divided by the maximum attainable score, for each of the categories listed in the Grading Policies section.

Attendance and Make-up Policies
The university views class attendance as an individual student responsibility. You are expected to attend class and to complete all assignments. Attendance is essential to complete the course successfully.

Please consult the University Student Rule 7 at http://student-rules.tamu.edu/rule07 for details on university-excused absences and make-up policies.

Course Topics, Calendar of Activities, Major Assignment Dates

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Week 7  Concepts of concurrency, dependency, and parallelism. Potential and actual parallelism, data locality, parallel efficiency, speedup, and scalability.

Assignment #2 due: Apply structured programming techniques and serial patterns to design and implement simple models.

Midterm Exam

Week 8

Week 10  Pattern-based parallel programming in the Geosciences. Examples include: geometrical decomposition and communication patterns in climate models, sequences in coupled models and reservoir simulations, map/reduce operations for convergence testing or large matrix operations.

Week 11  Description of the main parallel programming models used in computational Geosciences. Shared-memory parallelism with OpenMP.

Assignment #3 due: Design a pattern-based parallel code for a two dimensional problem

Assignment #4 due: Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.

Assignment #5 due: Use MPI to create a distributed-memory parallel code. Evaluate parallel efficiency.

Week 12-13  Distributed-memory parallelism with the Message Passing Interface (MPI)

Week 14  Concepts and tools for empirical performance analysis of parallel codes.

Final project due by 5pm on the last day of the university's Final Examination Schedule for the semester.

Please note that the schedule and topics of lectures and laboratory assignments are subject to change.

Other Pertinent Course Information

Email. All Texas A&M students are expected to use their official TAMU email account for all the communications regarding this course. It is the student's responsibility to check your TAMU email account regularly throughout the course.

Cell Phones/Mobile devices. You should set your mobile devices to silent and refrain from texting during class.

Access to HPC systems. You should have a working account on one of Texas A&M HPC systems to take full advantage of this course and successfully complete your assignments. You may apply for a basic supercomputing account by contacting High Performance Research Computing (http://sc.tamu.edu) before the beginning of the course. I am also available to help you obtaining a supercomputing account if you contact me during the first week of class.

Copyright Policy. All materials used in this class are copyrighted. These materials include but are not limited to syllabi, quizzes, exams, 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 permission is expressly granted.
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, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity

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Supporting statement for OCNG 634

We request to create a new course, OCNG 634 – Fundamentals of High Performance Computing for the Geosciences, which will duplicate the new requested ATMO 634 for cross-listing purposes. This course has been developed to fulfill the requirements of the certificate program in Computational Geosciences that is being created within the College of Geosciences.

We request cross-listing OCNG 634 with ATMO 634 and GEOP 634 to improve interdisciplinary exchanges among graduate students and between college programs, and to provide a common knowledge set emphasizing shared aspects of computational modeling to graduate students of different disciplines and backgrounds.
Course title and number
Fundamentals of High Performance Computing for the Geosciences, OCNG 634
Spring 201X
Lectures: TBD (3 hours); Laboratory: TBD (2 hours).

Course Description and Prerequisites

This course will present the architectural concepts, theoretical basis, common tools, and practical knowledge required to use current, state-of-the-art High-Performance Computing (HPC) systems to accurately and efficiently solve large-scale problems in the Geosciences.

The basic architecture of HPC systems will be discussed, and you will become familiar with Unix-based operating systems and shell environments. The main part of the course will focus on how to design and implement serial and parallel algorithms specific to Geosciences' problems by using structured, pattern-based programming techniques along with computer languages and widely used models in the Geosciences' research community. Concepts such as concurrency, dependency, and parallelism will be used as basis for understanding parallel code performance and techniques for empirical performance analysis.

The course will specifically focus on programming languages such as Fortran and deal with design and implementation concepts present in current models for general circulation, regional climate and weather, seismic wave propagation, data inversion, and others, as used on HPC systems. Dominant performance bottlenecks deriving from the data-intensive nature of computations in the Geosciences will be discussed, including disk I/O.

The course includes a laboratory section designed to improve the understanding of the topics presented during lecture hours and to further develop your computational skills. Through lab exercises you will become familiar with available computing environments, software and tools, and gain realistic, hands-on experience on HPC systems that may be applied to your future research work.

The intent of this course is to provide Geosciences students with diverse backgrounds a common knowledge set that will help them advance more effectively in their discipline, and to emphasize shared aspects of computational modeling in the Geosciences that may be leveraged to foster interdisciplinary exchanges.

There are no course prerequisites, but basic knowledge of programming is required.

Prerequisites: Graduate classification or approval of instructor.

Learning Outcomes

By the end of this course, you will be able to:

1. Describe the basic architecture and design features of a modern HPC system;
2. Understand the structure of the Unix operating system and make use of its main capabilities;
3. Break down a given computational task into primary steps and design a basic algorithm to carry out the work;
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Instructor Information

Name: Raffaele Montuoro
Telephone number: 979-862-3182
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Texas A&M University
Departmental Request for a New Course
Undergraduate + Graduate + Professional
* Submit original form and attach a course syllabus.*

Form Instructions

1. Course request type:
   - ☑ Undergraduate
   - ☐ Graduate
   - ☐ First Professional (DOS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   - International Affairs

3. Course prefix, number and complete title of course:
   - INTA 638 Political Economy of Development in Africa

4. Catalog course description (not to exceed 50 words):
   Course uses a political economy lens to examine how political forces shape economic outcomes and how political institutions develop and respond to socio-economic realities.

5. Prerequisite(s):
   - None
   - Cross-listed with:
     - None
   - Stacked with:
     - None

6. Is this a variable credit course?
   - ☐ Yes
   - ☑ No
   - If yes, from _____ to _____

7. Is this a repeatable course?
   - ☐ Yes
   - ☑ No
   - If yes, this course may be taken _____ times.

   Will this course be repeated within the same semester?
   - ☐ Yes
   - ☑ No

   Will this course be submitted to the Core Curriculum Council?
   - ☐ Yes
   - ☑ No

9. How will this course be graded?
   - ☑ Grade
   - ☐ S/U
   - ☐ P/F (CLMP)

10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
      - n/a
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
      - n/a

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with those departments. Attach approval letters.

12. ☑ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-control/export-controls-basics-for-distance-education).

13. Pref. Course # Title (excluding punctuation)
    
    | INTA  | 638 | Pol Econ of Dev In Africa |
    |-------|-----|--------------------------|
    | Lect. | Lab | Other |
    | 3.00  | 0.00| 0.00 |
    | S/II  | 0.00| 0.00 |
    | CIP and Fund Code | 1364 | 17 - 18 |
    | Admin. Unit | 0 0 3 6 3 2 |
    | EFL Code | Level 6 |

Approval recommended by:

F. Gregory Gause, Ill [Signature]
Department Chair or Program Chair (Type Name & Sign) Date 11/21/15

Department Chair or Program Chair (Type Name & Sign) Date [Signature]
Chair, College/Department Committee Date 12-15-15

Submitted to Coordinating Board by:

[Signature]
Associate Director, Curricular Services Date 07/14
INTA 638
Political Economy of Development in Africa
Bush School of Government & Public Service
Texas A&M University

Dr. Jessica Gottlieb
Email: jgottlieb@tamu.edu
Office location: Allen 1037
Phone: (979) 458-8018
Office hours: By appointment

Course description

Why are some countries so poor, some groups so violent and some states so unaccountable to their citizens? The course tackles these and other big questions in development by exploiting variation in economies, societies and polities on the African subcontinent. A political economy lens is used to examine how political forces shape economic outcomes and how political institutions develop and respond to socio-economic realities. Students will be exposed to a variety of analytical methods and an emphasis will be placed upon using evidence to test theories learned in the course. The course will explore the effects of colonialism, geography, and ethnic diversity and interrogate how development is shaped by contemporary issues such as civil war, democratization, and foreign assistance.

Course objectives

- To introduce students to key trends, both historic and contemporary, affecting political and economic development on the African continent.
- To acquaint students with major scholars and studies in African politics and development that have made contributions to our understanding of how Africa’s development differs from elsewhere in the world and why outcomes vary across the continent.
- To encourage analytic thinking and the use of evidence when evaluating the merit of different theories of development.
- To provide students with intimate knowledge of at least one African country to help put lessons of the course in context and to begin to understand the subtle complexities of the African experience, from the perspective of citizens, groups and politicians.

Required Texts


Assignments and grading
Country expertise: To enable students to put themes of the course in context and evaluate them more precisely, students will become “experts” on at least one African country during the semester. Students are expected to follow current events in their country on a weekly basis and may be asked during class how the week’s topic relates to their country. A good way to follow news in a particular country is to use Google news and have an alert or RSS feed for the country of interest. It is in the student’s interest to choose a country relevant for the final assignment.

In-class participation (15%): First, students should come to class prepared with questions about the readings and opinions or critiques as evidence of critical reading. Second, students should be able to provide basic facts about the topic of the week as it relates to their country of expertise. Third, students who submit response papers will be called upon to present ideas to the class.

Response papers (20%): Students are required to write two response papers (~2 pages long) for two separate weeks of the semester. No more than two students can submit each week, and sign-ups will occur on the first day of class. Papers must be emailed to the professor by noon the day before the seminar for distribution on the course list. Response papers should propose and defend a hypothesis/argument that relates to the topic of the week; synthesize readings and other relevant literature only to the extent needed to make the argument; address anticipated objections to the argument; and offer thoughts on evidence that would be needed to assess the argument’s validity. These papers will be used to structure discussion in seminar so all students should come to class having read the papers of their colleagues.

In-class presentation (25%): Students will make one 20-30 minute presentation on one of the readings marked with an (*). These readings are more technical in nature and the student’s role will be to study the methods used in the paper and present them in a clear and digestible manner to the rest of the class. The presentation should cover the paper’s research question, argument, evidence, methodology and findings. A short discussion of the merits and demerits of the paper should also be included.

Research proposal and presentation (40%): Students will submit a research proposal (10-12 pages) due at 9am on May 11 that identifies and motivates a research question or puzzling phenomenon, briefly reviews literature from in and outside class, proposes an argument or explanation, discusses alternative explanations, and designs a research strategy to test the argument and refute counter-arguments. The proposal should describe how the research strategy will generate evidence to adjudicate between the arguments/explanations, how that strategy will address issues of causal inference, and how data will be collected and analyzed. Students must send an abstract of the research proposal to the instructor by Week 6. During the last class session, students will give a 10-minute presentation on their research proposal.

The following standards will be used when grading assignments:

90%-100% A Extraordinary, excellent work and mastery of concept
80%-89% B Good work and solid command of concept
70%-79% C Adequate work and sufficient understanding of concept
60%-69% D Poor work, little understanding of concept
0%-59% F Lack of work, no understanding of concept
Students in the same pair or group will receive the same grade on group work except in extenuating circumstances.

Attendance and make-up policy

Class attendance is mandatory. If an absence is excused, the student must inform the instructor who will provide an opportunity to make up missed work. The reasons absences are considered excused by the university are listed at http://studentrules.tamu.edu/rule07. Failure to notify and/or document properly may result in an unexcused absence. Unexcused absences will be reflected in the participation grade.

Late work policy

Late work will not be accepted. In the case of an emergency (ex. hospitalization, family death), accommodations may be made with timely notification and appropriate documentation before the due date.

Course topics and readings

Week 1. Introduction, pre-colonial Africa and the Slave Trade


Further reading:


Week 2. De-colonization

In class: Screening of the movie Lumumba (2000)

Week 3. Colonialism changed everything...well, almost


Week 4. Weak states and personal rule (Feb. 12)


Further reading:


Week 5. Geography and natural resources


Further reading:


Week 6. Insurgency and civil war

Moss. Chapter 4. “Violent Conflict and Civil War.”


Further reading:


Week 7. Economic crisis and reform


**Week 8.   Ethnicity and nationalism**


Further reading:


**Week 9.   Clientelism**


Further reading:


**Week 10. Democracy and accountability**

Moss. Chapter 5. “Political Change and Democratization.”


Further reading:


**Week 11. Poverty and Growth**


**Week 12. Politics of foreign aid and humanitarianism**


Further reading:

Jeffrey Sachs. 2006. The end of poverty: economic possibilities for our time.


Bill Gates on why he shorted the Millennium Villages but goes long on Jeff Sachs: http://www.project-syndicate.org/commentary/bill-gates-explains-why-the-millennium-villages-project--though-a-failure--was-worth-the-risk

**Week 13. Contemporary issues: HIV/AIDS, gender, and homosexuality**


**Week 14. Student presentations**


***

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NB: The professor reserves the right to modify the syllabus. Students will be given enough advance notice to meet any revised expectations.
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

Form Instructions
1. Course request type:
   [ ] Undergraduate [ ] Graduate [ ] First Professional (DDS, MD,JD,PharmD,DPA)

2. Request submitted by (Department or Program Name):
   International Affairs Department

3. Course prefix, number and complete title of course:
   INTA 640 The Politics and Practice of Democracy Promotion

4. Catalog course description (not to exceed 50 words):
   Course will examine the contemporary challenges of promoting democracy worldwide; explore existing theoretical and empirical literature on democracy promotion as a topic within International relations and comparative politics

5. Prerequisite(s):
   None

   Cross-listed with: n/a

   Stacked with: n/a

6. Is this a variable credit course? [ ] Yes [ ] No
   If yes, from _______ to _______

7. Is this a repeatable course? [ ] Yes [ ] No
   If yes, this course may be taken _______ times.

   Will this course be repeated within the same semester? [ ] Yes [ ] No

8. Will this course be submitted to the Core Curriculum Council? [ ] Yes [ ] No

9. How will this course be graded? [ ] Grade [ ] S/U [ ] P/F (CLMD)

10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
       No
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
       No

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. [ ] I verify that I have reviewed the PAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-contro-basics-for-distance-education).

13. Prefix | Course # | Title (excluding punctuation)
   --------|---------|-----------------------------
   INTA   | 640     | Pol & Prac of Dem Promotion

   Lect. | Lab | Other | SCH | CIP and Fund Code | Admin. Unit | Acad. Year | HICE Code | Level | Effective Date
   3.00  | 0.00 | 0.00  | 3.00 | 45,1004.00.01     | 1364        | 17 - 18     | 0 0 3 6 3 2 | Level | 9

   Approval recommended by:
   F. Gregory Gause, III
   Department Head or Program Chair (Type Name & Sign) 11/13/15
   Chair, College Relationship Committee

   Department Head or Program Chair (Type Name & Sign) (If cross-listed course)
   Leonard Bright
   Chair, College Relationship Committee 11/13/15
   Dean of College

   Submitted to Coordinating Board by:
   Arnold Vedda
   Chair, GC or QC 12-15-15

   Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 07/14
INTA 640 The Politics and Practice of Democracy Promotion

Dr. Erin A. Snider
Bush School of Government and Public Service
Texas A&M University
Office: Room 1035
Email: esnider@tamu.edu
Phone: 979-862-3469
Office Hours: 2-4pm Mondays or by appointment

Course Description and Objectives

Over the last two decades, democracy promotion has become a prominent component of foreign policy for developed democracies around the world. In addition, most international organizations have made commitments to promote and enforce commitments to democracy and democracy promotion among member states. While support for democracy has grown, though, many questions remain about the mechanics and ethics in its promotion. Should, for example, democracy assistance be directed to parties that support the values of the donor country? Is there a universal process of transition to democracy? Can democracy be taught? Should states promote democracy when the consequences might be detrimental to their geopolitical or economic interests? What is core and what is contested in the concept of democracy?

This course considers these questions through an examination of the contemporary challenges of promoting democracy worldwide. It will explore existing theoretical and empirical literature on democracy promotion as a topic within international relations and comparative politics but will also include readings written by and for practitioners in the democracy promotion industry, with particular attention on the experience of the developing world, notably the Middle East. In this way, the course is designed to help students become conversant in the actors, scope, and motivations in democracy promotion efforts around the world, as well as the challenges facing individuals, organizations, and states wishing to promote democracy and the difficulty in evaluating the effects of democracy promotion programs.

Learning Outcomes

After successfully completing this course you will be able to:

- Read scholarly materials and those produced by aid agencies and the democracy practitioner community carefully and critically.
- Gain an understanding of the justifications used for democracy promotion by different international actors.
- Speak knowledgeably about different conceptions of democracy and democratization.
- Acquire in-depth understanding of the current challenges of democracy promotion in a selected country.
- Write and analyze texts critically.
- Develop and communicate compelling, evidence-based arguments through writing assignments and oral presentations.
Course Format

As a seminar class, weekly meetings will be devoted to discussion of the assigned readings with a brief introductory lecture by the professor. One student will lead the discussion each week in addition to providing the class (on Monday by 5pm through email) with a critical statement of the assigned readings. This summary should be no longer than two double-spaced pages. In addition to taking turns at leading the discussion, I expect each of you to participate in the discussion and will feel free to call on you, even when you do not volunteer. Additionally, students will choose one country to follow throughout the course and will have the opportunity to represent their country's perspective on the topic of discussion in each class. Current events related to democracy promotion are integral to the course. Students are expected to stay current on democracy related news reported in the New York Times and Washington Post, the Economist, and other sources.

Please Note: I reserve the right to change the class syllabus to meet class needs. Students will be notified with sufficient lead-time for new readings, guest speakers and changes to the schedule below. Students are responsible to learn about such changes should they miss a class. Announcements of changes in required readings as well as distribution of short additional readings may occur throughout the year, given the dynamic nature of our course subject.

Students are expected to come to class prepared and ready to discuss the readings.

Course Requirements

Grades will be determined on the basis of the following:

- **Final Democracy Transitions Project (40%)**: Students will present a written case study on the current challenges of democracy promotion in a selected country. The case study will examine the main obstacles for democratic transition or consolidation in the selected country and will propose international policies and programs to overcome those obstacles. The case study will consider past attempts at democracy promotion, the characteristics of the country that present challenges to democracy promotion, the role of the country within the broader international community, and other potential challenges to successful democratization. More detail about the assignment will be given in week three. The selection of countries for the case study is subject to my approval.

- **Mid Term Exam (25%)**: The mid-term will be a take-home exam. The questions for the exam will be handed out in class and will be due the following week at the beginning of the class period.

- **Weekly Attendance and Participation (10%)**: This course will be conducted in a seminar format, with students taking responsibility for leading much of the discussion. As such, students are expected to attend class having read the assigned readings for the week. Students should be prepared to contribute to each class by bringing questions linked to the readings.

- **Seminar Leader (15%)**: Students will be required to lead discussion at least once during the semester. Please note that leading discussion **DOES NOT** mean presenting a lecture. I will discuss what is required for successfully leading a discussion in class. Students leading seminars for the week are expected to provide the class (on Monday, by 5pm via email) with a critical statement of the assigned readings. This statement should be no longer than two double-spaced pages. The objective of these statements should be to motivate discussion. Summaries of the readings **are not expected nor encouraged**.
• **Response Papers (10%)** Students are required to write brief (1-2 single spaced pages) response papers on three of the topics covered in class on which they are not serving as seminar leader. Response papers are NOT summaries of the readings. Each response paper should reflect your critical thoughts about the readings and topic and may include questions that the readings raise for you and their relation to past readings and discussions. Response papers are due at 5pm the day before the topic for that week.

**Grading**

The following scale will be used for calculating final grades for the course:

A=90-100%
B=80-89%
C=70-79%
D=60-69%
F=0-59%

**Policy on Grade Appeals**

You are free to appeal any grade assigned to you in this class according to the following procedure. Wait two days before contacting me, then e-mail me a typewritten justification for the grade you wish to appeal. We’ll then schedule an appointment during regular office hours to discuss the grade. By appealing your grade, you consent to the fact that your final score could go up or down upon appeal.

