New Courses

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GRADUATE STUDIES

Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.•

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EASA

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 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, spacewalking and human health maintenance; applications to future space systems.
5. Prerequisite(s): Graduate classification.
   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 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)*
       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 #	Title (excluding punctuation)
AERO	651	Human Spaceflight Operations

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code
3.00	0.00	0.00	3.00	1402010006	0100	16 - 17	003632

Level: 6

Approval recommended by:

Rodney D. Bowersox — 10-29-15
Department Head or Program Chair *(Type Name & Sign)* — Date
AERO Vikram K. Kinra

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

Submitted to Coordinating Board by:

Associate Director, Curricular Services — Date

Prasad Enjeti — 11/17/2015
Chair, College Review Committee — Date

Prasad Enjeti — 11/17/2015
Dean of College — Date

Karen Butler-Purry — 12-15-15
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

TEXAS A&M UNIVERSITY

AEROSPACE ENGINEERING
TEXAS A&M UNIVERSITY

SYLLABUS

1940-2015 75 years

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).

Course Topics

		Week
1	**Introduction to Human Spaceflight Operations**	1
2	**Mission Integration and Execution**	2
3	**Mission Planning**	2
4	**Command, Control & Communication**	3
5	**Launch and Trajectory Design**	4
6	**Environmental Control and Life Support**	5
7	**Space-Based Power Systems**	6
8	**Attitude Determination, Control & Propulsion**	7
9	**Thermal Control Systems**	8
10	**Extra Vehicular Activity (EVA/Spacewalking)**	9
11	**Space Robotics**	9
12	**Science and Payload Operations**	10
13	**Flight Crew Operations**	11
14	**Mission Engineering Operations**	12
15	**Flight Medical Operations**	12
16	**Mission Safety**	13
17	**Launch Operations and Vehicle Processing**	14
18	**International Operations**	14
19	**FINAL PROJECT DUE (No Final Exam)**	15

Academic Integrity

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

Refer to the Honor Council Rules and Procedures on the web http://aggiehonor.tamu.edu.

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.•

RECEIVED
NOV 10 2015
GRADUATE STUDIES

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 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 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)*
       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://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).
13.

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

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
1.00	0.00	0.00	1.00	4502010001	0280	16	-	17	0	0	3	6	3	2

Level: 6

Approval recommended by:

Ted Goebel — Department Head or Program Chair *(Type Name & Sign)* — Date: 10/21/15

Chair, College Review Committee — Date

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

Dean of College — Date: 11-9-15

Submitted to Coordinating Board by:

Chair, GC or UCC — Date: 12-15-15

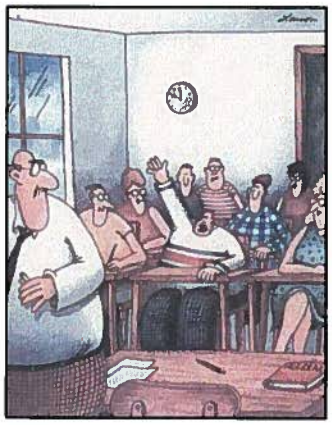
Associate Director, Curricular Services — Date — Effective Date

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

Bain, K., *What the Best College Teachers Do*. Harvard University Press, Cambridge, MA, 2004.

All other reading materials will be posted on e-Campus.

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).

"Anthropologists! Anthropologists!"

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

(Don McLeroy)

For next class watch video:

http://www.ted.com/talks/ken_robinson_says_schools_kill_creativity?language=en

(Ken Robinson)

Week 2: Planning a course

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

http://teachingcenter.wustl.edu/strategies/Pages/course-planning.aspx#.VFFAU_nF98E

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=u6XAPnuFjJc&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-ZI58wpw (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

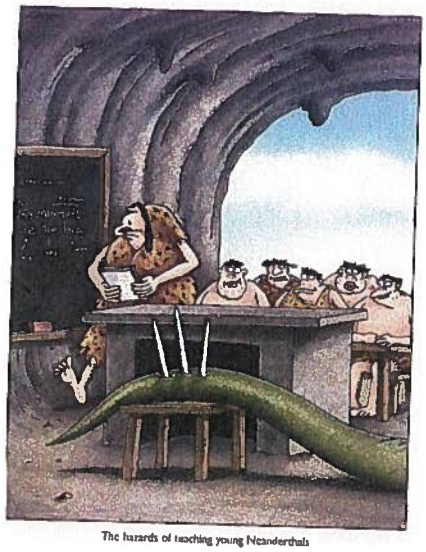
Assignment 3: Write the first draft of your syllabus (no longer than five pages).