**Policy on Late Work**

*Late papers will not be accepted.* Extensions will only be granted in the event of an extreme and verifiable medical or family emergency

**Office Hours**

My office hours are from 2-4pm on Mondays. You can schedule a 15-minute or up to 30-minute slot via the following link: [https://erinsnider.youcanbook.me](https://erinsnider.youcanbook.me). If that time doesn’t work with your schedule, please get in touch via [esnider@tamu.edu](mailto:esnider@tamu.edu) to arrange an appointment.

**TAMU email account**

All students must have a TAMU email account. As our class focuses on issues still very much in flux, I will often send out class announcements, reminders, or logistical instructions using this email system. You are responsible for ensuring that your TAMU account is current and working.

**Making Up a Missed Class**

The university considers an excused absence to be those for reasons of authorized university activities, major illness, and religious holy days. You do have to make up your absence, even if excused due to illness, university excuse, etc. as you would have to make up for a missed assignment for the same. The university provides that excused absences are given opportunities to be made up, not that they are erased with no responsibility for work missed.

For all excused absences, you have the opportunity to make up your missing participation grade by attending a lecture at the university or watching a documentary related to our course subject to my approval. With either option, you must:
Write a 1-2 page single spaced paper summarizing the lecture or the documentary and
Give a 10-minute presentation to the class on the subject of either the lecture or documentary.

Paper Format:

All papers for this class must be double-spaced, 12 point font with 1 inch margins. Please provide a cover sheet with your name, course number, topic, date, and the number of pages included. Citation format should follow the APSA or equivalent. Student papers will be submitted to Turn-it-in as per Bush School policy.

Bush School Writing Center: An invaluable resource for strengthening your writing skills. Their site is accessible here: https://sites.google.com/site/bushschoolwriting/

Required Texts:

Aid for democracy has become an expanded enterprise in the last two decades and one that is at the heart of often-contentious debates about the goals and mission of foreign assistance more generally. Texts for this class and guest speakers were chosen to reflect divergent views and differ in the evidence they provide and their persuasiveness towards highlighting the diverse approaches to the study and practice of democracy promotion. As this is a graduate seminar, they are also designed to encourage critical evaluation of the existing literature.


Thomas Carothers. Aiding Democracy Abroad: The Learning Curve (Washington, DC; CEIP, 1999)

Sheila Carapico. Political Aid and Arab Activism: Democracy Promotion, Justice, and Representation. (Cambridge, 2014)


*Course reserve list available online*

Keep the following questions in mind when reading to help focus your attention on the big picture:

What is the question being asked by the author? What is the argument the author is trying to make and why might this be important? What are the strengths and weaknesses of the argument? How convincing is their evidence? What are possible counter arguments that could be made? What does this tell us about evaluating current democracy promotion efforts?

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**Week 1**

Introductory Lecture/Syllabus Review/Course Requirements
The Economist. "What's gone wrong with democracy"


Week 2

What is Democracy Promotion? Introduction to Theories and Concepts


Michael McFaul, Advancing Democracy Abroad, Chapters 1-2

Thomas Carothers. Aiding Democracy Aboard. Chapters 2, 3, and 5

Week 3

Justifying Democracy Promotion


http://muse.jhu.edu/journals/journal_of_democracy/v012/12.3rich.html


Michael McFaul, "Democracy Promotion as a World Value," Washington Quarterly 28:

Week 4
Defining Democracy and Democratization


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**Week 5**

**Who Promotes Democracy?**


Richard Youngs, “Europe's Uncertain Pursuit of Middle East Reform,” in Carothers and Ottaway. Uncharted Journey, Ch. 12.


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**Week 6**

6
Democratization: More than Domestic Politics?


Jon C. Pevehouse, "Democracy from the Outside-In? International Organizations and Democratization" *International Organization,* Summer 2002
http://muse.jhu.edu/journals/international_organization/v056/56.3pevehouse.html


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Week 7

Does Democracy Promotion Work? Evaluating Democracy Aid

*Guest Speaker: Elizabeth Ellis, former director of West Africa for Chemonics and C.O.O. with IDE*


National Research Council. *Improving Democracy Assistance.* Chapter 1 (Summary) and Chapter 5.


Carothers, ADA Chapters 9-11

Andrew Green and Richard Kohl, "Research and Evaluation of Democracy Promotion," *Perspectives from the Donor Side," Democratization 2007*

Week 8
Mid-Term Take Home Exam Due

Considering Context and Culture


No Class, Spring Break!

Week 9

Varieties of Democracy Assistance

Guest: Ebie DuPont, The Carter Center

Elections and Election Observation


Eric Bjornlund. Beyond Free and Fair. Chapter 4


**Civil Society and Political Parties**


Ottoway and Carothers. *Funding Virtue: Civil Society Aid and Democracy Promotion*. Chapter 11.


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**Week 10**

**Administration and Occupation**

*Guest Speaker: Caitlin McNary, Syria Desk Officer, International Medical Corps*


**Alternative Motivations**


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**Week 11**

9
Approaches to Democracy: Comparing US and European Approaches to Democracy Promotion


Peter Burnell, “Political Strategies of External Support,” *Foreign Policy Analysis* 1:3 2005


Pavol Demes. “Twenty Years of Western Democracy Assistance in Central and Eastern Europe.” International Institute for Democracy and Electoral Assistance. 2010. [http://www.idea.int/resources/analysis/20_years_dem_assistance.cfm](http://www.idea.int/resources/analysis/20_years_dem_assistance.cfm)

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**Week 12**

**Promoting Democracy in the Middle East—Support for Democracy or the Status Quo?**

10
Sheila Carapico. *Political Aid and Arab Activism*. Read: Introduction and Chapters 1 & 2


http://www.brookings.edu//media/research/files/papers/2009/5/democracy%20promotion%20wittes /05_democracy_promotion_wittes


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**Week 13**

**Case Study: The United States and Egypt**

*Guest Speaker: Robert Becker, formerly with the National Democratic Institute for International Affairs (NDI) and a defendant in the NGO trial in Egypt*

Sheila Carapico. *Political Aid and Arab Activism*. Read Chapters 3, 4, and Conclusion


Kenneth Roth. “Egypt’s NGO funding crackdown.” *Foreign Policy* April 9, 2013
http://foreignpolicy.com/2013/04/09/egypts-ngo-funding-crackdown/

**Case Study Presentations**

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**Week 14**

**Ethics and Aid: Challenges for International Democracy Promotion**

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Jose R. Cardenas. "There's Nothing Sinister or Unique about USAID's Cuba Program." *Foreign Policy*. April 5, 2014 http://foreignpolicy.com/2014/04/05/theres-nothing-sinister-or-unique-about-usaidcs-cuba-program/?wp_login_redirect=0


**Case Study Presentations**

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**Useful Resources**

Foreign Policy's Democracy Lab: http://foreignpolicy.com/channel/democracy-lab/ News on a variety of subjects related to transitions to democracy

Think Tanks:

Center for the Democratic Control of the Armed Forces: www.dcaf.ch
German Institute of Global and Area Studies: http://www.giga-hamburg.de/
Council on Foreign Relations: www.cfr.org
Carnegie Endowment for International Peace: www.celp.org
Middle East Institute: www.mideastl.org
Saban Center, Brookings Institute: http://www.brookings.edu/saban.aspx
Washington Institute for Near East Policy: www.washingtoninstitute.org
The Heritage Foundation: www.heritage.org
Project on Middle East Democracy: www.pomed.org
National Endowment for Democracy: www.ned.org
International Republican Institute: www.iri.org
World Movement for Democracy: www.wmd.org
International IDEA-The International Institute for Democracy and Electoral Assistance: www.idea.int
National Democratic Institute: www.ndi.org
Center for Strategic and International Studies: www.csis.org
Egyptian Center for Economic Studies: www.eces.org.eg

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Truman Institute: http://truman.huji.ac.il/
Dayan Center: http://www.dayan.org/
Economic Research Forum: www.erf.org.eg

**Data**

*Foreign Aid:*
Aid Data: Open Data for International Development: [http://www.aiddata.org](http://www.aiddata.org) innovative new site aggregating development finance data in different areas.

*General Data:*
Inter-University Consortium for Political and Social Research: [http://www.icpsr.umich.edu/access/index.html](http://www.icpsr.umich.edu/access/index.html)
Brookings Iraq Index: [http://www.brookings.edu/saban/iraq-index.aspx](http://www.brookings.edu/saban/iraq-index.aspx)

**Democracy and Governance Measures**

*BTI - Bertelsmann Transformations Index:*
[http://www.bertelsmann-transformation-index.de](http://www.bertelsmann-transformation-index.de)
Index developed by the Bertelsmann Foundation on the political and economic development status of 120 countries in transition (2003-2010).

*Democracy Ranking:*
[http://www.democracyranking.org](http://www.democracyranking.org)
Democracy Index based on political (among others Freedom House, CPI) and socioeconomic factors. Available for 100 countries between 2008 and 2010.

*Democratic Audit:*
[http://www.democraticaudit.com](http://www.democraticaudit.com)
Qualitative appraisal of the democratic quality and the human rights in several countries. Democratic Audit is an independent research group at the University of Liverpool.

*Economist Intelligence Unit Democracy Index:*
[http://www.eiu.com](http://www.eiu.com)
Democracy Index developed on the basis of expert evaluations of 60 factors from five areas (election process, civil rights, government capability, participation and political culture) in 167 countries in the years 2006, 2008 and 2010.

*Freedom House: Freedom in the World Reports:*
[http://www.freedomhouse.org](http://www.freedomhouse.org)
Ratings on the guarantee of political rights and civil rights in all countries worldwide. Data available from 1972 onward and yearly updated. Well-established rating developed by the American NGO "Freedom House".
NID: Neuer Index der Demokratie:
http://www.politikwissenschaft.uni-wuerzburg.de/.../nid
New democracy measure developed by Hans-Joachim Lauth (University of Würzburg) based on the combination of constituent parts of the Freedom House, Polity and WGI indices. Data is available for 60 countries since 1996 on a two year basis.

Polity:
http://www.systemicpeace.org/polity/polity4.htm
Classification of political systems on a scale between the two extremes autocracy and democracy. Yearly updated data available for all countries worldwide from 1800 onwards. One of the most used democracy measures, it is compiled at the Colorado State University.

Polyarchy Dataset:
http://www.nd.edu/~mcoppled/crd/datacrd.htm
Democracy index based on Robert Dahl's (1971) concept of polyarchy. Developed by Michael Coppendge (University of Notre Dame) and Wolfgang Reinicke (Global Public Policy Institute) the index is available for all countries worldwide for the time span 1985-2000.

SGI - Bertelsmann Sustainable Governance Index:
http://www.sgi-network.org
Index on the democracy level, the economic capability and the welfare state in 31 OECD countries. Developed by the Bertelsmann foundation, the index is available for the years 2009 and 2011.

UDS - Unified Democracy Scores:
http://www.unified-democracy-scores.org
Democracy measure developed by James Melton (IMT Lucca) and his team, it combines measures from 12 existent democracy measures (among others Freedom House, Polity, Polyarchy, Vanhanen). Available for all the countries worldwide between 1946 and 2008.

Vanhanen's Index of Democracy:
http://www.prdo.no/CSCW/Datasets/Governance/Vanhanens-Index-of-democracy
Democracy index developed on the basis of the polyarchy dimensions competition and participation proposed by Robert Dahl (1971). The Index relies on election statistics worldwide (1810-200) and was developed by Tatu Vanhanen (University of Tampere).

V•Dem:
https://v-dem.net
Ratings on 11 different democracy components developed on the basis of evaluations by national experts. Available for all countries worldwide from 1900 onwards, the index was developed by the University of Gothenburg.

WGI - Worldwide Governance Indicators (Weltbank):
Indices for six governance dimensions based on the combination of data from a broad array of data sources. Available for 213 countries in the time span 1996-2009.

HUMAN RIGHTS AND INDIVIDUAL LIBERTIES
Amnesty International - Human Rights Reports:
Yearly reports on the human rights situation in all countries worldwide.

CIRI Human Rights Data Project:
http://ciri.binghamton.edu
Quantitative data on the effective guarantee of 15 human rights in 195 countries between 1981 and 2009. The measures were developed by David L. Cingarella (Binghamton University) and David L. Richards (University of Connecticut).

HDR - Human Development Reports (UNDP):
http://hdr.undp.org/en
Various data on the socioeconomic development status of all countries worldwide. Provided by the United Nations, the HDR-data are available in yearly reports from 1990 onwards and partially since 1960 (online databank). Further, the HDR features additional indices, among others the Human Development Index (HDI), the Gender Inequality Index (GII) and the Multidimensional Poverty Index (MPI).

MAR - Minorities at Risk Project:
http://www.cidcm.umd.edu/mar
Quantitative and qualitative data on the composition, the political and legal situation and the conflict potential of discriminated and/or politically active minorities in all countries worldwide with a population of at least 500'000 inhabitants. The data is available between 1945 and 2006 and was collected by the University of Maryland.

PITF - Political Instability Task Force / State Failure Project:
http://globalpolicy.gmu.edu/pitf/pitfset.htm
Several datasets about internal conflicts, state failure and genocides in all countries worldwide in the time span 1995-2010. The data was collected at the George Mason University.

Political Terror Scale:
http://www.politicalterrorindex.org
The index developed by Mark G Gibney (University of North Carolina) and colleagues measures the degree of political violence and repression. The measures are based on the yearly reports by Amnesty International and the U.S. Department of State and are available from 1976 onwards.

RAS - Religion and State Project:
http://www.religionandstate.org
Data on the relationship between religion and state (including the discrimination of religious groups) for all countries worldwide in the time span 1990-2002. The measures were developed at the Bar Ilan University.

UNODC - United Nations Office on Drugs and Crime:
http://www.unodc.org_/Crime-Monitor

U.S. Department of State - Human Rights Reports:
after 1999; before 1999
Yearly reports on the human rights situation in all countries worldwide from 1993 onwards.
Elections and Direct Democracy

ACE Electoral Knowledge Network:
http://aceproject.org
Qualitative information about elections, electoral systems, direct democracy and parties for all countries worldwide. ACE is a combined initiative by nine IGOs and INGOs.

CSES - Comparative Study of Electoral Systems:
http://www.cses.org/
International comparative election study consisting of three elements: 1) Post-election surveys; 2) Elections statistics on district level; 3) Elections results and system on national level. Available for approximately 30 countries in the time span 1996-2011; the data is collected by the universities of the specific countries.

DPI - Database of Political Institutions (Weltbank):
http://go.worldbank.org/2EAGGLRZ40
Data on the election system, federalism, the composition of the government as well as on the votes and seats distribution in all countries worldwide between 1975 and 2009.

Direct Democracy Database (C2D):
http://www.c2d.ch/inner.php?table=dd_db
Databank with detailed information on direct democratic institutions and all popular votes held at the national, subnational and local level for all countries worldwide. The database was developed at the Centre for Democracy Studies Aarau (ZDA).

Direct Democracy (IDEA):
http://www.idea.int/publications/direct_democracy/index.cfm
A worldwide comparison of direct democratic instruments and mechanisms in the form of a handbook edited by the IGO "International IDEA".

Election Resources:
http://www.electionresources.org
Developed by Manuel Alvarez, it contains results from local and national elections as well as qualitative information on the electoral and party system of most of the countries worldwide. The starting year may vary depending on the specific country, usually in 1980s.

Electoral System Design Project:
http://www.dartmouth.edu/~icarey/Data_Archive.html
Data on all elections held as well as on the electoral and party systems and various socioeconomic factors in 81 countries (1945-2006). Developed by John Carey (Dartmouth College) and Simon Hix (London School of Economics).

Inter-Parliamentary Union (IPU): Parline Database und Women In Parliaments:
http://www.ipu.org
Two databanks by the Inter-Parliamentary Union (IPU): 1) Election results since the 1970s and
Information about electoral systems and the composition of parliaments worldwide (Parline); 2) 
Women's share in parliaments in all countries worldwide since 1997 (Women in Parliaments).

**Manifesto-Project:**
http://www.manifestoproject.wzb.eu
Data on the political position of parties based on a qualitative content analysis of party manifestos in 50 countries since 1945. Developed at the Wissenschaftszentrum Berlin für Sozialforschung.

**Psephos Adam Carr’s Election Archive:**
http://psephos.adam-carr.net
Elections results from 182 countries, collected by Adam Carr. The data availability varies between countries, usually available from the 1990s onwards.

**QuotaProject - Global Database of Quotas for Women:**
http://www.quotaproject.org
Worldwide information on parliamentary and party women’s quota. Joint initiative by the International IDEA and the University of Stockholm.

**Voter Turnout Database (IDEA):**
http://www.idea.int/vt/
Worldwide turnout rates of parliamentary and presidential elections from 1945 onwards.

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**TRANSPARENCY**

**Freedom of Information (Privacy International):**
https://www.privacyinternational.org/article/global-freedom-information-map
Graph and report on the existence, history and extent of legal provisions for freedom of information. Data covers approximately 140 countries and is collected by the British NGO "Privacy International".

**Global Integrity Report:**
http://www.globalintegrity.org/report
Qualitative and quantitative expert evaluations of about 300 transparency, media freedom and de jure and de facto (anti-)corruption related factors. The data is collected by the INGO "Global Integrity" since 2004 and covers 30-60 transition countries (depending on the year).

**Political Finance Database (IDEA):**
http://www.idea.int/parties/finance/db/index.cfm
Information about election campaign and party financing worldwide.

**Transparency International: Corruption Perception Index (CPI), Global Corruption Barometer (GCB) and Bribe Payers’ Index (BPI):**
http://www.transparency.org/policy_research/surveys_indices/about
Research initiative by the INGO "Transparency International". The data covers three topics: 1) Corruption index for 150-180 countries since 1995 (CPI); 2) Surveys on the public perception and the daily experience with corruption in 60-90 countries since 2003 (GCR); 3) Index on the willingness of national companies and corporations to pay bribes; available for 22 countries in the years 1999, 2002, 2006 and 2008 (BPI).
FREEDOM OF THE PRESS AND MEDIA SYSTEMS

Freedom House - Freedom of the Press Index:
http://www.freedomhouse.org
Media freedom index: worldwide collected data yearly updated since 1980.

ICT Database (ITU):
http://www.itu.int/ITU-D/ict/
Contains data on the distribution of information and communication technologies provided by the International Telecommunication Union (ITU). Data is available for all countries worldwide since 1960 (yearly updates from 1975 onwards, partially subject to charges).

RSF - Reporters Without Borders Press Freedom Index:
http://en.rsf.org/
Qualitative information and quantitative index on media freedom compiled by the INGO "Reporters Without borders". Available for 140-180 countries from 2002 onwards, yearly updated.

Unesco:
http://stats.uis.unesco.org/
Press and broadcast related statistics (circulation and number of newspapers, radio and television stations). Provided by the UNESCO, the data cover all the countries worldwide and are available from 1975 onwards, however, a lot of data is missing.

World Press Trends (WAN):
Fee required press statistics (circulation, reach, consumption, advertisement and number of newspapers) provided by the INGO "World Association of Newspapers". Statistics are available for all the countries worldwide in the form of handbooks since 1993 and since 2000 in the form of an online databank.

BUREAUCRACY AND RULE OF LAW

Global Competitiveness Report (WEF):
http://www.weforum.org
Fee required data on the economic competitiveness and the quality of public authorities in 133 countries. The information is collected by means of surveys of business executives and is available from 1979 onwards.

ICRG - International Country Risk Guide:
http://www.prsgroup.com/ICRG.aspx
Political, economic and financial risk assessment performed by the private PRS Group. The data is available from 1984 onwards, covers 140 countries but a fee is required. The political factors considered cover corruption, internal and external conflicts, democratic accountability and law and order.

World Competitiveness Yearbook (IMD):
http://www.imd.org/research/publications/wcy/World-Competitiveness-Yearbook-Results/#/
Country ratings developed by the International Institute for Management (IMD) in Lausanne based on 331 factors from the areas economic performance, governmental capability and infrastructure. The yearly ratings cover 59 countries and are available from 1989 onwards.

**Economic Freedom of the World (Fraser Institute):**
http://www.freetheworld.com
Collection of approximately 30 indicators from various data sources on the effective guarantee of property rights, freedom of trade and the regulation of the financial and labour market. The data is collected by the economically liberal Canadian think tank "Fraser Institute" and covers approximately 140 countries from 1970 onwards (since 2000 collected on a yearly basis).

**Index of Economic Freedom (Heritage Foundation):**
http://www.heritage.org/index/
Economic freedom index developed by the liberal conservative American think tank "Heritage Foundation" based on 10 components (including the effective guarantee of property rights and freedom from corruption). The yearly collected and computed index covers approximately 180 countries and is available from 1995 onwards.

**COMPARATIVE DATA ON CONSTITUTIONS**

**CCP - Comparative Constitutions Project:**
http://www.comparativeconstitutionsproject.org
Data and information on the formal characteristics and content of constitutions for the vast majority of the independent states worldwide since 1789. Developed by Zachary Elkins (University of Texas) and Tom Ginsburg (University of Chicago) in collaboration with the Cline Center for Democracy (University of Illinois).

**Democracy Assistance Project (USAID):**
http://www.pitt.edu/~politics/democracy.html
More than 500 indicators on the American foreign aid and the constitutional provision of various basic rights. Additionally, a vast array of secondary data on the rule of law and socioeconomic factors is available. The data covers information from approximately 190 countries and the time span 1990-2007. The project is administered and developed by Steve E. Finkel (University of Pittsburgh) and colleagues.

**INTERNATIONAL SURVEYS**

**Afrobarometer:**
http://www.afrobarometer.org
**Arab Barometer Project:** http://www.arabbarometer.org/
**Asian Barometer:**
http://www.asianbarometer.org
**CSES - Comparative Study of Electoral Systems:**
http://www.cses.org
**EES - European Election Study:**
http://www.ees-homepage.net
**ESS - European Social Survey:**
http://www.europeansocialsurvey.org
Eurobarometer:  
http://www.gesis.org/eurobarometer
Gallup World Poll:  
http://eu.gallup.com/Poll/118471/World-Poll.aspx
ISSP - International Social Survey Programme:  
http://www.issp.org
LAPOP - Latin American Public Opinion Project:  
http://www.vanderbilt.edu/lapop/survey-data.php
Latinobarómetro:  
http://www.latinobarometro.org/latino/latinobarometro.jsp
WVS - World Value Survey:  
http://www.worldvaluessurvey.org
Palestinian Center for Policy and Survey Research: http://www.pcpsr.org/
Gallup Center for Muslim Studies: http://www.gallup.com/consulting/worldpoll/26410/Gallup-Center-Muslim-Studies.aspx
Zogby Polls: http://www.zogby.com/

**Economic Data:**

Organization for Economic Cooperation and Development Aid Database (OECD):  
http://www.oecd.org/dac/stats/
USAID Greenbook: http://gesdb.usaid.gov/gbk/
Penn World Tables: http://pwt.econ.upenn.edu/
International Monetary Fund: http://www.imf.org/external/data.htm
Index of Economic Freedom: http://www.heritage.org/index/

**Data on Governance and Public Goods:**
World Bank Doing Business: http://www.doingbusiness.org/
World Bank Governance and Anti-Corruption:  
http://info.worldbank.org/governance/wgi/index.aspx#home

**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://aggiehonor.tamu.edu

"An Aggie does not lie, cheat, or steal, or tolerate those who do."
Tips on Close Reading and Preparing to Present

Each week we will read a large amount of material before discussing that reading in class. Close reading entails reflecting on the text as you are reading and evaluating the author's argument. The following suggestions are meant to guide you in preparing for class each week:

- **Look for the author's argument and the evidence she uses to support it:** What is the main claim she makes? With whom is she disagreeing? Then consider your reactions to the author's work: Does this make sense to you? Why or why not? What are the weaknesses of the argument?

- **Read with pencil in hand. Jot down thoughts you want to raise in class.** Write your reactions to the text in the margins. Above all, think about what you are reading; if you find yourself turning pages numbly, stop, take a pause, and then refocus on the author's chain of thought.

- **Plan your readings to be spaced out in reasonable increments.** Thoughtful reading takes time and energy. It is more pleasant and more productive to read over several days than to try and compress all the reading into a couple of nights.

- **Don't use a highlighter.** Writing comments (e.g., "good counterpoint to Huntington") helps a reader engage with the text, whereas highlighting encourages passivity and torpor.

- **Keep track of the parts of the text where you had questions, objections, or fierce agreement with the author's points.** Note page numbers on a separate sheet of paper. You may also want to use post-it flags for quick reference to key passages.

- **When you are done reading, check to see that you can summarize the author's argument in a few sentences.** You may want to take 5 minutes and write down this summary, particularly if you are reading several texts in a short period.

- **Remember that the goal of close reading is not just to have turned pages, but to be able to say something about the material and evaluate it.**

Expectations for Seminar Discussion

Seminar meetings are an opportunity to analyze the information presented in our readings. My expectations are that you will come to class having done a close reading of the assigned texts. You should be ready to answer questions about the text, including "What is the author's argument and what do you think of it?" Proper preparation will enable the class to have an informed discussion. An informed discussion entails the following:

- **Active listening to whomever the instructor has recognized to speak.** Like close reading, active listening requires reflection on what is being said. This means jotting down your reactions to the lecture or discussion and raising questions for your fellow classmates. It also means not talking while others are speaking.

- **Responding, as best as you are able, to questions asked by the instructor.** The material we will be reading is sometimes very difficult and complex. Because it is open to interpretation from many viewpoints, in most cases there will not a single correct answer. Nonetheless, it is incumbent upon
all students to attempt to respond to questions in class by drawing upon the readings done outside of class.

- Letting the instructor know when a point is not clear. When you have a question, you are probably not the only one. By asking the instructor to clarify an issue from the readings or lectures, you are helping us all to learn more.

- Making your own points and arguments. You may recall what you said in class, much longer than you will remember what the instructor said. By sharing your reactions and thoughts with me and your colleagues, you will take much more from this course than if you sat quietly.

- Respect your fellow students and the instructor. A rich discussion requires that many people participate. The instructor will actively moderate discussion in class so that all are given a chance to express their opinions. Those who have many points to share should listen closely to their colleagues and respect the instructor’s judgment in facilitating a full conversation.
Response Paper Guidance

The following information is meant to strengthen and refine both your thinking and writing over the course of the semester and to give you more structure in preparing your responses each week. As stated in the syllabus, the questions given for the week’s readings are meant to serve as guides and give you some insight into what I’m looking for you to get out of the texts. You are free to engage directly with the questions or explore related inquiries. In the paper you should develop one main topic or thesis. While the writing is informal it is imperative that the papers adhere to the conventions of good writing even if the assignment is 1-2 pages: coherent, succinct, and free of grammatical errors. Read and edit your paper before you send it to me!

Questions to ask yourself while reading and points to consider in preparing your response:

- What is the main problem or issue the author is addressing?
- What is the author’s central claim, argument, or point?
- What assumptions does the author make?
- What are possible counterarguments to the text’s claims?
- Why are the problem(s) and the argument(s) interesting or important?
- In considering the texts collectively, how do they relate to one another? Do the authors agree? Disagree? Address different aspects of an issue? Formulate a problem in different ways?
- In what way (if any) does the information or argument of one text strengthen or weaken the argument of others? Does integrating the claims in two or more of the texts advance your understanding of a larger issue?
- Include your own voice by weighing arguments, evaluating evidence, and raising critical questions. If there seems to be something important that none of the authors considers, point it out and state what you think its significance is.
- What questions does the text(s) raise for you—about the material, about other things?

Points to Avoid:

- Response papers are not simply a space for you say whether you liked or disliked the texts. Give praise or blame where you think it is due, but avoid commendation or condemnation for its own sake.
- Do NOT summarize the texts! I know what they say. You are supposed to be reacting or responding to them, not simply repeating what they say. If there is no analysis involved, then you have not responded, only regurgitated.
- If there are things in the text that you don’t understand, do not try to gloss over them. Try to find out what the text means. If you still cannot make sense of an argument in a text, then it may be the case that the argument does in fact not make sense. If that’s the case, point it out in your paper.

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Grading

In grading response papers, I look for five things:

1. Thesis statement and/or clear topic
2. Use of Evidence
3. Organization
4. Incorporation of Readings and/or Class Discussions
5. Writing Skills (grammar, mechanics, spelling)

Response papers are graded as follows:

- Clear topic/thesis articulated 2
- Organization 2
- Content: Quality of Logic 2
- Writing Style and Clarity 2
- Grammar and Punctuation 2

Total 10
Leading Seminar Discussions

Over the course of the semester, you'll have the opportunity to lead seminar discussions twice. On the week that you are set to lead our discussion, you must provide the class (by 5pm on Monday through email) with a critical statement of the assigned readings. This statement should be no longer than two double-spaced pages. When you lead our discussion, you can trust that your colleagues will have discussed the key elements of the readings. How should you approach your preparation to leading discussions and what should you do?

The possibilities open to you are endless, although bounded. You may:

- Lead a group discussion on prepared questions
- Hand out new readings for the class to take time to absorb and discuss (these might include academic journals, the NYT, Financial Times, the Economist, book reviews, etc)
- Stage a debate (between two authors, three schools of thought)
- Show a film linked to the areas relevant to the week's readings

In short, you have free reign to conduct any activity you deem worthy of the readings in the unit or the themes and lessons therein.

Out of 10 possible points, your class leadership will be assessed as follows:

8-10
- Present an original, innovative, exciting way to get the class to think about the readings.
- Bring in outside materials, such as short films, readings, articles, to launch or enhance your discussion
- Take the themes of the readings and force us to think about them deeply and carefully and to stretch them beyond the readings to further applications or higher levels
- Highlight the salient points of the reading in the post-activity/reflection/discussion
- Relate the main points to development, to other readings, and/or to other colleagues' personal experiences.

6-7
- Conduct a discussion/exercise that is fun and raucous, yet folclw it with little reflection on the point of the readings or on the semester as a whole.
- Ask questions that elicit a few answers, but then fail to pursue those answers or push the respondents to think about their responses.
- Solicit answers without linking them to each other or to the larger context of the readings/course

4-6
- Host a disinterested or unattached discussion
- Refuse to answer questions that would clear up confusion about readings or fail to defer them to the instructor when you don't know the answer.

- Conduct a discussion has nothing to do with the readings

---

**Below 4**

- Throw open the floor for undirected discussion

- Ask people what their questions are.

- State that the authors have nothing of worth to add to our semester long inquiry and therefore that you have nothing to add either.
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
* Submit original form and attach a course syllabus.

In Instructions
1. Course request type:
   ☑ Undergraduate ☐ Graduate ☐ First Professional (DDS, MD, JD, PhamD, DPA)
2. Request submitted by (Department or Program Name): International Affairs Department
3. Course prefix, number and complete title of course:
   INTA 662 Intelligence Threats to National Security in the Modern Era

4. Catalog course description (not to exceed 50 words):
   Course focuses on the threats presented by the intelligence and security services of Russia, China and Iran; will include in-depth discussion of the culture, mission, structure and recent foreign intelligence threat activity both in the domestic and international arena.

5. Prerequisite(s):
   None
   Cross-listed with: n/a
   Stacked with: n/a

6. Is this a variable credit course?
   ☐ Yes ☑ No
   If yes, from _______ to _______

7. Is this a repeatable course?
   ☐ Yes ☑ No
   If yes, this course may be taken _______ times.
   Will this course be repeated within the same semester?
   ☐ Yes ☑ No

8. Will this course be submitted to the Core Curriculum Council?
   ☐ Yes ☐ No

9. How will this course be graded?
   ☑ Grade ☐ S/U ☐ P/F (CLASE)

10. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
      __________
      __________
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
      __________

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-control-basics-for-distance-education).

13. Prefix: INTA  
    Course #: 662  
    Title (excluding punctuation): Intel Thrts to Natl Security

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<th>Lect.</th>
<th>Lab</th>
<th>Other</th>
<th>SUI</th>
<th>CPF and Fund Code</th>
<th>Admin Unit</th>
<th>Acad. Year</th>
<th>PICE Code</th>
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</tbody>
</table>

Approval recommended by:

F. Gregory Gause, III
Department Head or Program Chair (Type Name & Sign)  Date

Leonard Bright
Chair, College Review Committee
Arnold Veit
Dean of College

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

Submitted to Coordinating Board by:

Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 07/14
INTA 662
INTELLIGENCE THREATS TO NATIONAL SECURITY
IN THE MODERN ERA

Alex J. Vega IV
George Bush School of Government and Public Service
Allen Building, Room - 1066
Telephone: 571-236-2263; email: alexvega4@tamu.edu

Course Description

This three-hour graduate course is a survey of the top three intelligence threats to U.S.
National Security as identified by the Director of National Intelligence in the "Statement
for the Record of the Worldwide Threat Assessment of the U.S. Intelligence Community to
the Senate Select Committee on Intelligence." This course focuses on the threats
presented by the intelligence and security services of Russia, China, and Iran. This will
include in-depth discussions of the culture, mission, structure and recent foreign
intelligence threat activity both in the domestic and international arena. Case studies
from recent U.S. federal and foreign government indictments of human intelligence and
cyber related activities will serve to illuminate current adversarial tradecraft and
methodologies. The course will also provide an introduction to counterintelligence as a
tool for threat mitigation. Select guest speakers will augment throughout the course.

Learning Outcomes

Students who complete this course will gain a nuanced perspective of the top three
nation state threats to U.S. National Security. This perspective will include the
professionalism, structure and capability of each of the primary threats as well as an entry
level understanding how counterintelligence can mitigate these threats.

Required Textbooks

Felshinsky, Yuri, *The Corporation: Russia and the KGB in the Age of President Putin*

Wise, David, *Cassidy's Run: The Secret Spy War Over Nerve Gas* (New York, Random
House, 2000)

Wise, David, *Tiger Trap: America's Secret Spy War With China* (New York, Houghtlin
Mifflin Harcourt, 2011)

Effimiaides, Nicholas, *Chinese Intelligence Operations* (Washington D.C., Naval Institute
Press, 1994)

**Participation and Attendance:** All students are expected to participate actively in the classroom discussions and presentations. **Unexcused absences will be penalized.** Participation and attendance will count for 15% of the course grade. Additional authors will be assigned throughout the course and will be available to the students in the form of digital handouts. Students are responsible for reading assigned material before each class in order to facilitate meaningful, substantive discussion and dialogue. Student participation and attendance performance will be assessed in terms of comprehending, critical thinking, synthesizing, and applying course content to “real world” issues and intelligence challenges.

- **Substantive Performance Measures:** Students’ performance will be measured based on their substantive participation in discussions demonstrating that they have read the assigned readings; ability to logically and persuasively present an oral critique of an assigned reading using supporting facts and evidence; ability to articulate in writing a coherent, evidence based set of analyses and conclusions. Writing will be graded for proper spelling/grammar as well as content.

- Each student will present a critique of one or more readings during the course. The student will present the critiques in a brief power point presentation and will use the presentation to lead the class in a discussion of the reading. The student’s prepared remarks should not exceed 10 minutes.

**A mid-term examination:** The mid-term will be a two-hour examination over the lectures, videos, classroom discussions, and readings up to the mid-point in the course. The mid-term is worth 25% of the course grade. The format for this examination is 75% essay and 25% true-false and multiple choice.

**A final examination:** The final take home exam will cover the lectures, videos, classroom discussions, and readings from the second half of the course. The final exam is worth 25% of the course grade. (A minimum grade of 70 on the final examination is required to pass the course). The format for this examination is 100% essay.

**Group Case Study Presentation:** This group assignment is based on a significant foreign intelligence related case study assigned by the instructor at the beginning of the course. Your success in a potential future career as an intelligence and/or counterintelligence professional is not only based on your individual ability to assess collected information, but to study, analyze and present a cohesive and articulate prognosis for future adversarial activity and potential mitigation. This group assignment is meant as an opportunity for “Iron to Sharpen Iron” as you work to conclude and present your predictive findings. You will be graded on your ability to conduct research,
debate and challenge your group assumptions, organize a cohesive argument, and present your findings to both your peers and your instructor. Each group will conduct between a 60 to 90 minute presentation with all group members participating. This group project is worth 35% of the course grade.

**Grading:** The breakdown for the awarding of final course grades is therefore as follows:

Group Presentation 35%, Mid-Term Exam 25%, Final Exam 25%, Participation 15%

The following scale will be used for calculating final grades for this course:

A = 90%, B = 80%, C = 70%, F = 69% and lower

**Important Dates**

<table>
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<tr>
<th>TBD</th>
<th>Midterm Exam (In-Class, Handwritten Essay Blue Books)</th>
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<tr>
<td>TBD</td>
<td>Group Presentations</td>
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<tr>
<td>TBD</td>
<td>Final Exam Issue &amp; Return (Take Home)</td>
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Course Outline

After the first week, all students are expected to have completed the assigned readings before the next class starts. Syllabus topics are subject to change at the discretion of the instructor.

Week 01 – Introduction
- Understanding Russians
- Origins of the Threat

Readings for the next class:
- The Corporation Ch. 1-6
- The Chekist Takeover of the Russian State
- The HUMINT Offensive from Putin’s Chekist State

Week 02 – Russia: Russian Intelligence

Readings for the next class 23 Sept:
- The Corporation Ch. 7, 8, 9 (Pg. 357-end)
- Cassidy’s Run
- SVR Illegals
- GRU Illegals
- Poison
- Disinformation
- Procurement
- Cyber

Week 03 – Russia: Poisoned by Polonium

Week 04 – Russia: Introduction to Counterintelligence / Cassidy’s Run

Week 05 – Russia: Guest Speaker (s)

Week 06 – Mid-Term Exam

Readings for the next class:
- Tiger Trap Chapters 1-7
- Chinese Intelligence Operations Pgs. 1-56
- Sun Tzu: The Art of War Ch. 13
- The Divine Skein: Sun Tzu on Intelligence
- Chinese Intelligence History

**Week 07 – China: Understanding Chinese Culture**

**Readings for the next class:**
- Tiger Trap Chapters 8-16
- Chinese Intelligence Operations Pgs. 57-125
- Five Ways To Spy
- The Analytic Challenge of Understanding Chinese Intelligence Services
- China’s Student Network

**Week 08 – China: Origins of the Threat / Chinese Intelligence**

**Readings for the next class:**
- Tiger Trap Chapters 17-22
- Mandiant Report
- Chinese Cyber Strategy

**Week 09 – China: Guest Speaker - Case Studies**

**Readings for the next class:**
- A Time to Betray Chapters 01-10

**Week 10 – Iran: Understanding Iranians**

**Readings for the next class:**
- A Time to Betray Chapters 11-20
- Iran’s Ministry of Intelligence and Security: A Profile
- Hezbollah and Qods Force
- Iran and the US Timeline

**Week 11 – Iran: Iranian Intelligence**

**Readings for the next class:**
- A Time to Betray Chapters 21- End

**Week 12 – Iran: Guest Speaker**

**Week 13 – Group Presentations / Final Exam Issue**

**Week 14 – Group Presentations / Final Exam Due**

**Week 15 – Grades Posted**
1. Essay-Exam Grading Criteria:

**A** — Offers a genuinely new understanding of the topic. An organized, coherent and well-written product that clearly warrants publication. Demonstrates a total grasp of the topic. Writing is free of spelling and grammar errors and style is clear and concise.