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.



The hazards of teaching young Neanderthals

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 Refection 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

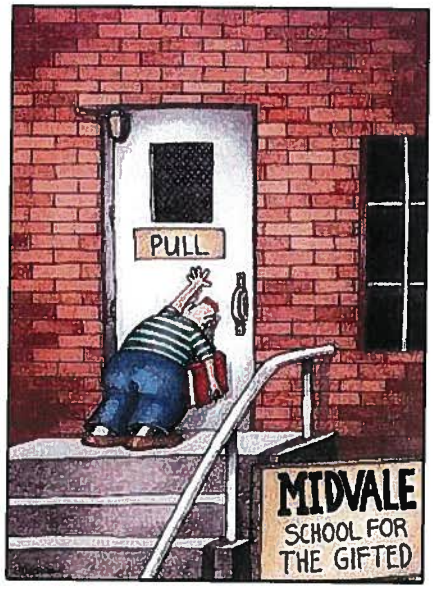
Week 11: Trends in academia

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"

Video: http://www.ted.com/talks/richard_wilkinson?language=en



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.

RECEIVED
NOV 03 2015
GRADUATE STUDIES

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 Architecture
3. Course prefix, number and complete title of course: ARCH 637 - Seminar in Japanese Architecture History and Theory
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): 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 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. 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

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
3.00	0.00	0.00	3.00	040210006	0690	16	-	17	0	0	3	6	3	2

Level: 6

Approval recommended by:

Ward V. Wells — 10-28-15
Department Head or Program Chair *(Type Name & Sign)* Date

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

Leslie Feigenbaum — 10-28-15
Chair, College Review Committee Date

Leslie Feigenbaum — 10-28-15
Dean of College Date

Chair, GC or UCC Date

Submitted to Coordinating Board by:

Associate Director, Curricular Services Date

RECEIVED
OCT 29 2015
CURRICULAR SERVICES

12-05-15
Effective Date

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

TEXAS A&M UNIVERSITY

DEPARTMENT OF ARCHITECTURE
SYLLABUS

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 – Room431

Textbook and/or Resource Material
(Reading Assignment)

In Praise of Shadows by Junichiro Tanizaki, Leete's Island Books, 1977, pp. 5-64
What is Japanese Architecture? -A Survey of Traditional Japanese Architecture by Kazuo Nishi, Kodansha USA (May 1, 2012), pp. 7-52
The Metabolism/1960, Bijutsu Syuppan, 1960, pp. 4-69
Fumihiko Maki: Building and Projects, Princeton Architectural Press; 1st edition (July 1, 1997), pp. 206-217
Fumihiko Maki, An Aesthetic of Fragmentation, Rizzoli (August 15, 1988) pp. 7-16
Learning from the Japanese City: West Meets East in Urban Design (Planning, History and Environment Series) Taylor & Francis (1999/04), pp. 66-150
Light Construction by Terence Riley, The Museum of Modern Art, New York (1995), pp. 9-32

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%

Grading will be based on the following criteria, ranked on a scale of 0 (not attempted) to 5 (superior):						
Clarity and specificity of written project topic proposal	0	1	2	3	4	5
Relevance of the topic to the course material	0	1	2	3	4	5
Relevance of the topic to the student's chosen field	0	1	2	3	4	5
Bibliography	0	1	2	3	4	5
Research documentation	0	1	2	3	4	5
Clarity, vigor, correctness and conciseness of expression	0	1	2	3	4	5
Degree of completion as compared to proposal	0	1	2	3	4	5

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.tamu.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:

A= 90-100	Excellent/outstanding (extremely good work)
B= 80-89	Above average (very good work)
C= 70-79	Average (fairly good work)
D= 69-60	Below average (poor work)
F= below 60	Failure (unacceptable work)

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 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 on-line 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