**B** — Average graduate-level performance. A solid essay that is, on the whole, a successful consideration of the topic. Minor spelling and grammar errors present.

**C** — The work is barely adequate and does not meet the standards of graduate work. Answers the question minimally without demonstrating a thorough understanding of the topic. Makes inadequate use of evidence, has little coherent structure, and fails to adequately explore the issue. Many spelling and grammar errors.

**F** — An essay that is clearly unrepresentative of the qualities expected of graduate-level work or that fails to address the question. Writing is unintelligible. Essay contains plagiarism.

2. Class Participation Grading Criteria:

**A** — Strikes an outstanding balance of listening and contributing. Contribution is always of superior quality. Demonstrates preparation for every session in quality of contributions to class discussions.

**B** — Average graduate-level contribution. A positive contributor to class discussions. Participates in the majority of sessions. Contributions reflect understanding of the material.

**C** — Says nothing at all during five or more class sessions. Sometimes contributes voluntarily; more frequently needs to be encouraged. Minimal preparation for class reflected in arguments lacking analytical support, structure or clarity. **Frequently uses computer at desk during class without instructor's permission.**

**F** — Consistently disrupts class with side conversations. Lack of contribution to discussions reflects lack of preparation for sessions. Unable to articulate a responsible opinion on anything. Displays a negative attitude.
Academic Integrity

The Bush School is committed to the development of principled leaders for public service. Entering a Bush School course as a student means accepting this commitment personally. The commitment to "principled leadership" is a further expansion of the Texas A&M student honor code that states: "An Aggie will not lie, cheat or steal nor tolerate those who do." Every student in this course must comply with this code in all work submitted for a grade and will be held accountable accordingly for both individual and team assignments. Anyone who is not prepared to be held accountable to this standard should immediately withdraw from this course.

It is imperative to avoid plagiarism or the appearance of plagiarism through sloppy citation. As commonly defined, plagiarism consists of passing off as one's own ideas, words, writings, etc. that which belongs to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you have the permission of that person. It does not matter from where the material is borrowed--a book, an article, material off the web, another student's paper--all constitute plagiarism unless the source of the work is fully identified and credited. It is important when using a phrase, a distinct idea, concept, a sentence, or sentences from another source to credit explicitly that source either in the text, a footnote, or endnote. Plagiarism is a violation of academic and personal integrity and carries extremely serious consequences. Scholastic dishonesty (including cheating, multiple submission of work for grades in different courses, and plagiarism) will not be tolerated and will be punished. Further information can be found at http://www.tamu.edu/aggiehonor/acadmisconduct.htm

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. If you believe you have a disability requiring accommodation, please make that fact known to me and I will assist you in every way possible.
Texas A&M University

Departmental Request for a New Course
Undergraduate + Graduate + Professional

Submit original form and attach a course syllabus.

1. Course request type:
   - Undergraduate
   - Graduate
   - First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   International Affairs Department

3. Course prefix, number and complete title of course:
   INTA 664 The Middle East State System

4. Catalog course description (not to exceed 50 words):
   Course focuses on key challenges facing post-war societies; how recovery and development programs work; three main themes to be discussed, conflict, humanitarian intervention ad development

5. Prerequisite(s):
   None
   Cross-listed with: n/a
   Stacked with: n/a

6. Is this a variable credit course?
   - No
   If yes, from _______ to _______

7. Is this a repeatable course?
   - No
   If yes, this course may be taken _______ times.

   Will this course be repeated within the same semester?
   - No

   Will this course be submitted to the Core Curriculum Council?
   - No

9. How will this course be graded?
   - Grade
   - S/U
   - P/F (CLAD)

10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
       No
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
       No

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-control-basics-export-control-basics-for-distance-education).

13. Prefix Course # Title (excluding punctuation)
    INTA 664 ME State System

   Lect. Lab Other SCH CIP and Fund Code Admin. Unit Acad. Year FICE Code
   3.00 0.00 0.00 3.00 4501.01.01 1364 17 - 18 0 0 3 6 3 2
   Approval recommended by:
   F. Gregory Gausa, III
   Department Head or Program Chair (Type Name & Sign) Date
   Leonard Bright
   Chair, College Review Committee Date
   Arnold Vedutz
   Dean of College Date
   Submitted to Coordinating Board by:
   Chair, GC of UCC 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 – 07/14
INTA 664 The Middle East State System

Instructor: F. Gregory Gause, III
1087 Allen Building
gregory.gause@tamu.edu

Office Hours: Mondays 9-12:00 p.m.
or by appointment
979-862-8834

Course Description: Why is the modern Middle East so conflict ridden? This course attempts to answer that question through an examination of the interactions among the states of the region, the region’s non-state actors and outside powers in the post-World War II period. Special attention will be paid to the following factors in seeking to explain recurrent patterns and outcomes in the region’s international relations: power distributions both within the region and globally; the effects of powerful transnational ideological and identity movements in the region; domestic political institutions in the region’s states; regional economic systems; outside power policies in the region. While focusing generally on conflict and war in the region, the course will try to explain other aspects of regional politics that affect and are affected by regional conflict, including: war and peace decisions; alliance and alignment patterns; regional modes of statecraft (i.e., state-to-state war, regular diplomatic interchange, cross-border patron-client relations, financial tools of influence, cross-border subversion). The course will address certain chronological periods of Middle East international relations to examine these various factors and will cover thematic and theoretical attempts to explain recurrent patterns in the region’s politics.

Course Prerequisites: INTA 674, 676, or any INTA 689 related to the Middle East, or permission of the instructor.

Learning Outcomes: Upon completion of this course, the student will be able to: 1) identify major turning points in the post-World War II history of Middle East international relations; 2) apply competing explanatory frameworks to historical and current Middle East international issues; 3) assess the validity of competing explanatory frameworks in explaining overall historical trends in the international politics of the Middle East.

Books and Readings:

-Fred Halliday, The Middle East in International Relations (Cambridge University Press, 2005)

Other assigned readings will be available on the TAMU Libraries' E-Reserves site (http://library-reserves.tamu.edu/areslocal/index.htm) and/or on the Internet.

Grading: The final grade in this class will be calculated as follows: 1) composite score of your six short analytical essays - 40%; 2) completion of four preparatory assignments for your final paper - 10%; 3) final paper (10-page single spaced) - 40%; 4) classroom participation - 10%. Please see the syllabus for a description of the short analytical essays and the final paper. The essays and final paper will be graded with letter grades: A, A/B, B, B/C, C, D, F. Those letter grades will be converted into numerical equivalents for calculation of the final grade on the following 100 point scale: A=95, A/B=90, B=85, B/C=80, C=75, D=65, F=0. Final grades will be assigned according to the following scale: A=90-100, B=80-89, C=70-79, D=60-69, F=below 60).

Attendance and Make-Up Policy

Class attendance is mandatory. If an absence is excused, the instructor will either provide the student an opportunity to make up any quiz, exam or other work that contributes to the final grade or provide a satisfactory alternative by a date agreed upon by the student and instructor. If the instructor has a regularly scheduled make up exam, students are expected to attend unless they have a university approved excuse. The make-up work must be completed in a timeframe not to exceed 30 calendar days from the last day of the initial absence. The reasons absences are considered excused by the university are listed below. See Student Rule 7 for details (http://studentrules.tamu.edu/rule07). The fact that these are university-excused absences does not relieve the student of responsibility for prior notification and documentation. Failure to notify and/or document properly may result in an unexcused absence. Falsification of documentation is a violation of the Honor Code.

1) Participation in an activity that is required for a class and appears on the university authorized activity list at https://studentactivities.tamu.edu/app/sponsouth/index
2) Death or major illness in a student's immediate family.
3) Illness of a dependent family member.
4) Participation in legal proceedings or administrative procedures that require a student's presence.
5) Religious holy day. NOTE: Prior notification is NOT required.
6) Injury or illness that is too severe or contagious for the student to attend class.
   a) Injury or illness of three or more class days: Student will provide a medical confirmation note from his or her medical provider within one week of the last date of the absence (see Student Rules 7.1.6.1)
b) Injury or illness of less than three class days: Student will provide one or both of these (at instructor’s discretion), within one week of the last date of the absence:
   (i.) Texas A&M University Explanatory Statement for Absence from Class form available at http://attendance.tamu.edu or
   (ii.) Confirmation of visit to a health care professional affirming date and time of visit.

7) Required participation in military duties.
8) Mandatory admission interviews for professional or graduate school that cannot be rescheduled.

Other absences may be excused at the discretion of the instructor with prior notification and proper documentation. In cases where prior notification is not feasible (e.g., accident or emergency) the student must provide notification by the end of the second working day after the absence, including an explanation of why notice could not be sent prior to the class.

On rare occasions, the instructor might have to miss a class due to administrative or academic responsibilities out of town. This will be exceedingly rare, but if it does occur, the instructor reserves the right to reschedule class at a time when the vast majority of students are available for the make-up class and will convey the material to students unable to attend the make-up during office hours.

**SCHEDULE OF LECTURES, READINGS AND ASSIGNMENTS**

**Week 1: Introduction to the Course**
- no assigned readings (get started on the readings down the line)
- lecture on “Legacies of the Past”

**Week 2: Frameworks for Understanding the International Politics of the Middle East**

- Halliday, Introduction, Chapters 1 and 2

- Assignment #1: What is the key factor that Brown, Solingen and Miller each see as driving outcomes in the international politics of the Middle East? Which argument is most convincing and why? (3 pages, single-spaced)
-Discussion Questions: 1) What are the key differences among realist, constructivist, regional-cultural, historical sociological, leader-focused and domestic political frameworks for analyzing Middle East international relations? 2) Which approaches focus on unique attributes of the Middle East; which see the Middle East as very similar to other world regions? 3) Given their frameworks, what would Brown, Solingen and Miller advise the United States to do in reaction to the growth in the power of ISIS in Iraq/Syria?

Week 3: Transnational Ideas and Regime Security – Arab Nationalism

- Michael Barnett, *Dialogues in Arab Politics* (Columbia University Press, 1998), Chapters 2 and 8
- Fred Lawson, *Constructing International Relations in the Arab World* (Stanford University Press, 2006), Chapter 1 and Conclusion
- Curtis Ryan, *Inter-Arab Alliances*, (University Press of Florida, 2009), Chapters 1, 2 and 3

-Assignment #2: What is the core disagreement between Barnett and Lawson? Who makes the better argument? (3 pages, single-spaced)

-Discussion Questions: 1) What does Ryan mean by “regime security” and how can that help us understand foreign policy decisions? 2) How would the authors explain the rise in Iranian regional power in the last 10 years?

Week 4: The Creation of Regional Politics – Arab Nationalism and the First Arab-Israeli War

- Yehoshua Porath, *In Search of Arab Unity, 1930-1945* (Frank Cass, 1986), Chapters 1 and 3
- Rogan and Shlaim, *The War for Palestine* (2nd edition), Chapters 4-8

-Assignment #3: Why did the Arab states attack Israel in 1948? (3 pages, single-spaced)

-Discussion Questions: 1) Why did the Arab unity plans of the inter-war period fail? 2) How was Israel able to defeat the Arab armies in 1948-49? 3) Considering the Gaza conflict of 2014 and Arab state behavior during the crisis, what has changed between 1948 and 2014?

Week 5: The Rise and Fall of Arab Nationalism – Nasser and the 1967 War

**Assignment #4**: Nasser was the dominant figure in the Middle East from the mid-1950’s to the 1967 War. Did that have more to do with Egypt’s material power or with Nasser’s capture of the Pan-Arab idea? (3 pages, single-spaced)

**Discussion Questions**: 1) Why did the Nasserist Pan-Arab project fail? 2) Why did Nasser escalate the crisis of May 1967? 3) What role did the superpowers play in the outbreak of the 1967 War? 4) Why hasn’t there been a war between an Arab state and Israel since 1973?

**Week 6: Egyptian-Israeli Peace**

- William Quandt, *Peace Process*, Chapters 4, 6 and 7

**Assignment #5**: Why did Sadat choose to make peace with Israel in 1979? Assess the relative importance of domestic factors, regional and global power configurations and ideational factors. (3 pages, single-spaced)

**Discussion Questions**: 1) How and why did American policy toward Arab-Israeli peace change between the 1967 War and the 1973 War? 2) What do Sadat’s moves to make peace with Israel say about the importance of Pan-Arabism in regional politics? Does it completely negate its importance? 3) Would you say that the United States is as actively involved in seeking Arab-Israeli peace now as it was in the 1970’s? If yes, why; if no, why not?

**Week 7: Islam as Transnational Ideology**

- Halliday, *The Middle East in International Relations*, Chapter 7
- James Piscatori, *Islam in a World of Nation-States*, Chapters 1-3, 5

**Assignment – Final Paper preparation #1**: Come to class with a one-paragraph idea for your final paper. We will spend the first part of the class on presentations of that one-graph idea by each student.

**Discussion Questions**: 1) How, if at all, is Islam different from Arab nationalism as a transnational regional ideology? 2) Can Islam be characterized as hostile to the current world system of sovereign states? As supportive of that system? 3) Is Islam a more effective transnational identity platform for affecting regional politics in the Middle East than Arab nationalism was?
Week 8: The Iranian Revolution and Regional Politics

- Takeyh, Guardians of the Revolution, Chapters 1-4
- Lawrence Rubin, Islam in the Balance, Chapters 2, 3, 5

Assignment #6: “The Iranian Revolution was the most important international event in the Middle East since World War II.” Discuss. (3 single-spaced pages)


Week 9: The End of the Cold War and the Middle East

- Halliday, The Middle East in International Relations, Chapters 4 and 5
- Birthe Hansen, Unipolarity and the Middle East, (St. Martin’s Press, 2001), Chapter 15
- William Quandt, Peace Process, Chapters 10, 11 and 12

Assignment – Final Paper preparation #2: Final paper proposal. Pick a current issue in the Middle East and analyze it from a range of the perspectives we are studying this semester, with an eye toward making policy recommendations. Or pick an historical event and do the same thing, with an eye toward giving a comprehensive explanation of why the event happened and why the actors involved behaved the way they did. 1-page statement of your issue and a 1-page bibliography. Be ready to present your proposal very briefly in class.

Discussion Questions: 1) Did the end of the Cold War change the regional politics of the Middle East? 2) Did the end of the Cold War change American policy in the Middle East? 3) In a period of American “hegemony” in the region, why did the Arab-Israeli peace process of the 1990’s fail?
Week 10: War and Oil in the Middle East – with special reference to the Iraq War of 2003

-Giacomo Luciani, “Oil and Political Economy in the International Relations of the Middle East,” in Louise Fawcett (ed.), International Relations of the Middle East (3rd edition, Oxford University Press, 2013)


-Halliday, The Middle East in International Relations, Chapter 9

-Michael Klare, Blood and Oil, (Metropolitan Books, 2004), Chapter 4


-Discussion Questions: 1) What is a rentier state? Do rentier oil states have distinctive foreign policies? 2) How have changes in the control over production and changes in the price of oil affected relations between outside powers and the Middle East since 1970? 3) How has the post-1970 oil boom affected the distribution of power among the Middle Eastern states and international politics in the region? 4) Does oil lead to war in the Middle East? What role did oil play in the U.S. decision to go to war in 2003?

Week 11: The Rise of Salafi Jihadism


-Assignment – Final Paper Preparation #3: The introduction to your final paper. (One page, single-spaced)

-Discussion Questions: 1) How did the salafi jihadist movement arise? 2) What drives salafi jihadists to target “near enemies” vs. “far enemies”? 3) Is ISIS a serious challenge to the Middle Eastern state system? If so, why? If not, why not? 4) Why hasn’t an effective regional alliance formed against ISIS, when it is a threat to regime security of so many regional states?

Week 12: Sectarianism, State Strength and the Middle East State System


-Bassel F. Salloukh, “The Arab Uprisings and the Geopolitics of the Middle East,”
The International Spectator, Vol. 48, No. 2 (June 2013)
-F. Gregory Gause, III, "Beyond Sectarianism: The New Middle East Cold War," Brooking Doha Center, July 2014
-Halliday, The Middle East in International Relations, Chapter 8

Assignment: No written assignment today. Keep working on your final papers.

Discussion Questions: 1) How important is sectarianism in understanding the current configuration of regional politics? Are there other factors driving regional politics? 2) What effect does state weakness/collapse have on the international politics of the Middle East? 3) Is the current period like the "Arab Cold War" of the 1950's and 1960's? If so, how? If not, why not?

Week 13: The Rise of Iranian Power, US-Iranian Relations and a Nuclear Middle East

-Takeyh, Guardians of the Revolution, Chapters 8-11 and Conclusion

-a good article on the Iran nuclear deal, which I am waiting to find

Assignment: No written assignment today. Keep working on your final papers.

Discussion Questions: 1) Is US-Iranian rapprochement possible beyond the nuclear deal? 2) How, if at all, would Middle East regional politics change if Iran acquired a nuclear weapons capability?

Week 14: Last Class

-no reading. We will have brief (5 minute) presentations from each of you on your final papers. Followed by a few comments by me on why you have to have a framework.

Assignment – Final Paper Preparation #4: Draft of the first five pages (double-spaced) of your final paper.

Americans with Disabilities Act (ADA) Policy Statement

The Americans with Disabilities Act (ADA) is a federal antidiscrimination 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, or call 845-1637.

**Academic Integrity Statement and Policy**

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

If you have any questions at all about an issue of academic integrity regarding your own work or your responsibilities under the Aggie Code of Honor, please refer to the University’s policies (http://aggiehonor.tamu.edu/) and see the instructor.
Texas A&M University
Departmental Request for a New Course
Undergraduate + Graduate + Professional
* Submit original form and attach a course syllabus.

Form Instructions
1. Course request type: [ ] Undergraduate [ ] Graduate [ ] First Professional (DVM, MD, JD, PharmD, DNP)
2. Request submitted by (Department or Program Name): International Affairs Department
3. Course prefix, number and complete title of course: INTA 668 The Politics and History of the Arab Spring

4. Catalog course description (not to exceed 50 words):
Course explores and examines socioeconomic, geopolitical and cultural factors behind uprisings in the region.

5. Prerequisite(s): None
Cross-listed with: n/a
Stacked with: n/a

6. Is this a variable credit course? [ ] Yes [ ] No If yes, from ________ to ________
7. Is this a repeatable course? [ ] Yes [ ] No If yes, this course may be taken ________ times.
8. Will this course be repeated within the same semester? [ ] Yes [ ] No
9. Will this course be submitted to the Core Curriculum Council? [ ] Yes [ ] No
10. How will this course be graded? [ ] Grade [ ] S/U [ ] P/F (CLMO)

10. This course will be:
a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   No
b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
   No

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. [ ] I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-control-basics-for-distance-education).

13. Prefix Course # Title (excluding punctuation)

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Approval recommended by:
F. Gregory Ganse, III, Department Chair or Program Chair (Type Name & Sign) 11/12/15

Leonard Bright, Chair, College Review Committee
Arnold Veditz, Dean of College

Date
Chair, GC or UCC

Date
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 – 07/14
INTA 668 The Politics and History of the Arab Spring

Dr. Erlin A. Snider
Bush School of Government and Public Service
Texas A&M University
Office: Room 1035
Email: esnider@tamu.edu
Phone: 979-862-3469
Office Hours: 2-4pm Mondays or by appointment

Course Description and Objectives:

More than four years have passed since protests in Tunisia sparked a wave of popular uprisings throughout the Middle East. In that time, four entrenched authoritarian leaders have left power and new political actors have emerged to challenge former conceptions of power in the region. While it remains premature to predict how substantive these changes will be to the political map of the Middle East, those already underway suggest a new path unfolding in the region. Present events in Egypt and Syria underscore the challenges of these transitions and the uncertainty and turmoil that often accompany revolutionary change. What explains the divergent paths taken by states in the region since 2011? How likely are aspirations by Arab citizens for freedom, dignity, and social justice to be fulfilled as governments in the region struggle to respond to change? Why have Islamist groups gained prominence in the region? What challenges do developments in the region present for international actors, particularly the United States? Why did social scientists and scholars of Middle East politics largely fail to anticipate protests in the region? What comparisons, if any, can be made meaningfully with social movements and revolutions elsewhere? How does change happen?