Week	Topic	Required Reading
#1 (Jan.17 & Jan. 19)	**Introduction**	
#2 (Jan.24 & Jan. 26)	**Traditional Architecture** *Religious Architecture: Buddhist Temple and Shinto Shrine*	In Praise of Shadows, pp. 5-64 Assignment 1(Due: Jan. 26)
#3 (Jan.31 & Feb. 2)	**Traditional Architecture** *Residential Houses: Palace, Town/Row House*	
#4 (Feb. 7 & Feb. 9)	**Traditional Architecture** *Development of Castle Town*	What is Japanese Architecture, pp. 7-52 Assignment 2(Due: Feb. 9)
#5 (Feb. 14 & Feb. 16)	**Modern Architecture** *British and American Influence*	
#6 (Feb. 21 & Feb. 23)	**Modern Architecture** *Le Corbusier's Influence*	The Metabolism/1960, pp. 4-69 Assignment 3(Due: Feb. 23)

#7 (Feb. 28 & March 2)	**Modern Architecture** *Works of Kenzo Tange*	
#8 (March 7 & March 9)	**Modern Architecture** *Metabolism Movement; Kiyonori Kikutake, Kisho Kurokawa*	Fumihiko Maki: Building and Projects, pp. 206-217 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*	
#10 (March 28 & March 30)	**Contemporary Architecture** *Works of Tadao Ando and Yoshio Taniguchi*	Learning from the Japanese City by Barrie Shelton, pp. 66-150 Assignment 5 (Due: March 30)
#11 (April 4 & April 6)	**Contemporary Architecture** *Works of Toyo Ito and SANAA*	
#12 (April 11 & April 13)	**Contemporary Architecture** *Works of Emerging Architects 1*	Light Construction by Terence Riley, pp. 9-32 Assignment 6 (Due: April 13)
#13 (April 18 & April 20)	**Contemporary Architecture** *Works of Emerging Architects 2*	
#14 (April 25 & April 27)	**Final Review**	
#15 (May 2)	**Final Review**	Reserved, it might be completed by April 30

Americans with Disabilities Act (ADA)

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

Academic Integrity

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

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*

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 *(DDS, MD, JD, PharmD, DVM)*
2. Request submitted by *(Department or Program Name)*: Department of Atmospheric Sciences
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: _____

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	618	NUMERICAL METHODS GEOSCIENCES

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code	Level
03	00	00	03	4006070002	0351	16 - 17	003632	6

Approval recommended by:

Ping Yang — 11/9/2015
Department Head or Program Chair *(Type Name & Sign)* Date

Chair, College Review Committee — 11/11/15 — Date

Michael C Pope Michael C Pope — 11/09/15
Department Head or Program Chair *(Type Name & Sign)* Date
(if cross-listed course)

Dean of College — 11/11/15 — Date

12-15-15

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

TEXAS A&M UNIVERSITY

SYLLABUS

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:

1. Roache, J.P., Fundamentals of Computational Fluid Dynamics, Hermosa Publishers, 1988
2. Ferziger, J.H., Peric, M., Computational Methods for Fluid Dynamics, 3rd rev. ed., Springer-Verlag

Berlin Heidelberg, 2002
3. Fletcher, C.A.J., Computational Techniques for Fluid Dynamics, Volume 1: Fundamental and General Techniques, Springer-Verlag, Berlin, 1988
4. Fletcher, C.A.J., Computational Techniques for Fluid Dynamics, Volume 2: Specific Techniques for Different Flow Categories, Springer-Verlag, Berlin, 1988
5. Canuto, C., et al., Spectral Methods in Fluid Dynamics, Springer-Verlag, Berlin Heidelberg, 1988
6. Gerya, T., Introduction to Numerical Geodynamic Modelling, Cambridge University Press, 2010
7. Haidvogel, D.B, Beckmann, A., Numerical Ocean Circulation Modeling, Imperial College Press, 1999
8. Griffies, S., Fundamentals of Ocean Climate Models, Princeton University Press, 2004
9. Mesinger, F., Arakawa, A., Numerical Methods Used in Atmospheric Models, Volume 1, GARP Publication Series No. 17, August 1976
10. Haltiner, G.J., Williams, R.T., Numerical Prediction and Dynamic Meteorology, Wiley, 1980
11. Washington, W.M., Parkinson, C.L., An Introduction to Three-Dimensional Climate Modeling, 2nd Ed., University Science Books, 2005
12. Bedford, A., Drumheller, D.S., Introduction to Elastic Wave Propagation, Wiley, 1994
13. Pujol, J., Elastic Wave Propagation and Generation in Seismology, Cambridge University Press, 2003
14. Yanfei Wang, Anatoly G. Yagola, Changchun Yang (Eds.), Computational Methods for Applied Inverse Problems. Higher Education Press, 2012

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

Please consult University Student Rule 10 (Grading) at 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 for details on university-excused absences and make-up policies.

Course Topics, Calendar of Activities, Major Assignment Dates

Week	Topic	Assignment
Week 1	Introduction to fundamental physical systems and processes in Geosciences that can be represented using continuum partial differential equations (PDEs). Basic concepts in numerical modeling.	
Week 2	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.	
Week 3	Fundamental equations in the Geosciences. Traditional working approximations. Primitive equations: continuity, momentum, thermal energy. Beta plane approximation in fluid dynamics.	
Week 4	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).	
Week 5-6	Discretization techniques for PDEs: Finite Difference Method (FDM), Finite Element Method (FEM), Spectral Method, Pseudospectral Method.	
Week 7	Consistency, convergence, and stability of numerical solutions of initial value problems by FDMs. Equivalence theorem.	
Week 8	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.	
Week 8		**Midterm Exam**
Week 9	Modeling diffusive processes: explicit and implicit methods.	

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
3. Course prefix, number and complete title of course: ATMO 634 - Fundamentals of High Performance Computing for the Geosciences
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: OCNG 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

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code	Level
03	02	00	04	4006990202	0351	16 - 17	003632	6

Approval recommended by:

Ping Yang — 11/9/2015
Department Head or Program Chair *(Type Name & Sign)* Date

Michael C Pope Michael C. Pope 11/09/15
Department Head or Program Chair *(Type Name & Sign)* Date
(if cross-listed course)

Submitted to Coordinating Board by:

Associate Director, Curricular Services

Chair, College Review Committee — 11/11/15 Date

Dean of College — 11/11/15 Date

Chair, GC or UCC — 12-15-15 Date

Date

Effective Date

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

TEXAS A&M UNIVERSITY

SYLLABUS

Course title and number	**Fundamentals of High Performance Computing for the Geosciences, ATMO 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:

1. Chivers, I., Sleightholme, J., Introduction to Programming with Fortran, 2nd Ed., Springer, 2012, ISBN 978-0-85729-232-2.
2. Akin, E., Object Oriented Programming via Fortran 90/95, 1st Ed., Cambridge University Press, 2003, ISBN 0-521-52408-3.
3. Chapman, S.J., Fortran 95/2003 for Scientists and Engineers, 3rd Ed., McGraw-Hill, 2007, ISBN 978-0-07-319157-7.
4. Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flannery, B.P., Numerical Recipes: The Art of Scientific Computing, Third Edition, Cambridge University Press, 2007, ISBN 978-0-521-88068-8. See also, by the same authors: Fortran Numerical Recipes, 2nd Edition, Vol. 1 and 2, Cambridge University Press, 1992, 1997, available on line at: http://apps.nrbook.com/fortran/index.html.
5. McCool, M., Robinson, A., Reinders, J., Structured Parallel Programming: Patterns for Efficient Computation, Morgan Kaufmann, 2012, ISBN: 978-0-12-415993-8. See also: http://parallelbook.com
6. Foster, I., Designing and Building Parallel Programs: Concepts and Tools for Parallel Software Engineering, Addison-Wesley, 1995, ISBN: 978-0-20-157594-1.
7. Mattson, T.G., Sanders, B.A., Massingill, B.L., Patterns for Parallel Programming, Addison-Wesley Professional, 2013, ISBN 978-0-32-194078-0.
8. Hager, G., Wellein, G., Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4398-1192-4.
9. Levesque, J., Wagenbreth, G., High Performance Computing: Programming and Applications, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4200-7705-6.
10. Zhao, C., Hobbs, B.E., Ord, A., Fundamentals of Computational Geoscience, Numerical Methods and Algorithms, Lecture Notes in Earth Sciences, Vol. 122, Springer-Verlag Berlin Heidelberg, 2009, ISBN 978-3-540-89742-2.