In this course, we will explore these questions by examining the socioeconomic, geopolitical, and cultural factors behind uprisings in the region. Scholars and policymakers continue to struggle to identify the causes and dynamics of the uprisings as well as their consequent changes. This course is designed to help you become conversant in the major political questions and themes that characterize current discussion on uprisings in the Middle East. By the end of the course you will not just understand but be fluent in the kinds of questions policymakers, scholars, and analysts tackle on a daily basis. This course presumes no prior study of the Middle East, but a background in international relations, history, sociology, and political science is useful to possess for seminar learning and contributions.

Learning Outcomes

After successfully completing this course you will be able to:
• Read scholarly materials carefully and critically
• Speak knowledgeably about recent uprisings in the Middle East
• Discuss various social and political movements in the region
• Acquire in-depth understanding of at least two regimes in the Middle East
• Discuss the different trajectories taken by states in the region since 2011
• Develop an in-depth appreciation of the position of the MENA countries in the wider context of the International political system
• Write and analyze texts critically
• Develop and communicate compelling, evidence-based arguments through writing assignments and oral presentations.

Course Format and Expectations

As a seminar based course, the success of this course depends on the active participation of everyone. Each week I will present general background information and an overview of the topic but much of the class will be devoted to focused discussion and analysis of readings. As such, you are required to:

1. Read and be prepared to discuss the readings before you come to class.

2. You will be required to lead discussion at least once during the semester. Please note that leading discussion DOES NOT mean presenting a lecture. I will discuss what is required for successfully leading a discussion in class.

I expect each of you to participate in the discussion and will feel free to call on you, even when you do not volunteer.

Students are expected to come to class prepared and ready to discuss the readings and to keep up to date on current politics in the region (starting with the useful links listed at the end of the syllabus). Announcements of changes in required readings as well as distribution of short additional readings may occur throughout the year. Given our focus on the dynamic and exciting changes ongoing in the Middle East, you can expect additional short pieces to supplement those in the syllabus.

Please Note: I reserve the right to change the class syllabus to meet class needs. Students will be notified with sufficient lead-time for new readings, guest speakers, and changes to the schedule below. Students are responsible to learn about such changes should they miss a class.

Course Requirements and Grading

• Class Attendance and Participation: 10%
  Participation will be assessed on the basis of informed comments and questions raised by students in class regarding assigned readings and relevant current events, not solely on the basis of attendance.
• Response Papers (10%) Students are required to write brief (1-2 single spaced pages) response papers on three of the topics covered in class on which they are not serving as seminar leader. Response papers are NOT summaries of the readings. Each response paper should reflect your
critical thoughts about the readings and topic and may include questions that the readings raise for you and their relation to past readings and discussions. Response papers are due at 5pm the day before the topic for that week.

- **Seminar Leader: (15%)** Students will be required to lead discussion at least once during the semester. Please note that leading discussion DOES NOT mean presenting a lecture. I will discuss what is required for successfully leading a discussion in class. Students leading seminars for the week are expected to provide the class (by Saturday at 5pm via email) with a critical statement of the assigned readings. This statement should be no longer than two double spaced pages. The objective of these statements should be to motivate discussion. Summaries of the readings are not expected nor encouraged.

- **Policy Brief: (25%)** The policy brief will be an 8-10 page analysis of a transition issue facing one of your chosen countries.

- **Transition Case Study (40%)**: Students will choose a country from the Middle East and North Africa to research and analyze throughout the semester and submit a 20-25 page final paper at the end of the term on transitions issues facing their country since 2011. More extensive details and guidance about the assignment will be distributed during week three.

**Grading**

The following scale will be used for calculating final grades for the course:

A=90-100%
B=80-89%
C=70-79%
D=60-69%
F=0-59%

**Policy on Grade Appeals**

You are free to appeal any grade assigned to you in this class according to the following procedure. Wait two days before contacting me, then e-mail me a typewritten justification for the grade you wish to appeal. We’ll then schedule an appointment during regular office hours to discuss the grade. By appealing your grade, you consent to the fact that your final score could go up or down upon appeal.

**Policy on Late Work**

Late work will not be accepted. Extensions will only be granted in the event of an extreme and verifiable medical or family emergency.

**Office Hours**
My office hours are from 2-4pm on Mondays. You can schedule a 15-minute or up to a 30- minute slot via the following link: https://erinsnider.youcanbook.me. If that time doesn’t work with your schedule, please get in touch via esnider@tamu.edu to arrange an appointment.

TAMU email account

All students must have a TAMU email account. As our class focuses on a region still very much in flux, I will often send out via Howdy class announcements, reminders, or logistical instructions using this email system. You are responsible for ensuring that your TAMU account is current and working.

Making Up a Missed Class

The university considers an excused absence to be those for reasons of authorized university activities, major illness, and religious holy days. You do have to make up your absence, even if excused due to illness, university excuse, etc. as you would have to make up a missed assignment for the same. The university provides that excused absences are given opportunities to be made up, not that they are erased with no responsibility for work missed.

For all excused absences, you have the opportunity to make up your missing participation grade by attending a lecture at the university or watching a documentary related to political events in the region. With either option, you must:

- Write a 1-2 page single spaced paper summarizing the lecture or the documentary and
- Give a 10-minute presentation to the class on the subject of either the lecture or documentary.

Paper Format:

All papers must be double-spaced, 12 point font with 1 inch margins. Please provide a cover sheet with your name, course number, topic, date, and the number of pages included. Citation format should follow the APSA or equivalent. Student papers will be submitted to Turn-it-in as per Bush School policy.

Bush School Writing Center: An invaluable resource for strengthening your writing skills. Their site is accessible here: https://sites.google.com/site/bushschoolwriting/

Required Texts:


Additional readings in the syllabus available on the course reserve list online
In this class, our work over the semester will draw on interdisciplinary sources to include the works of political scientists, historians, economists, activists, and journalists toward building a more substantive, nuanced portrait of continuing change in the region.

*This class presumes no prior study of the Middle East; however, those wishing for a general text for background on the region should consult the following:*


Jillian Schwedler and Deborah Germer. *Understanding the Contemporary Middle East.* Lynne Rienner, 2008.

**Seminar Schedule**

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**Introductory Lecture and Syllabus Review: Beginnings**


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<th>Week Two</th>
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**The Arab Spring at Year Four: Origins and Theoretical Foundations**


Lynch. Chapters 1-2


Eva Bellin, “Reconsidering the Robustness of Authoritarianism in the Middle East: Lessons from the Arab Spring,” *Comparative Politics.* 44:2 January 2012 pp. 127-149


5


Asef Bayat, Life as Politics: How Ordinary People Change the Middle East, Amsterdam, Chapters 3 &4 pp 43-95

**Week Three**

How Does Change Happen?

Revolution and Social Movements In Comparative Perspective

Lynch. Chapter Three: Patel, Bunce, and Wolchik, “Diffusion and Demonstration.” p 57


**Week Four**
Tunisia

(Guest: Ines Bel Alba, Journalist, Agence France Presse)

Lynch. Chapter 4

http://www.foreignpolicy.com/articles/2011/01/14/the_tunisian_moment

"Tunisians go to the polls still in the shadow of the old regime." The Guardian October 21 2011

Sam Bollier. Who are Tunisia’s political parties? October 27, 2011 Al Jazeera online:  

U.S. Embassy Tunis, cable 08TUNIS679, Corruption in Tunisia: What’s Yours is Mine, created June 23, 2008, released August 30, 2011, read parts 1, 3, 8, 9, 13, 14.
http://wikileaks.ch/cable/2008/06/08TUNIS679.html#


U.S. Embassy Tunis, cable 05TUNIS1045, Tunisia-Democratic Reform Strategy to Support Freedom Agenda, created May 12, 2005 http://wikileaks.org/cable/2005/05/05TUNIS1045.html


“Tunisia’s new al Nahda,” Foreign Policy June 29, 2011

Christian Caryl, “Can Tunisia Save the Arab Spring,” Foreign Policy June 7, 2013
http://www.foreignpolicy.com/articles/2013/06/07/can_tunisia_save_the_arab_spring

http://blog.foreignpolicy.com/posts/2013/07/25/assassination_and_protests_rock_tunisian_politics

http://mideast.foreignpolicy.com/posts/2011/10/31/will_an_islamist_victory_translate_to_democracy


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**Week Five**

**Egypt**

*(Guest: Mahmoud Salem, Egyptian blogger (sandmonkey), columnist for the Daily News Egypt)*


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http://www.madamasr.com/opinion/sheep-and-infidels

http://blogs.cfr.org/cook/2014/09/19/revisiting-rabaa/#more-3840

http://www.theatlantic.com/international/archive/2015/01/the-egyptian-revolution-four-years-later/384593/

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Lynch. Chapter 7

Anthony Shadid. “In Assad’s Syria, There is No Imagination,”


Anthony Shadid. “Syria Elite to Fight Protests to ‘the End’ May 10, 2011


Hassan Abbas, “The Dynamics of the Uprising in Syria,” Jadaliyya
http://www.jadaliyya.com/pages/index/2906/


Week Seven

Yemen


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**Policy Briefs Due**

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**Week Eight**

**Jordan and Morocco**

**Jordan**


**Morocco**
http://www.merip.org/mero/mero070511


Ursula Lindsey. “All the King’s Men,” New York Times. June 5, 2013:
http://latitude.blogs.nytimes.com/2013/06/05/all-the-kings-men/?smid-tw-share

http://www.nybooks.com/blogs/nyrblog/2012/jul/05/how-morocco-dodged-arab-spring/

“Morocco February 20 protest leaders quit after row,” Reuters February 19, 2011.
http://www.reuters.com/article/2011/02/19/us-morocco-protest-idUSTRE7I3K20110219


Week Nine

International Intervention I

Lynch. The Arab Uprising. Chapter 7

Rosemary Hollis. “No friend of democratization: Europe’s role in the genesis of the ‘Arab Spring’”, International Affairs. 88:1 January 2012 pp81-94

Marc Lynch, “Money to Meddle?” Foreign Policy, 11 July 2013


"Obama proposes $800 million in aid for Arab Spring," Reuters February 2012
http://www.reuters.com/article/2012/02/13/us-usa-budget-foreign-idUSTRE81C1C920120213


Anne Orford. *International Authority and the Responsibility to Protect* ( Chapters 1,2, 5)

Anne Orford. *Reading Humanitarian Intervention: Human Rights and the Use of Force in International Laws* (Chapters 2,3, 4)

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### Week Ten

**International Intervention II: The Case of Libya**

*(Guest, Hadeel Al Shalchi, Reuters Libya correspondent)*


James Traub. "Is Libya Beyond Repair?" *Foreign Policy* November 1, 2013
http://www.foreignpolicy.com/articles/2013/10/25/the_global_war_on_thinking_bad_thoughts


http://carnegieendowment.org/2013/08/06/building-libya-s-security-sector/ghle

http://www.crisisgroup.org/*/media/Files/Middle%20East%20North%20Africa/North%20Africa/10


Recommended: Dirk Vandewalle, A History of Modern Libya (Intro, Chapters 4-7)

Week Eleven

Counter-Revolution


Lynch. Chapter Six: Curtis Ryan, “Inter-Arab Relations and the Regional System.” p 110


Lynch. Chapter 11: Quinn Mecham, "Islamist Movements,” p 201


Mark N. Katz. "The International Relations of the Arab Spring." Middle East Policy Vol XXI, No 2 Summer 2014


Roland Dannreuther. "Russia and the Arab Spring: Supporting the Counter-Revolution." Journal of European Integration. 37:1 2015. 77-94


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Week Twelve

Youth, Media, Technology and the Arab Uprisings

(Dr. David Faris, Roosevelt University, guest)

Lynch. Chapter Five “Media, Old, and New.”


Loubna Skli Hanna, “Youth, Media, and the Art of Protest in North Africa,” Jadaliyya


Ted Swedenburg, “Imagined Youths,” Middle East Report, no. 245 (Winter 2007)

Week Thirteen

Evaluating Economic Explanations for the Uprisings

Tripp, Chapter 3. “Imposition and Resistance In Economic Life”


Week Fourteen

The Future of Democracy in the Middle East


Harrid Dabashi. “Delayed Defiance,” in The Arab Spring pp 89-118

Group Presentations

<table>
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<tr>
<td>Arab spring: An Interactive timeline of Middle East protests. Terrific visual resource from the Guardian</td>
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</table>

Another great timeline for reference:

http://www.dgquarterly.com/arab-spring-timeline

Mamfakinch: https://www.mamfakinch.com/

Mosireen: http://mosireen.org/

Economic Research Forum: http://www.erf.org.eg

Middle East Report: http://www.merip.org

Middle East Economic Digest

BP/Amoco Annual Statistical Bulletin

Economist Intelligence Unit, Country Profiles and Quarterly Reports

OPEC Annual Statistical Bulletin (interactive web version)

UN Development Program (UNDP) on Governance in the Arab Region (POLGAR)
http://www.pogar.org


Regional News

Al Ahram English Weekly (Egypt): http://weekly.ahram.org.eg/
Daily News Egypt (Egypt): http://www.thedailynewsegpt.com/

Al Jazeera English (Qatar): http://english.aljazeera.net/

Al Bawaba (UK): http://www.albawaba.com/


Ha'aretz English (Israel): http://www.haaretz.com/

Dar Al Hayat English (England/Lebanon): http://english.daralhayat.com/

Jerusalem Post (Israel): www.ipost.com


Cumhuriyet English (Turkey): http://www.cumhuriyet.com/

WorldPress/ Middle East: http://www.worldpress.org/mideast.htm

Arabic:

Dar Al Hayat (England/ Lebanon): http://www.daralhayat.com/

Al Jazeera (Qatar): www.aljazeera.net


Al Ahram (Egypt): http://www.ahram.org.eg/

Al Ghad (Jordan): www.alghad.io


Al Quds (Jerusalem): http://www.alquds.com/


Al Zaman (Iraq): http://www.azzaman.com/

Hebrew:
Ha'aretz (Israel): http://www.haaretz.co.il/

Other:
Cumhuriyet (Turkey): http://www.cumhuriyet.com.tr/

Kayhan (Iran): http://www.kayhannews.ir/

Audio/Video:
BBC Arabic, BBC Farsi: http://www.bbc.co.uk/radio/

Al Jazeera English: http://english.aljazeera.net/watch_now/

MEMRI: http://www.memri.org

You can also obtain Al Jazeera and Middle East Institute podcasts on iTunes. English-language translations of Middle East media are also available at www.memri.org and The World News Connection/Open Source Center. Be aware that any translated work you use could be (1) unrepresentative and (2) poorly translated.

Blogs:

English

Foreign Policy Middle East Channel: http://mideast.foreignpolicy.com/

Jadaliyya: http://www.jadaliyya.com/

Rebel Economy: http://rebeleconomy.com

Inanities: http://inanities.org

Global Voices/ Aggregator: http://globalvoicesonline.org/-/world/middle-east-north-africa/
Syria Comment/ Joshua Landis: http://www.joshualandis.com/blog/

The Arablst/ Issandr El Amrani: www.arablst.net

Arabawy/ Hossam El-Hamalawy: http://arabist.net/arabawy/

Foreign Policy/ Marc Lynch, GWU: http://lynch.foreignpolicy.com/

Foreign Policy/ Stephen Walt, Harvard KSG: http://walt.foreignpolicy.com/

The Black Irls of Jordan/ Naseem Tarawneh: www.black-iris.com

Informed Comment/ Juan Cole: www.juancole.com

7iberDotCom/ Various: http://www.7iber.com

Jihadica/ Various: www.jihadica.com

KabobFest/ Various: http://www.kabobfest.com/

Arabic:
MisrDigital/ Wael Abbas: http://misrdigital.blogspot.com

Ana Ikhwan/ Abdel Monem Mahmoud: http://ana-ikhwan.blogspot.com

Manal and Alaa: www.manala.net

Yalally/ Ahmed Abdel Fatah: http://yalally.blogspot.com

Cartoons:
Emad Hajjaj: http://www.mahjoob.com
Om El Cartoon: Caricature and Comics from Egypt:
http://oumcartoon.tumblr.com

Think Tanks:
All of these think tanks have in-house Middle East specialists that publish policy papers, engage in collaborative research, and hold events in Washington, D.C., New York, and abroad. Some of them, including POMED and CEIP, have individual country profiles and tend to aggregate country-specific resources across the web. However, keep in mind that most of these think tanks have some sort of
political agenda. This doesn’t mean that the information should be avoided, but you should always research board members and major donors to gauge objectivity.

Council on Foreign Relations: www.cfr.org
Carnegie Endowment for International Peace: www.ceip.org
Middle East Institute: www.mideastl.org
Project on Middle East Democracy: www.pomed.org
National Endowment for Democracy: www.ned.org
International Republican Institute: www.iri.org
National Democratic Institute: www.ndi.org
Center for Strategic and International Studies: www.csis.org
Egyptian Center for Economic Studies: www.eces.org.eg
Economic Research Forum: www.erf.org.eg

Center for the Democratic Control of the Armed Forces: www.dcaf.ch
German Institute of Global and Area Studies: http://www.giga-hamburg.de/
Council on Foreign Relations: www.cfr.org
Carnegie Endowment for International Peace: www.ceip.org
Middle East Institute: www.mideastl.org
Saban Center, Brookings Institute: http://www.brookings.edu/saban.aspx
Washington Institute for Near East Policy: www.washingtoninstitute.org
The Heritage Foundation: www.heritage.org
Project on Middle East Democracy: www.pomed.org
National Endowment for Democracy: www.ned.org
International Republican Institute: www.iri.org
National Democratic Institute: www.ndi.org
Center for Strategic and International Studies: www.csis.org
Egyptian Center for Economic Studies: www.eces.org.eg
Truman Institute: http://truman.hji.ac.il/
Dayan Center: http://www.dayan.org/
Economic Research Forum: www.erf.org.eg

Data:
General Data:
Inter-University Consortium for Political and Social Research:
http://www.icpsr.umich.edu/access/index.html Millennium Challenge Indicators:
Public Opinion:
Palestinian Center for Policy and Survey Research: http://www.pcpsr.org/
Gallup Center for Muslim Studies: http://www.gallup.com/consulting/worldpoll/26410/Gallup-Center-Muslim-Studies.aspx
Zogby Polls: http://www.zogby.com/
Arab Barometer Project: http://www.arabbarometer.org/
Economic Data:
Organization for Economic Cooperation and Development Aid Database: http://www.oecd.org/document/33/0,2340,en_2649_34447_36661793_1_1_1_1,00.html USAID
Greenbook: http://qesdb.usaid.gov/gbk/
Penn World Tables: http://pwt.econ.upenn.edu/
International Monetary Fund: http://www.imf.org/external/data.htm
Index of Economic Freedom: http://www.heritage.org/Index/
Data on Governance and Public Goods:
World Bank Doing Business: http://www.doingbusiness.org/
World Bank Governance and Anti-Corruption:
World Bank Country Policy and Institutional Assessment:

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://aggiehonor.tamu.edu

"An Aggie does not lie, cheat, or steal, or tolerate those who do."
Tips on Close Reading and Preparing to Present

Each week we will read a large amount of material before discussing that reading in class. Close reading entails reflecting on the text as you are reading and evaluating the author’s argument. The following suggestions are meant to guide you in preparing for class each week:

- Look for the author’s argument and the evidence she uses to support it: What is the main claim she makes? With whom is she disagreeing? Then consider your reactions to the author’s work: Does this make sense to you? Why or why not? What are the weaknesses of the argument?

- Read with pencil in hand. Jot down thoughts you want to raise in class. Write your reactions to the text in the margins. Above all, think about what you are reading; if you find yourself turning pages numbly, stop, take a pause, and then refocus on the author’s chain of thought.

- Plan your readings to be spaced out in reasonable increments. Thoughtful reading takes time and energy. It is more pleasant and more productive to read over several days than to try and compress all the reading into a couple of nights.

- Don’t use a highlighter. Writing comments (e.g., “good counterpoint to Huntington”) helps a reader engage with the text, whereas highlighting encourages passivity and torpor.

- Keep track of the parts of the text where you had questions, objections, or fierce agreement with the author’s points. Note page numbers on a separate sheet of paper. You may also want to use post-it flags for quick reference to key passages.

- When you are done reading, check to see that you can summarize the author’s argument in a few sentences. You may want to take 5 minutes and write down this summary, particularly if you are reading several texts in a short period.

- Remember that the goal of close reading is not just to have turned pages, but to be able to say something about the material and evaluate it.

Expectations for Seminar Discussion

Seminar meetings are an opportunity to analyze the information presented in our readings. My expectations are that you will come to class having done a close reading of the assigned texts. You should be ready to answer questions about the text, including “What is the author’s argument and what do you think of it?” Proper preparation will enable the class to have an informed discussion. An informed discussion entails the following:

- Active listening to whomever the instructor has recognized to speak. Like close reading, active listening requires reflection on what is being said. This means jotting down your reactions to the lecture or discussion and raising questions for your fellow classmates. It also means not talking while others are speaking.
• Responding, as best as you are able, to questions asked by the instructor. The material we will be reading is sometimes very difficult and complex. Because it is open to interpretation from many viewpoints, in most cases there will not a single correct answer. Nonetheless, it is incumbent upon all students to attempt to respond to questions in class by drawing upon the readings done outside of class.

• Letting the instructor know when a point is not clear. When you have a question, you are probably not the only one. By asking the instructor to clarify an issue from the readings or lectures, you are helping us all to learn more.

• Making your own points and arguments. You may recall what you said in class, much longer than you will remember what the instructor said. By sharing your reactions and thoughts with me and your colleagues, you will take much more from this course than if you sat quietly.

• Respect your fellow students and the instructor. A rich discussion requires that many people participate. The instructor will actively moderate discussion in class so that all are given a chance to express their opinions. Those who have many points to share should listen closely to their colleagues and respect the instructor's judgment in facilitating a full conversation.
Response Paper Guidance

The following information is meant to strengthen and refine both your thinking and writing over the course of the semester and to give you more structure in preparing your responses each week. As stated in the syllabus, the questions given for the week's readings are meant to serve as guides and give you some insight into what I'm looking for you to get out of the texts. You are free to engage directly with the questions or explore related inquiries. In the paper you should develop one main topic or thesis. While the writing is informal it is imperative that the papers adhere to the conventions of good writing even if the assignment is 1-2 pages: coherent, succinct, and free of grammatical errors. Read and edit your paper before you send it to me!

Questions to ask yourself while reading and points to consider in preparing your response:

- What is the main problem or issue the author is addressing?
- What is the author's central claim, argument, or point?
- What assumptions does the author make?
- What are possible counterarguments to the text's claims?
- Why are the problem(s) and the argument(s) interesting or important?
- In considering the texts collectively, how do they relate to one another? Do the authors agree? Disagree? Address different aspects of an issue? Formulate a problem in different ways?
- In what way (if any) does the information or argument of one text strengthen or weaken the argument of others? Does integrating the claims in two or more of the texts advance your understanding of a larger issue?
- Include your own voice by weighing arguments, evaluating evidence, and raising critical questions. If there seems to be something important that none of the authors considers, point it out and state what you think its significance is.
- What questions does the text(s) raise for you—about the material, about other things?

Points to Avoid:

- Response papers are not simply a space for you say whether you liked or disliked the texts. Give praise or blame where you think it is due, but avoid commendation or condemnation for its own sake.
- Do NOT summarize the texts! I know what they say. You are supposed to be reacting or responding to them, not simply repeating what they say. If there is no analysis involved, then you have not responded, only regurgitated.
- If there are things in the text that you don't understand, do not try to gloss over them. Try to find out what the text means. If you still cannot make sense of an argument in a text, then it may be the case that the argument does in fact not make sense. If that's the case, point it out in your paper.
Grading

In grading response papers, I look for five things:

1. Thesis statement and/or clear topic
2. Use of Evidence
3. Organization
4. Incorporation of Readings and/or Class Discussions
5. Writing Skills (grammar, mechanics, spelling)

Response papers are graded as follows:

- Clear topic/thesis articulated 2
- Organization 2
- Content: Quality of Logic 2
- Writing Style and Clarity 2
- Grammar and Punctuation 2

Total 10
Leading Seminar Discussions

Over the course of the semester, you’ll have the opportunity to lead seminar discussions twice. On the week that you are set to lead our discussion, you must provide the class (by 5pm on Monday through email) with a critical statement of the assigned readings. This statement should be no longer than two double-spaced pages. When you lead our discussion, you can trust that your colleagues will have discussed the key elements of the readings. How should you approach your preparation to leading discussions and what should you do?

The possibilities open to you are endless, although bounded. You may:

- Lead a group discussion on prepared questions
- Hand out new readings for the class to take time to absorb and discuss (these might include academic journals, the NYT, Financial Times, the Economist, book reviews, etc)
- Stage a debate (between two authors, three schools of thought)
- Show a film linked to the areas relevant to the week’s readings

In short, you have free reign to conduct any activity you deem worthy of the readings in the unit or the themes and lessons therein.

Out of 10 possible points, your class leadership will be assessed as follows:

| 8-10 | -Present an original, innovative, exciting way to get the class to think about the readings.
|      | -Bring in outside materials, such as short films, readings, articles, to launch or enhance your discussion
|      | -Take the themes of the readings and force us to think about them deeply and carefully and to stretch them beyond the readings to further applications or higher levels
|      | -Highlight the salient points of the reading in the post-activity/reflection/discussion
|      | -Relate the main points to development, to other readings, and/or to other colleagues’ personal experiences.

| 6-7  | -Conduct a discussion/exercise that is fun and raucous, yet follow it with little reflection on the point of the readings or on the semester as a whole.
|      | -Ask questions that elicit a few answers, but then fail to pursue those answers or push the respondents to think about their responses.
|      | -Solicit answers without linking them to each other or to the larger context of the readings/course
| 4-6 | - Host a disinterested or unattached discussion  
     | - Refuse to answer questions that would clear up confusion about readings or fail to defer them to the instructor when you don't know the answer.  
     | - Conduct a discussion has nothing to do with the readings |
|------|---------------------------------------------------------------|
| Below 4 | - Throw open the floor for undirected discussion  
         | - Ask people what their questions are.  
         | - State that the authors have nothing of worth to add to our semester long inquiry and therefore that you have nothing to add either. |
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Course request type:  □ Undergraduate  □ Graduate  □ First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):  Mechanical Engineering

3. Course prefix, number and complete title of course:  MEEN 604 - Time Frequency Nonlinear Vibration Control

4. Catalog course description (not to exceed 50 words): Deployment of simultaneous vibration and frequency control in real-time to efficiently negate nonlinear dynamic instability. Address non-linear vibrations in the joint time-frequency domain; theories on incorporating non-linear dynamics and nonlinear time-frequency control into the control of bifurcation and route-to-chaos; integration on basic and advanced topics from several engineering disciplines into the creation of an innovative, new control theory effective in denying bifurcation and chaotic state from emerging.

5. Prerequisite(s):  Graduate classification

6. Is this a variable credit course?  □ Yes  □ No  If yes, from ____ to ____

7. Is this a repeatable course?  □ Yes  □ No  If yes, this course may be taken ____ times.

Will this course be repeated within the same semester?  □ Yes  □ No

8. Will this course be submitted to the Core Curriculum Council?  □ Yes  □ No

9. How will this course be graded:  □ Grade  □ S/U  □ P/F (CLMD)

10. This course will be:
    a. required for students enrolled in the following degree programs(s) (e.g., B.A. in history)

    b. an elective for students enrolled in the following program(s) (e.g., M.S., Ph.D. in geography)

    M.Eng., M.S., and Ph.D. in MEEN

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. □ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix  Course #  Title (excluding punctuation)
    MEEN  604  TIME FREQ NONLINEAR VIB CNTRL

<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>Other</th>
<th>SCH</th>
<th>CIP and Fund Code</th>
<th>Admin Unit</th>
<th>Acad. Year</th>
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</tbody>
</table>

Approval recommended by:

Dr. Daniel McAdams  
Department Head or Program Chair (Type Name & Sign)  
Date  
Chair, College Review Committee  
Date  
Dean of College  
Date  
Chair, GE of UCC  
Date  
Effective 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 – 07/14
MEEN 604
Time-Frequency Nonlinear Vibration Control
Course Syllabus • Fall 2015

Lecture: TBD

Instructor: Dr. C. Steve Suh, MEOB 215, ssuh@tamu.edu, 845-1417
Office Hours: MWF 9:00 AM – 10:30 AM, and by email appointment


Descriptions: Dynamic instability is a temporal-spectral aberration in the simultaneous time-frequency domain. This aberration is particularly prominent at high frequency as it is nonlinear, non-stationary, and characteristically broadband. Proper mitigation of instability requires that vibration amplitudes in the time-domain and vibration spectra in the frequency-domain be simultaneously suppressed. The new course is novel, original, and unique in that it deploys simultaneous vibration and frequency control in real-time to efficiently negate nonlinear dynamic instability. There are no courses available anywhere that address nonlinear vibrations in the joint time-frequency domain. Nor are there theories on incorporating nonlinear dynamics and nonlinear time-frequency control into the control of bifurcation and route-to-chaos. The new course differentiates itself from all available courses on control in that it integrates both basic and advanced topics from several engineering disciplines into the creation of an innovative, new control theory effective in denying bifurcation and chaotic state from emerging.

Objectives: The objective is to teach graduate students to formulate a control methodology that mitigates instability and enables robust controller design. Powerful analytical tools essential for the characterization of dynamic instability which is inherently complex and oftentimes chaotic will be developed in the course. Concepts viable for the stipulation of instability control and system identification and signal processing will also be derived. Students will develop substantial knowledge along with computer tools through example problems on high-speed micromachining control and synchronization of chaos, among others. All students will be required as individual to formulate time-frequency control scheme for specific engineering problems that are transient, aperiodic, and broadband in nature. Such efforts will be collected as term projects and provided as a proper demonstration of course outcome.

Grading: 5 Homework Assignments  40% (8% each)  100-90. A
2 Computer Projects  60% (30% each)  89-80... B
Attendance (See Absences policy)  79-70... C
                                  69-60... D
Topics

1. Analog signals, Basis, Vectors, Projection, Vector Spaces  
2. Integral Transform: Fourier Analysis  
3. Sampling, Sampling Theorem, Discrete-Time Signals  
4. Nonlinear Dynamics  
5. Nonlinear Non-Stationary Signals  
6. Discrete Fourier Transform, Short-Time Fourier Transform, Gabor Transform  
7. Time-Frequency Analysis: Wavelets, Filters and Filterbanks  
8. Time-Frequency Analysis: Instantaneous Frequency  
9. Time-Frequency Control Theory  
10. High Speed Time-Frequency Cutting Control  
11. Synchronization of Chaos

Total number of hours: 45

Absences: Attendance is mandatory. Attendance will be taken at the discretion of the instructor and it will be used in individual grading.

Beginning with Week 1 of the semester, attendance will be taken periodically. Unexcused absence when attendance is taken will result in the following adjustments to whatever letter grade a student has otherwise earned during this course:

0 – 2 total absences No Penalty
3 – 4 total absences Reduction by 1 Letter Grade
5 – 6 total absences Reduction by 2 Letter Grades
More than 6 total absences Automatic Grade of "F" for the course

Work missed due to absences will be excused only for University-approved activities in accordance with Texas A&M University Student Rules (see http://student-rules.tamu.edu). Students are encouraged to read these rules to refresh familiarity. Specific arrangements for make-up work in such instances will be handled on a case-by-case basis. In accordance with recent changes to Rule 7, please be aware that in this class any "injury or illness that is too severe or contagious for the student to attend class" will require "a medical confirmation note from his or her medical provider" even if the absence is for less than 3 days (see 7.1.6.2 Injury or illness less than three days.).

Homework and Projects:

Homework will be assigned per the instructor's discretion and typically graded for content, neatness, methodology, and accuracy. Partial credit will be given in most cases. In some instances, homework may be just 'checked-in' and not 'graded in detail'. This will at least provide a measure of effort and participation and should also create additional motivation for working all homework problems. Homework is due in class. Late homework will not be accepted. Some homework problems will require design work and as such will not necessarily have unique solutions. These will be more open-ended assignments requiring significant problem definition, engineering judgment, and decision making, and
interpretation. Computer projects will require reports with appropriate supporting calculations and documentation.

**Academic Misconduct and Dishonesty** will not be tolerated and, if any instances arise, they will be handled according to **Texas A&M University Student Rules** (see [http://student-rules.tamu.edu/rule20.htm](http://student-rules.tamu.edu/rule20.htm)).

**Academic Integrity Statement**

**Aggie Honor Code:** "An Aggie does not lie, cheat, or steal, or tolerate those who do."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the Texas A&M University community from the requirements or the processes of the Honor System. For additional information please visit: [http://aggiehonor.tamu.edu](http://aggiehonor.tamu.edu). On all assignments, the following Honor Pledge shall be preprinted and signed by the student:

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

**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 845-1637. For additional information visit [http://disability.tamu.edu](http://disability.tamu.edu)
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Course request type:
   - Undergraduate
   - Graduate
   - First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Materials Science and Engineering

3. Course prefix, number and complete title of course:
   MSEN 610, Principles of Composite Materials

4. Catalog course description (not to exceed 50 words):
   Classification and characteristics of composite materials; micromechanical and macromechanical behavior of composite laminate; macromechanical behavior of laminates using classical laminate theory; interlaminar stresses and failure modes; structural design concepts, testing and manufacturing techniques.

5. Prerequisite(s):
   MEMA 602
   MEMA 613

6. Is this a variable credit course?
   - Yes
   - No
   If yes, from _____ to _____ times.

7. Is this a repeatable course?
   - Yes
   - No
   If yes, this course may be taken _____ times.

8. Will this course be repeated within the same semester?
   - Yes
   - No

9. Will this course be submitted to the Core Curriculum Council?
   - Yes
   - No

10. How will this course be graded:
    - Grade
    - S/U
    - P/F (CLSD)

11. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

12. M.S., Ph.D. in Materials Science and Engineering

13. MSEN 610 PRINC OF COMPOSITE MTL

<table>
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<th>Lect.</th>
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</table>

Approval recommended by:

Miladin Radovic - MSEN

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

Prasad Erjoti
Chair, College Review Committee Date

Vikram K. Kinra - AERO

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

Prasad Erjoti
Dean of College Date

Karen Butler-Purry
Chair, GC or UCC Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 07/14
# Syllabus

## Principles of Composite Materials

### MEMA 613/MSEN 610

**Spring 2017**

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Dr. Ramesh Talreja, Professor, Department of Aerospace Engineering, and Department of Materials Science and Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor contact</td>
<td>(979) 458-3256; <a href="mailto:talreja@tamu.edu">talreja@tamu.edu</a>; 736A HRBB</td>
</tr>
<tr>
<td>Course Description</td>
<td>Introduction to fiber reinforced composite material systems with emphasis on the fundamental principles; introduction to processing and manufacturing of polymer- and ceramic-matrix composites; introduction to simple micromechanics estimates of elastic properties; elastic behavior of a unidirectional lamina; laminate plate theory; experimental characterization of composites; emerging composites; damage, fatigue, and failure; selected special topics.</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>Basic courses in mechanics and materials science; graduate classification.</td>
</tr>
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### Learning outcomes

Students will become familiar with the fundamental principles underlying composite material systems; they will understand the criteria for selection of composite constituents for given applications; they will learn how to estimate and characterize elastic behavior of composites with multiple fiber orientations; they will understand the basic mechanisms governing failure of composites; they will gain additional knowledge of composites in selected areas through directed studies.

### Grading Assignments

The course letter grade will be based on homework assignments, and one term paper. Homework will be assigned typically once a week, due the week after, and will carry 60%; the project term paper will have 40%.

### Grading scale

The final weighted average of each student will be calculated based on the indicated grade distribution. The letter grade will be assigned by the following criterion:

- A>=90; 80=<B< 90; 70 <=C< 80; 60=<D<70; F<60.

### 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.
### Topics to be covered

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Types of fiber and matrix materials.</td>
</tr>
<tr>
<td>2</td>
<td>Processing and manufacturing methods</td>
</tr>
<tr>
<td>3</td>
<td>Micromechanics estimates of properties</td>
</tr>
<tr>
<td>4</td>
<td>Unidirectional composites; orthotropic solids</td>
</tr>
<tr>
<td>5</td>
<td>Lamine plate theory</td>
</tr>
<tr>
<td>6</td>
<td>Lamine plate theory – contd.</td>
</tr>
<tr>
<td>7</td>
<td>Short-fiber composites</td>
</tr>
<tr>
<td>8</td>
<td>Experimental characterization</td>
</tr>
<tr>
<td>9</td>
<td>Interlaminar stresses and free-edge effects</td>
</tr>
<tr>
<td>10</td>
<td>Nonlinear/time-dependent constitutive relations (plasticity/viscoelasticity/viscoplasticity)</td>
</tr>
<tr>
<td>11</td>
<td>Failure – static and fatigue</td>
</tr>
<tr>
<td>12</td>
<td>Selected applications – emerging composite systems</td>
</tr>
<tr>
<td>13</td>
<td>Selected applications, contd.</td>
</tr>
<tr>
<td>14</td>
<td>Project Term Paper Due</td>
</tr>
</tbody>
</table>

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As commonly defined, plagiarism consists of passing off as one's own the ideas, work, writings, etc., that belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules ([http://student-rules.tamu.edu](http://student-rules.tamu.edu/)), under the section "Scholastic Dishonesty."

### Attendance policy

The University views class attendance as the responsibility of an individual student. Attendance is essential to complete the course successfully. University rules related to excused and unexcused absences are located online at [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07). Please come on time. Silence cell-phones and other electronic distractions.
Make-up Policy

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The student is responsible for providing satisfactory evidence to the instructor to substantiate the reason for the absence. Among the reasons absences are considered excused by the university are the following (see Student Rule 7 for details [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07)). The fact that these are university-excused absences does not relieve the student of responsibility for prior notification and documentation. Failure to notify and/or document properly may result in an unexcused absence. Falsification of documentation is a violation of the Honor Code.