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

Week	Topic	Assignment
Week 1	Introduction to the architecture and design of state-of-the-art High Performance Computing systems	
Week 2	Description of the UNIX operating system, including the shell environment.	
Week 3	Algorithm design and basic principles of computer programming.	
Week 4-5	Fundamentals of Fortran programming language.	
Week 6	Advanced Fortran features for computational Geosciences. Introduction to structured programming. Pattern-based serial programming.	**Assignment #1 due:** Serial codes for one-dimensional physical models

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
Week 8		**Midterm Exam**
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
Week 12-13	Distributed-memory parallelism with the Message Passing Interface (MPI)	**Assignment #4 due:** Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.
Week 14	Concepts and tools for empirical performance analysis of parallel codes.	**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 the 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.

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GRADUATE STUDIES

RECEIVED
NOV 09 2015
EASA

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 Biological and Agricultural Engineering
3. Course prefix, number and complete title of course: BAEN 642 Water-Engergy-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 (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)*
       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-controls/export-controls-basics-for-distance-education).
13.

Prefix	Course #	Title (excluding punctuation)
BAEN	642	WEF Nexus Sust Res Mgmt

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
3.00	0.00	0.00	3.00	1403010006	0433	16	-	17	0	0	3	6	3	2

Level: 6

Approval recommended by:

Stephen W. Searcy — Stephen W Searcy — 10/30/15
Department Head or Program Chair *(Type Name & Sign)* Date

Robin Autenrieth — Robin Autenrieth — 11-5-15
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 — 11/17/2015 Date

Dean of College — 11/17/2015 Date

Chair, GC or UCC — 12-15-15 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

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 too 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://aggiehonor.tamu.edu
"An Aggie does not lie, cheat or steal, or tolerate those who do."

Class by Topics and Readings

Week 1 Jan 21st	**Resource scarcity and spatial variability**
Content	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)
Readings	World Economic Forum. 2011. The Water-Energy-Food-Climate Nexus: Island Press: London. World Economic Forum. 2014. *The Future Availability of Natural Resources A New Paradigm for Global Resource Availability.* The United Nations. 2014. "The United Nations World Water Development Report- Water and Energy." [chapter 2 and 9 for this week] http://unesdoc.unesco.org/images/0022/002257/225741e.pdf. Brown, Becky J., Mark E. Hanson, Diana M. Liverman, and Robert W. Merideth. 1987. "Global Sustainability: Toward Definition." *Environmental Management* 11 (6): 713–19. Amigun, Bamikole, Josephine Kaviti Musango, and William Stafford. 2011. "Biofuels and Sustainability in Africa." *Renewable and Sustainable Energy Reviews* 15 (2): 1360–72. Gleick, PH, and M Palaniappan. 2010. "Peak Water Limits to Freshwater Withdrawal and Use." http://www.pnas.org/content/107/25/11155.full.pdf Immerzeel, Walter etal. 2011. "Middle-East and Northern Africa Water Outlook." *World Bank.* http://siteresources.worldbank.org/INTMNAREGTOPWATRES/Resources/MNAWaterOutlook_to_2050.pdf. Shi, Daniel; Naresh, Devineni; Upmanu, Lall; Edwin, Piñero. 2013. "America's Water Risk: Water Stress and Climate Variability – Columbia Water Center." *Columbia Water Center.* http://water.columbia.edu/2013/06/10/americas-water-risk-water-stress-and-climate-variability/.

Week 2 Jan 28th	Interdependencies in resources I
Content	Nexus elements a. Water for food b. Water for energy
Assignment	Individual Semester Class Project Scope Online data resources for water-energy-food
Readings	Texas Water Plan http://www.twdb.texas.gov/waterplanning/swp/ Hanjra, Munir A., and M. Ejaz Qureshi. 2010. "Global Water Crisis and Future Food Security in an Era of Climate Change." *Food Policy* 35 (5): 365–77. Hoekstra, A. Y. 2012. "The Hidden Water Resource Use behind Meat and Dairy." *Animal Frontiers* 2 (2). American Society of Animal Science: 3–8. Faeth, Paul. 2012. "U.S. Energy Security and Water: The Challenges We Face." *Environment: Science and Policy for Sustainable Development*. The United Nations. 2014. "The United Nations World Water Development Report- Water and Energy." [chapter 3 and 6 for this week] http://unesdoc.unesco.org/images/0022/002257/225741e.pdf.