1. Participation in an activity that is required for a class and appears on the university authorized activity list at [https://studentactivities.tamu.edu/app/sponsor/auth/index](https://studentactivities.tamu.edu/app/sponsor/auth/index)
2. Death or major illness in a student’s immediate family.
3. Illness of a dependent family member.
4. Participation in legal proceedings or administrative procedures that require a student’s presence.
5. Religious holy day. NOTE: Prior notification is NOT required.
6. Injury or illness that is too severe or contagious for the student to attend class.
   i. Injury or illness of three or more class days: Student will provide a medical confirmation note from his or her medical provider within one week of the last date of the absence (see Student Rules 7.1.6.1)
   ii. Injury or illness of less than three class days: Student will provide one or both of these (at instructor’s discretion), within one week of the last date of the absence:
      a) Texas A&M University Explanatory Statement for Absence from Class form available at [http://attendance.tamu.edu](http://attendance.tamu.edu)
      b) Confirmation of visit to a health care professional affirming date and time of visit.
7. Required participation in military duties.
8. Mandatory admission interviews for professional or graduate school that cannot be rescheduled.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Mandatory participation as a student-athlete in NCAA-sanctioned competition.</td>
</tr>
<tr>
<td>10.</td>
<td>In accordance with Title IX of the Educational Amendments of 1972, Texas A&amp;M University shall treat pregnancy (childbirth, false pregnancy, termination of pregnancy and recovery therefrom) and related conditions as a justification for an excused absence for so long a period of time as is deemed medically necessary by the student's physician. Requests for excused absence related to pregnancy should be directed to the instructor.</td>
</tr>
</tbody>
</table>

Other absences may be excused at the discretion of the instructor with prior notification and proper documentation.

In cases where prior notification is not feasible (e.g., accident or emergency) the student must provide notification by the end of the second working day after the absence, including an explanation of why notice could not be sent prior to the class.

Accommodations sought for absences due to the observance of a religious holiday can be sought either prior or after the absence, but not later than two working days after the absence.
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Course request type: [ ] Undergraduate [ ] Graduate [ ] First Professional (DDS, MD, JD, PharmD, DVM)
2. Request submitted by (Department or Program Name): Department of Materials Science and Engineering
   MSEN 655, Materials Design Studio
3. Course prefix, number and complete title of course:

4. Catalog course description (not to exceed 50 words):
   Project-driven studio course based on the integration of informatics and engineering systems design to address problems in materials discovery and development. Student teams select projects derived from real industry-driven needs.

5. Prerequisite(s):
   Cross-listed with: MSEN 601, MSEN/ECEN 616, MSEN 601 or equivalent, Permission from Instructor
   Stacked with:
   Cross-listed courses require the signatures of both department heads.

6. Is this a variable credit course? [ ] Yes [ ] No If yes, from ________ to ________
7. Is this a repeatable course? [ ] Yes [ ] No If yes, this course may be taken ________ times.
   Will this course be repeated within the same semester? [ ] Yes [ ] No
8. Will this course be submitted to the Core Curriculum Council? [ ] Yes [ ] No
9. How will this course be graded? [ ] Grade [ ] S/U [ ] P/F (CLM0)
10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
       Certificate in Materials Informatics Design
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.
12. [ ] I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix Course # Title (excluding punctuation)

   MSEN 655 MATERIALS DESIGN STUDIO

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<th>Admin. Unit</th>
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Approval recommended by:

Miladin Radovic
Department Head, Program Chair (Type Name & Sign) Date

Prasad Enjeti
Chair, College Review Committee Date

Dean of College Date

Karen Butler-Purry
Chair, GC or UCC Date

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 – 07/14
Course Title and Number | MSEN 655 / MEEN 6xx
Course Name | Materials Design Studio
Term | Spring 2016
Meeting Times and Location | TBD
Credit Hours | 2-3

Course Description and Prerequisites
This is a project-driven studio course based on the integration of informatics and engineering systems design to address problems in materials discovery and development. Student teams select projects derived from real industry-driven needs.

Prerequisites: MEEN 601, MSEN/ECEN 618, MSEN 601 or equivalent, Permission from Instructor

Goals: The students will attain good understanding of the different methods available to accelerate the discovery of materials through data mining and machine learning approaches.

Learning Outcomes
Listed below are the learning outcomes for this course that will be addressed
- Apply concepts of systems engineering to materials
- Frame materials development/discovery problems in terms of processing-structure-property-relationships
- Create and interpret requirements for a materials discovery/design project
- Create and interpret physics and statistical-based models that connect processing, structure, property and performance metrics
- Apply informatics approaches to explore the materials design space
- Apply design theoretic methods to identify optimal materials solutions

Instructor Information
Name | Raymundo Arroyave
Telephone number | 979-845-5416
Email address | rarroyave@tamu.edu
Office hours | TBD
Office location | RDMD 218

Textbook and/or Resource Material
## Grading Policies

Projects: 80%
  - Project 1: 15%
  - Project 2: 20%
  - Project 3: 45%
Participation: 20%

**Grade Basis:** A ≥ 90; 80 ≤ B < 90; 70 ≤ C < 80; 60 ≤ D < 70; F ≤ 60.

Students will be expected to submit homework assignments.
Students will be expected to participate during in-class discussions or quizzes
Students will be expected to complete projects

## Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Materials as Hierarchical Systems</td>
</tr>
<tr>
<td>2</td>
<td>Materials Design as an Inverse Problem</td>
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<tr>
<td>3</td>
<td>Data-enabled Quantitative Structure Property Relationships</td>
</tr>
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<td>4</td>
<td>Project 1 is due</td>
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<tr>
<td>5</td>
<td>Decision Making in Materials Design</td>
</tr>
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<td>6</td>
<td></td>
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<tr>
<td>7</td>
<td>Search and Optimization of Materials Design Spaces</td>
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<td>8</td>
<td></td>
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<tr>
<td>9</td>
<td>Design under Uncertainty</td>
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<td></td>
<td>Project 2 is due</td>
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<td>10</td>
<td>Integrated Computational Materials Science and Engineering (ICME)</td>
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<tr>
<td>11</td>
<td>Computational Approaches to Materials Discovery</td>
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<td>12</td>
<td>Experimental Methods for High-throughput Materials Synthesis and Characterization</td>
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<tr>
<td>13</td>
<td>Innovation and Entrepreneurship: Bring Materials Solutions to Markets</td>
</tr>
<tr>
<td></td>
<td>• creation of a business model canvas</td>
</tr>
<tr>
<td></td>
<td>• understanding and testing of hypotheses for new ventures</td>
</tr>
<tr>
<td></td>
<td>• structuring and conducting customer interviews for maximum effect</td>
</tr>
<tr>
<td></td>
<td>• role of financing for new ventures</td>
</tr>
<tr>
<td></td>
<td>Project 3 is due</td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>
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MEMORANDUM

TO: Office of Curricular Services

FROM: Daniel McAdams
Professor and Graduate Program Director
Department of Mechanical Engineering

SUBJECT: Approval of addition -- MEEN 601 course as prerequisite

I, the undersigned graduate program director, confirm that the Department of Mechanical Engineering approves MEEN 601 to be added as a prerequisite for the following newly created courses:

- MSEN 655 – Materials Design ePortfolio
- MSEN 659 – Materials Design Studio

If you have any questions, please feel free to contact me at dmcadams@tamu.edu.
Texas A&M University

Departmental Request for a New Course

Undergraduate  •  Graduate  •  Professional

Submit original form and attach a course syllabus.

1. Course request type:
   - Undergraduate
   - Graduate
   - First Professional (ODS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Materials Science and Engineering

3. Course prefix, number and complete title of course:
   MSEN 657, Multiscale Modeling in Materials

4. Catalog course description (not to exceed 50 words):
   Introduction to a wide range of computational methods to simulate materials behavior at multiple scales. The school consists of 10 days of instruction, with each day divided into theoretical and practical sessions.

5. Prerequisite(s):
   Permission from instructor.

6. Is this a variable credit course? [ ] Yes [X] No
   If yes, from ____ to ____

7. Is this a repeatable course? [ ] Yes [X] No
   If yes, this course may be taken ____ times.

   Will this course be repeated within the same semester? [ ] Yes [ ] No
   [X] No

8. Will this course be submitted to the Core Curriculum Council? [ ] Yes [X] No

9. How will this course be graded? [X] Grade [ ] S/U [ ] Pass/No Pass (CLMO)

10. This course will be:
    a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
       Certificate in Materials Informatics Design
    b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. [X] I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Faculty  Course #  Title (excluding punctuation)
    MSEN 657  SUMMER SCH COMP MATLS SCI

<table>
<thead>
<tr>
<th>Type</th>
<th>Lab</th>
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Approval recommended by:

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

Prasad Enjeti
Chair, College Review Committee Date

Prasad Enjeti
Dean of College Date

Karen Bullar-Pyle
Chair, GC or UCC Date

Submitted to Coordinating Board by:

Associate Director, Curricular Services Date

Effective Date

Questions regarding this form should be directed to Sandra Williams at 945-8201 or sandra.williams@tamu.edu.
Curricular Services — 07/14
<table>
<thead>
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<th>MSEN 657</th>
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<tbody>
<tr>
<td>Course Name</td>
<td>Multiscale Modeling in Materials</td>
</tr>
<tr>
<td>Term</td>
<td>Summer 2016</td>
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<td>Meeting Times and Location</td>
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</tr>
<tr>
<td>Credit Hours:</td>
<td>3</td>
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</table>

**Course Description and Prerequisites**

This course provides a thorough introduction to a wide range of computational methods to simulate materials behavior at multiple scales. The school consists of 10 days of instruction, with each day divided into theoretical and practical sessions.

**Prerequisites:** Approval of Instructor

**Goals:** The students will attain good understanding of the different methods available to simulate materials behavior across multiple scales in space and time.

**Learning Outcomes**

Listed below are the learning outcomes for this course that will be addressed:

- Identify the need to use different computational methods to describe materials phenomena at different scales.
- Gain elementary understanding of the basic structure of computational methods in materials science.
- Develop a basic understanding of different computational materials science approaches, including electronic structure methods, molecular dynamics, computational thermodynamics and kinetics, mesoscale simulation of materials, continuum methods, etc.

**Instructor Information**

<table>
<thead>
<tr>
<th>Name</th>
<th>Raymundo Arroyave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone number</td>
<td>979-845-5416</td>
</tr>
<tr>
<td>Email address</td>
<td><a href="mailto:rarroyave@tamu.edu">rarroyave@tamu.edu</a></td>
</tr>
<tr>
<td>Office hours</td>
<td>TBD</td>
</tr>
<tr>
<td>Office location</td>
<td>RDMD 218</td>
</tr>
</tbody>
</table>

**Textbook and/or Resource Material**

Textbook(s): *Introduction to Computational Materials Science: Fundamentals to Applications* 1st Edition, R. Lesar
Grading Policies

Projects: 80%
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<td>Introduction to Computational Materials Science</td>
</tr>
<tr>
<td>2</td>
<td>Electronic Structure Methods - <em>(Project 1 is due)</em></td>
</tr>
<tr>
<td>3</td>
<td>Classical Molecular Dynamics</td>
</tr>
<tr>
<td>4</td>
<td>Computational Thermodynamics and the CALPHAD Approach <em>(Project 2 is due)</em></td>
</tr>
<tr>
<td>5</td>
<td>Phase Field Models of Microstructure Evolution</td>
</tr>
<tr>
<td>6</td>
<td>Dislocation Dynamics and Mesoscale Phenomena <em>(Project 3 is due)</em></td>
</tr>
<tr>
<td>7</td>
<td>Coarse-graining Approaches</td>
</tr>
<tr>
<td>8</td>
<td>Microstructure-sensitive Mechanics of Materials <em>(Project 4 is due)</em></td>
</tr>
<tr>
<td>9</td>
<td>Homogenization Methods</td>
</tr>
<tr>
<td>10</td>
<td>Challenges in Multi-scale Materials Modeling</td>
</tr>
</tbody>
</table>

*Note: Each day will consist of 4 hrs. Lecture and 3 hrs. Lab*

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Texas A&M University
Departmental Request for a New Course
Undergraduate + Graduate + Professional
Submit original form and attach a course syllabus.

Form Instructions
1. Course request type:  
   - Undergraduate  
   - Graduate  
   - First Professional (DDS, MD, JD, PharmD, DVM)
2. Request submitted by (Department or Program Name):  
   Department of Materials Science and Engineering
3. Course prefix, number and complete title of course:  
   MSEN 618 Data-Driven Discovery of Materials
4. Catalog course description (not to exceed 50 words):  
   Use of informatics approaches to establish quantitative structure-property relations (QSPRs) in materials and materials systems. Topics include: basic concepts of data mining, introduction to QSPRs, unsupervised learning, supervised learning, search algorithms applied to materials discovery.
5. Prerequisite(s):  
   Knowledge of basic materials science, permission from instructor.
6. Cross-listed with:  
   Stacked with:
   Cross-listed courses require the signature of both department heads.
7. Is this a variable credit course?  
   - Yes  
   - No
   If yes, from _____ to _____
8. Is this a repeatable course?  
   - Yes  
   - No
   If yes, this course may be taken _____ times.
9. Will this course be repeated within the same semester?  
   - Yes  
   - No
   If yes, this course may be taken _____ times.
10. This course will be:  
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)  
      Certificate in Materials Informatics Design
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)  
11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.
12. I certify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).
13. Prefix Course # Title (excluding punctuation)  
   MSEN 618 DATA-DRIVEN DISCOVERY MTLS
   Lect. Lab Other SCH General Fund Code Admin. Unit Acad. Year DUE Code
   3.00 0.00 0.00 3.00 1418010006 1664 16 - 17 0 0 3 6 3 2
   Approval recommended by:  
   Milosdin Radovic
   Department Head or Program Chair (Type Name & Sign)  
   Date
   Prasad Enjeti
   Chair, College Review Committee  
   Date
   Prasad Enjeti
   Dean of College  
   Date
   Karen Butler-Park  
   Chair, GC or UCC  
   Date
   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 – 07/14
<table>
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<td>Meeting Times and Location</td>
<td>TBD</td>
</tr>
<tr>
<td>Credit Hours:</td>
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</table>

**Course Description and Prerequisites**

This course will introduce students to the use of informatics approaches to establish quantitative structure-property relations (QSPRs) in materials and materials systems. Topics include: basic concepts of data mining, introduction to QSPRs, unsupervised learning, supervised learning, search algorithms applied to materials discovery

**Prerequisites:** Knowledge of basic materials science, approval of instructor.

**Goals:** The students will attain good understanding of the different methods available to accelerate the discovery of materials through data mining and machine learning approaches.

**Learning Outcomes**

At the end of the course students will be able to:

- Understand the materials science forward problem as the establishment quantitative structure-property relations (QSPRs)
- Apply supervised learning techniques to establish QSPRs
- Use unsupervised learning approaches for dimensional reduction and clustering analysis in multi-dimensional materials data sets
- Apply advanced materials informatics approaches to establish connections between structural descriptors and materials indicators in realistic materials discovery problems

**Instructor Information**

<table>
<thead>
<tr>
<th>Name</th>
<th>Ulisses Braga-Neto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone number</td>
<td>979-862-6441</td>
</tr>
<tr>
<td>Email address</td>
<td><a href="mailto:ulisses@ece.tamu.edu">ulisses@ece.tamu.edu</a></td>
</tr>
<tr>
<td>Office hours</td>
<td>TBD</td>
</tr>
<tr>
<td>Office location</td>
<td>TBD</td>
</tr>
</tbody>
</table>

**Textbook and/or Resource Material**

Textbook(s): Informatics in Materials Science and Engineering, K. Rajan, Ed
Grading Policies

Projects: 50%
Participation (Quizzes): 20%
Exams: 30%

Grade Basis: A ≥ 90; 80 ≤ B < 90; 70 ≤ C < 80; 60 ≤ D < 70; F < 60.

Students will be expected to submit homework assignments.
Students will be expected to participate during in-class discussions or quizzes
Students will be expected to complete exams
Students will be expected to complete projects

Course Topics, Calendar of Activities, Major Assignment Dates

Calendar

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Materials Informatics</td>
</tr>
<tr>
<td>2</td>
<td>Quantitative-Structure Property Relationships (QSPRs) in Materials Science and Engineering</td>
</tr>
<tr>
<td>3</td>
<td>Review of Probability</td>
</tr>
<tr>
<td>4</td>
<td>Optimal Prediction: Least-Squares Estimation</td>
</tr>
<tr>
<td>5</td>
<td>Optimal Prediction: MMSE Estimation</td>
</tr>
<tr>
<td>6</td>
<td>Supervised Learning: Basics of Classification</td>
</tr>
<tr>
<td>7</td>
<td>Supervised Learning: Linear and Nonlinear Classification Rules</td>
</tr>
<tr>
<td>8</td>
<td>Supervised Learning: Regression</td>
</tr>
<tr>
<td>9</td>
<td>Supervised Learning: Case Study in Classification and Regression for Materials Informatics Problems</td>
</tr>
<tr>
<td>10</td>
<td>Unsupervised Learning: Dimensional Reduction</td>
</tr>
<tr>
<td>11</td>
<td>Unsupervised Learning: Clustering</td>
</tr>
<tr>
<td>12</td>
<td>Unsupervised Learning: Case Study: Dimensional Reduction and Clustering in Materials Informatics Problems</td>
</tr>
<tr>
<td>13</td>
<td>Project Presentations</td>
</tr>
<tr>
<td>14</td>
<td>Project Presentations</td>
</tr>
</tbody>
</table>

Attendance

The University views class attendance as the responsibility of an individual student. Attendance is essential to complete the course successfully. University rules related to excused and unexcused absences are located on-line (http://student-rules.tamu.edu/rule07).
### Make-up Policy

If an absence is excused, the instructor will either provide the student an opportunity to make up any quiz, exam or other work that contributes to the final grade or provide a satisfactory alternative by a date agreed upon by the student and instructor. If the instructor has a regularly scheduled make up exam, students are expected to attend unless they have a university approved excuse. The make-up work must be completed in a timeframe not to exceed 30 calendar days from the last day of the initial absence. The reasons absences are considered excused by the university are located on-line. See Student Rule 7 for details [here](http://student-rules.tamu.edu/rule07).

### 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, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information visit [here](http://disability.tamu.edu).

### Academic Integrity

**Aggie Honor Code:** “An Aggie does not lie, cheat, or steal, or 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. Conduct contradicting to this policy will be punished according to the current rules and regulations. For additional information please visit: [here](http://aggiehonor.tamu.edu)
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus. •

Form Instructions

1. Course request type:  
   □ Undergraduate  ☑ Graduate  □ First Professional (DOS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name):
   Department of Oceanography
   OCNG 634 - Fundamentals of High Performance Computing for the Geosciences

3. Course prefix, number and complete title of course:

4. Catalog course description (not to exceed 50 words):
   Architecture of High Performance Computing (HPC) systems; Unix operating system, shell environment; algorithms and programming languages for the Geosciences; concurrency, dependency, parallelism; parallel performance, scalability; structured programming; serial, parallel patterns; parallel programming models; parallel algorithms and software design for the Geosciences; techniques for empirical parallel performance analysis.

5. Prerequisite(s):
   Graduate classification or approval of instructor.

   Cross-listed with:  ATMO 634 and GEOP 634  Stacked with:  

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

6. Is this a variable credit course?  □ Yes  ☑ No  If yes, from _______ to _______

7. Is this a repeatable course?  □ Yes  ☑ No  If yes, this course may be taken _______ times.

   Will this course be repeated within the same semester?  □ Yes  ☑ No

8. Will this course be submitted to the Core Curriculum Council?  □ Yes  ☑ No

   How will this course be graded?  ☑ Grade  □ S/U  ☑ P/F (CLMD)

10. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
      M.S., Ph.D. in all Geosciences majors.

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. ☑ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix  Course #  Title (excluding punctuation)
    OCNG  634  FUND HPC GEOSCIENCES

<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>Other</th>
<th>SCH</th>
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Approval recommended by:
Deborah Thomas

Department Head or Program Chair (Type Name & Sign)  Date: 11/10/15
Chair, College Review Committee

Department Head or Program Chair (Type Name & Sign)  Date: 11/10/15
Dean of College

Submitted to Coordinating Board by:
Associate Director, Curricular Services

Date: 12/15/15  Effective Date:

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu
Curricular Services – 07/14
Course title and number: Fundamentals of High Performance Computing for the Geosciences, OCNG 634
Term (e.g., Fall 200X): Spring 201X
Meeting times and location: Lectures: TBD (3 hours); Laboratory: TBD (2 hours).

Course Description and Prerequisites
This course will present the architectural concepts, theoretical basis, common tools, and practical knowledge required to use current, state-of-the-art High-Performance Computing (HPC) systems to accurately and efficiently solve large-scale problems in the Geosciences.

The basic architecture of HPC systems will be discussed, and you will become familiar with Unix-based operating systems and shell environments. The main part of the course will focus on how to design and implement serial and parallel algorithms specific to Geosciences’ problems by using structured, pattern-based programming techniques along with computer languages and widely used models in the Geosciences’ research community. Concepts such as concurrency, dependency, and parallelism will be used as basis for understanding parallel code performance and techniques for empirical performance analysis.

The course will specifically focus on programming languages such as Fortran and deal with design and implementation concepts present in current models for general circulation, regional climate and weather, seismic wave propagation, data inversion, and others, as used on HPC systems. Dominant performance bottlenecks deriving from the data-intensive nature of computations in the Geosciences will be discussed, including disk I/O.

The course includes a laboratory section designed to improve the understanding of the topics presented during lecture hours and to further develop your computational skills. Through lab exercises you will become familiar with available computing environments, software and tools, and gain realistic, hands-on experience on HPC systems that may be applied to your future research work.

The intent of this course is to provide Geosciences students with diverse backgrounds a common knowledge set that will help them advance more effectively in their discipline, and to emphasize shared aspects of computational modeling in the Geosciences that may be leveraged to foster interdisciplinary exchanges.

There are no course prerequisites, but basic knowledge of programming is required.

Prerequisites: Graduate classification or approval of instructor.

Learning Outcomes
By the end of this course, you will be able to:

1. Describe the basic architecture and design features of a modern HPC system;
2. Understand the structure of the Unix operating system and make use of its main capabilities;
3. Break down a given computational task into primary steps and design a basic algorithm to carry out the work;
4. Use a programming language (Fortran) and leverage its main features to implement serial and parallel Geosciences-oriented computer codes;
5. Understand structured, pattern-based serial and parallel programming;
6. Identify and apply parallel programming patterns to parallel code design for modeling in the Geosciences;
7. Understand the concepts of concurrency, dependency, and parallelism;
8. Evaluate the performance of a parallel code on a HPC system;
9. Develop a parallel computer code to simulate a basic physical process relevant to the Geosciences;
10. Give an oral presentation of your programming project;
11. Write a comprehensive technical report of your programming project.

Instructor Information

Name: Raffaele Montuoro  
Telephone number: 979-862-3182  
Email address: rmontuoro@tamu.edu  
Office hours: Open  
Office location: O&M 1017B

Textbook and/or Resource Material

Course material will be provided in the form of lecture notes and handouts.

I encourage you to consult the following reference material:


Grading Policies

Your final grade will be determined based on the following categories and weights:

1) Programming assignments (20% of course grade)  
2) Midterm exam (30% of course grade)  
3) Final project (50% of course grade)

Assignments. Assignments will be due at the beginning of class on the scheduled week, unless stated otherwise by the instructor. Late homework without a university-excused absence (see Attendance and Make-up Policies section) will be assessed a penalty equal to 20% of its grade per day. An unexcused delay longer than 4 working days will automatically result in receiving zero points on the assignment.
**Midterm Exam.** There will be a two-hour, in-class midterm exam.

**Final Project.** A final programming project will be due by 5pm on the last day of the university’s Final Examination Schedule for the semester, available at [http://registrar.tamu.edu/Courses.-Registration.-Scheduling/Final-Exam-Schedule](http://registrar.tamu.edu/Courses.-Registration.-Scheduling/Final-Exam-Schedule).

This final project must include:
1. a 10-page technical report written in the style of the Institute of Electrical and Electronics Engineers (IEEE) Transactions (https://www.ieee.org/publications_standards/publications/authors/author_templates.html). The report must comprehensively summarize and explain the objectives and technical approach, software design and implementation, and computational results of your project;
2. a presentation during last week of class.

Final course grades will be posted on [http://elearning.tamu.edu](http://elearning.tamu.edu)

Please consult University Student Rule 10 (Grading) at [http://student-rules.tamu.edu/rule10](http://student-rules.tamu.edu/rule10) for additional details on grading policies.

**Grading Scale**

You will be assigned a final letter grade based on your final percentage grade according to the following scale:

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = <60%

Your final percentage grade will be calculated by adding your weighted scores, divided by the maximum attainable score, for each of the categories listed in the Grading Policies section.

**Attendance and Make-up Policies**

The university views class attendance as an individual student responsibility. You are expected to attend class and to complete all assignments. Attendance is essential to complete the course successfully.

Please consult the University Student Rule 7 at [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07) for details on university-excused absences and make-up policies.

**Course Topics, Calendar of Activities, Major Assignment Dates**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to the architecture and design of state-of-the-art High Performance Computing systems</td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td>Description of the UNIX operating system, including the shell environment.</td>
<td></td>
</tr>
<tr>
<td>Week 3</td>
<td>Algorithm design and basic principles of computer programming.</td>
<td></td>
</tr>
<tr>
<td>Week 4-5</td>
<td>Fundamentals of Fortran programming language.</td>
<td></td>
</tr>
<tr>
<td>Week 6</td>
<td>Advanced Fortran features for computational Geosciences. Introduction to structured programming. Pattern-based serial programming.</td>
<td>Assignment #1 due: Serial codes for one-dimensional physical models</td>
</tr>
</tbody>
</table>
Week 7  Concepts of concurrency, dependency, and parallelism. Potential and actual parallelism, data locality, parallel efficiency, speedup, and scalability.

Assignment #2 due:
Apply structured programming techniques and serial patterns to design and implement simple models.

Midterm Exam

Week 8

Week 10  Pattern-based parallel programming in the Geosciences. Examples include: geometrical decomposition and communication patterns in climate models, sequences in coupled models and reservoir simulations, map/reduce operations for convergence testing or large matrix operations.

Week 11  Description of the main parallel programming models used in computational Geosciences. Shared-memory parallelism with OpenMP.

Assignment #3 due:
Design a pattern-based parallel code for a two dimensional problem

Assignment #4 due:
Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.

Week 12-13  Distributed-memory parallelism with the Message Passing Interface (MPI)

Assignment #5 due: Use MPI to create a distributed-memory parallel code. Evaluate parallel efficiency.

Week 14  Concepts and tools for empirical performance analysis of parallel codes.

Final project due by 5pm on the last day of the university's Final Examination Schedule for the semester.

Please note that the schedule and topics of lectures and laboratory assignments are subject to change.

Other Pertinent Course Information

Email. All Texas A&M students are expected to use their official TAMU email account for all the communications regarding this course. It is the student's responsibility to check your TAMU email account regularly throughout the course.

Cell Phones/Mobile devices. You should set your mobile devices to silent and refrain from texting during class.

Access to HPC systems. You should have a working account on one of Texas A&M HPC systems to take full advantage of this course and successfully complete your assignments. You may apply for a basic supercomputing account by contacting High Performance Research Computing (http://sc.tamu.edu) before the beginning of the course. I am also available to help you obtaining a supercomputing account if you contact me during the first week of class.

Copyright Policy. All materials used in this class are copyrighted. These materials include but are not limited to syllabi, quizzes, exams, 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 permission is expressly granted.
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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://aggiehonor.tamu.edu

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

You are encouraged to study together and discuss the information presented in the course lectures and material with other students. However, all coursework submitted to the instructor must be the result of your original work. Intentional or careless appropriation of someone else's work or ideas, even with their explicit consent, violates the Aggie Honor System Rules (Student Rule 20.1.2) and will result in all the students involved automatically receiving zero points for the assignment as well as mandatory reporting of the violation.

You are responsible for authenticating all submitted work and, if asked, to produce proof that the item submitted is indeed the work of that student. The inability to authenticate one's work upon the instructor's request is sufficient grounds to initiate an academic dishonesty case.
Texas A&M University
Departmental Request for a New Course
Undergraduate □ Graduate □ Professional
• Submit original form and attach a course syllabus.

1. Course request type: □ Undergraduate □ Graduate □ First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name): Department of Oceanography
OCNG 656 MATLAB Programming for Ocean Sciences

3. Course prefix, number and complete title of course:

4. Catalog course description (not to exceed 50 words):
This course is designed to train students in computation techniques for oceanographic data processing using MATLAB. Each class will be a combination of lecture and lab on the day’s topic. Students will be given background information and an assignment that will be worked on during the allotted time. Whenever possible, the assignments will focus on the analysis of oceanographic-related data sets and real-world oceanographic applications. Students are encouraged to bring their own data sets to analyze.

5. Prerequisite(s):
Graduate Classification
Cross-listed with:
Stacked with: OCNG 456

6. Is this a variable credit course? □ Yes □ No
If yes, from ______ to ______

7. Is this a repeatable course? □ Yes □ No
If yes, this course may be taken ______ times.

8. Will this course be repeated within the same semester? □ Yes □ No

9. Will this course be submitted to the Core Curriculum Council? □ Yes □ No

10. How will this course be graded: □ Grade □ S/U □ P/F (CLMD)

11. This course will be:
a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   M.S. OCNG, MOST, PhD OCNG

b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

12. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

13. Prefix Course # Title (excluding punctuation)
OCNG 656 MATLAB Prog for Ocean Sciences

<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>Other</th>
<th>SCH</th>
<th>CIP and Fund Code</th>
<th>Admin. Unit</th>
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<td>0 0 3 6 3 2</td>
</tr>
</tbody>
</table>

Approval recommended by:

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

Eric Riggs
Chair, College Review Committee Date

Kate Miller
Dean of College Date

12-15-15
Chair, GC or UAC Date

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 – 07/14
Course title and number: OCNG 456/656, MATLAB Programming for Ocean Sciences
Term: Spring 2016
Meeting times and location: M/W 9-11 Room 602

Course Description and Prerequisites
This course is designed to train students in computation techniques for oceanographic data processing using MATLAB. Each class will be a combination of lecture and lab on the day’s topic. Students will be given background information and an assignment that will be worked on during the allotted time. Whenever possible, the assignments will focus on the analysis of oceanographic-related data sets and real-world oceanographic applications. Students are encouraged to bring their own data sets to analyze.

Learning Outcomes or Course Objectives
Course Objectives: To provide instruction of MATLAB techniques useful to oceanographers.
Learning Outcomes: After completing this course student should be able to successfully write MATLAB scripts that load, manipulate, and visually display various large oceanographic data sets.

Instructor Information
Name: Dr. Christina L. Wiederwohl
Instructional Assistant Professor
Department of Oceanography
Telephone number: 979-845-7191
Email address: chrissyw@tamu.edu
Office hours: TBA
Office location: 410 O&M Building, TAMU

Textbook and/or Resource Material
Required: Laptop with access to MATLAB software. This is a BYOD (Bring your own Device) course. Computers will not be provided. Matlab software is provide for free to students via software.tamu.edu. iPads also work, but require matlab via the virtual open access labs (voal.tamu.edu).

Prerequisites:
OCNG 456: U3 or U4 status or approval of instructor
OCNG 656: No prerequisites.
A survey course in Oceanography is recommended for all students, but not required.

Grading Policies
Undergraduates and Graduates: There will be a total of 11 assignments. The lowest grade will be dropped and the remaining 10 assignments reports for this course are each worth 8% of the final grade. Grades will be based on the following grading system: 90-100%=A, 80-89%=B, 70-79%=C, 60-69%=D, <60=F. Assignments are to be turned in by 5pm on Friday the week the assignment was assigned. Late assignments will not be accepted without prior arrangement before the assignment. Graduate student assignments will be more in-depth and intensive than undergraduate student assignments. There is no final exam.

Graduates: Graduate student will be given a final project at the end of the semester encompassing all skill sets learned in the course.
Undergraduates: Attendance: 20%, Assignments: 80%
Graduates: Assignments: 80%, Final Project: 20%

Attendance Policy:

Attendance is mandatory for this course. Make up opportunities will only be given for students with excused absences. Please refer to http://student-rules.tamu.edu. Please see Part 1: Academic Rules, #7 Attendance

Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The art of Scientific computing, logging on</td>
</tr>
<tr>
<td>2</td>
<td>Introduction MATLAB programming: basics of programing</td>
</tr>
<tr>
<td>3</td>
<td>Introduction MATLAB programming: m-scripts, functions (Assignment 1 due)</td>
</tr>
<tr>
<td>4</td>
<td>Introduction to MATLAB programming II: debugging, loading various data formats, loops (Assignment 2 due)</td>
</tr>
<tr>
<td>5</td>
<td>Introduction to MATLAB programming III: Manipulating CTD and bottle data (Assignment 3 due)</td>
</tr>
<tr>
<td>6</td>
<td>Basics of MATLAB programming: working with vectors: times series plotting (Assignment 4 due)</td>
</tr>
<tr>
<td>7</td>
<td>Basics of MATLAB programming: matrices, scripting and command line statistics (Assignment 5 due)</td>
</tr>
<tr>
<td>8</td>
<td>Accessing data from NODC (The National Ocean Data Center) and CCHDO (CLIVAR and Carbon Hydrographic Data Office)</td>
</tr>
<tr>
<td>9</td>
<td>Introduction to Oceanographic toolboxes: seawater toolbox; calculating oceanographic variables (Assignment 6 due)</td>
</tr>
<tr>
<td>10</td>
<td>Graphical representations of oceanographic data (Assignment 7 due)</td>
</tr>
<tr>
<td>11</td>
<td>Mapping techniques (Assignment 8 due)</td>
</tr>
<tr>
<td>12</td>
<td>Gridding and contouring (Assignment 9 due)</td>
</tr>
<tr>
<td>13</td>
<td>Vertical sections (Assignment 10 due)</td>
</tr>
<tr>
<td>14</td>
<td>Semester wrap up (Assignment 11 due) Graduates: final project due.</td>
</tr>
</tbody>
</table>

Americans with Disabilities Act (ADA)

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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."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of
the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

Copyright and Plagiarism Policy

The materials used in this course are copyrighted. These materials include but are not limited to syllabi, quizzes, exams, 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 permission is expressly granted.

As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated.

If you have any questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules, http://student-rules.tamu.edu, under the section “Scholastic Dishonesty.”
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

Form Instructions
1. Course request type:
   - Undergraduate
   - Graduate
   - First Professional (M.D., D.V.M., Pharm.D., D.P.A.)
2. Request submitted by (Department or Program Name):
   Harold Vance Department of Petroleum Engineering
3. Course prefix, number and complete title of course:
   PETE 614-Master Graduate Student Paper Contest

4. Catalog course description (not to exceed 50 words):
   Presentation of a technical petroleum engineering topic judged by petroleum professionals at the master graduate level departmental student paper contest.

5. Prerequisite(s):
   Master Level Graduate classification
   Cross-listed with: ___________________________  Stacked with: ___________________________

6. Is this a variable credit course?
   - Yes
   - No
   If yes, from ______ to ______

7. Is this a repeatable course?
   - Yes
   - No
   If yes, this course may be taken ________ times.
   Will this course be repeated within the same semester?
   - Yes
   - No

8. Will this course be submitted to the Core Curriculum Council?
   - Yes
   - No

9. How will this course be graded?
   - Grade
   - S/U
   - P/F (CLMD)

10. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
      Master level graduate students
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-control-basics-for-distance-education).

13. Prefix Course # Title (excluding punctuation)
    PETE 614 MS Grad Student Paper Contest

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<th>Admin. Unit</th>
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Approval recommended by: ___________________________

1. Yuval Akkutlu
   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: ___________________________

Associate Director, Curricular Services Date

Chair, College Review Committee Date

Dean of College Date

Chair, GC or UCC Date

Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu
Curricular Services – 07/14
Course title and number  PETE 614  
Term (e.g., Fall 200X)  Fall 2016  
Meeting times and location  The Student Paper Contest is held annually on a Saturday near the end of January.

Course Description and Prerequisites
Participate satisfactorily in the Master division of the Petroleum Engineering Department annual Student Paper Contest. Students will give a 10-15 minute oral presentation of their graduate research to a panel of judges from industry.

Prerequisites: Master MS/MEN Classification

Learning Outcomes
Professional presentation to Industry representatives.

Instructor Information
Name  Duane A. McVay  
Telephone number  979-862-8466  
Email address  Duane.mcvay@pe.tamu.edu  
Office hours  TBD  
Office location  407 B Richardson

Method of Evaluation
Each student will be awarded a grade of satisfactory or unsatisfactory based on industry judges’ review of the presentation and the student’s responses during a 5-minute question-and-answer session following the presentation.

Attendance and Make-up Policies
Individual requests will be reviewed by instructor.

Other Pertinent Course Information
Course is taken satisfactory/unsatisfactory and for zero credit hours.

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://aggiehonor.tamu.edu

"An Aggie does not lie, cheat, or steal, or tolerate those who do."
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Course request type: ☑ Graduate ☐ Undergraduate ☐ First Professional (DDS, MD, JD, PharmD, DVM)

2. Request submitted by (Department or Program Name): Harold Vance Department of Petroleum Engineering

3. Course prefix, number and complete title of course: PETE 615, PHD Grad Student Paper Contest

4. Catalog course description (not to exceed 50 words):
Presentation of a technical petroleum engineering topic judged by petroleum professionals at the PHD graduate level departmental student paper contest.

5. Prerequisite(s): PHD graduate classification

6. Is this a variable credit course? ☑ No ☐ Yes If yes, from ______ to ______

7. Is this a repeatable course? ☐ No ☑ Yes If yes, this course may be taken ______ times.

Will this course be repeated within the same semester? ☐ Yes ☑ No

8. Will this course be submitted to the Core Curriculum Council? ☑ No ☐ Yes

9. How will this course be graded? ☑ S/U ☐ Grade ☐ P/F (CLMD)

10. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   PHD level graduate students
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

11. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

12. ☑ I verify that I have reviewed the FAQ for Export Control Basics for Distance Education (http://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).

13. Prefix Course # Title (excluding punctuation)

PETE 615 PHD Grad Student Paper Contest

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</table>

Approval recommended by:

Yuval Akkutlu
Department Head or Program Chair Type Name & Sign Date

Chair, College Review Committee Date

Dean of College Date

Chair, GC or UCC Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Course title and number  PETE 615 – Doctoral Student Paper Contest
Term (e.g., Fall 200X)  Fall 2016
Meeting times and location  The Student Paper Contest is held annually on a Saturday near the end of January.

Course Description and Prerequisites
Participate satisfactorily in the doctoral division of the Petroleum Engineering Department annual Student Paper Contest. Students will give a 10-15 minute oral presentation of their graduate research to a panel of judges from industry.

Prerequisites: PHD Classification

Learning Outcomes
Professional presentation to Industry representatives.

Instructor Information
Name  Duane A. McVay
Telephone number  979-862-8466
Email address  Duane.mcvay@pe.tamu.edu
Office hours  TBD
Office location  407 B Richardson

Method of Evaluation
Each student will be awarded a grade of satisfactory or unsatisfactory based on industry judges' review of the presentation and the student's responses during a 5-minute question-and-answer session following the presentation.

Attendance and Make-up Policies
Individual requests will be reviewed by instructor.

Other Pertinent Course Information
Course is taken satisfactorily/unsatisfactory and for zero credit hours.

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

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