Week 3 Feb 2nd	Interdependencies in resources II
Content	Nexus elements a. Energy for water b. Energy for food c. Food for energy Introduction to the nexus
Assignment	Project Groups and Project Timeline
Readings	Hoff, H. 2011. "Understanding the Nexus." *Background Paper*. Rabi H. Mohtar, and Bassel Daher. 2010. "Water, Energy, and Food: The Ultimate Nexus." U.S. Department of Energy. 2014. "The Water-Energy Nexus: Challenges and Opportunities."

	http://www.energy.gov/articles/department-energy-releases-water-energy-nexus-report. Gleick, P H. 1994. "Water and Energy." *Annual Review of Energy and the Environment* 19 (1). Murkowski, Lisa. 2014. *The Energy-Water Nexus Interlinked Resources That Are Vital For Economic Growth and Sustainability. An Energy 20/20 White Paper.* Fraiture, Charlotte de, Mark Giordano, and Yongsong Liao. 2008. "Biofuels and Implications for Agricultural Water Use: Blue Impacts of Green Energy." *Water Policy* 10 (S1): 67. Gerbens-Leenes, P.W., A.Y. Hoekstra, and Th. van der Meer. 2009. "The Water Footprint of Energy from Biomass: A Quantitative Assessment and Consequences of an Increasing Share of Bio-Energy in Energy Supply." *Ecological Economics* 68 (4): 1052–60. Cuéllar, Amanda D, and Michael E Webber. 2010. "Wasted Food, Wasted Energy: The Embedded Energy in Food Waste in the United States." *Environmental Science & Technology* 44 (16). American Chemical Society: 6464–69. Sanders, Kelly T, and Michael E Webber. 2012. "Evaluating the Energy Consumed for Water Use in the United States." *Environmental Research Letters.*

Week 4 Feb 9th	**Virtual Water (guest lecture by Tony Allan, King's College London)**
Content	History of the virtual water concept What is food-water Analysis of the nexus through a supply chain framework
Assignment	Articulate research questions Outline project timeline Describe system inter-dependencies
Readings	Virtual Water by Tony Allan http://www.amazon.com/gp/offer-listing/1845119843/ref=tmm_pap_used_olp_sr?ie=UTF8&condition=used&sr=&qid=

Week 5 Feb 16th	**Nexus Success Stories**
Content	. Energy (renewables, example solar farm)Water (alternative water,

	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 http://wwf.panda.org/what_we_do/how_we_work/conservation/freshwater/water_management/ Giampietro, et al. 2013. "An Innovative Accounting Framework for the Food-Energy-Water Nexus : Application of the MuSIASEM Approach to Three Case Studies." *FAO*. [Chapter 1]

Week 6 Feb 23rd	**Localizing water and food security**
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) Lele, U., M. Klousia-Marquis, and S. Goswami. 2013. "Good Governance for Food, Water and Energy Security." *Aquatic Procedia* 1 (January): 44–63. World Energy Council. 2014. *LAC Region High Level Scenario Explorations*. Perrone, Debra, Jennifer Murphy, and George M. Hornberger. 2011. "Gaining Perspective on the Water-Energy Nexus at the Community Scale." *Environmental Science and Technology* 45 (10): 4228–34. Qadir, M., B.R. Sharma, A. Bruggeman, R. Choukr-Allah, and F. Karajeh. 2007. "Non-Conventional Water Resources and Opportunities for Water Augmentation to Achieve Food Security in Water Scarce Countries." *Agricultural Water Management* 87 (1): 2–22. Sposito, Garrison. 2013. "Green Water and Global Food Security."

	Vadose Zone Journal 12 (4). The Soil Science Society of America, Inc. doi:10.2136/vzj2013.02.0041.

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

Week 8 March 9th	**Quantitative Nexus Framework**
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-Friday, Spring Break (Wed-Fri Faculty and Staff holiday)**

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

Week 11 March 30th	**Nexus Tool 2.0**
Content	Examples case studies using the nexus tools by the instructor. Data preparation and file management
Assignment	Updated report draft
Readings	Same as above

Week 12 April 6th	**Catching up with unfinished material from nexus analytics**

Week 13 April 13th	**Environmental policy (guest lecture by Gabe Eckstein, Raya Stephan, Ron Kaiser)**
Content	Environmental policy Regulations Policy reform
Assignment	Report draft
Readings	TBD

Week 14 April 20th	Lessons learned and current gaps
Content	From Science to policy (framework elaborated) Lessons learned Future Nexus governance
Assignment	Enhanced project report
Readings	No reading assignment
Week 15 April 27th	**One Day Symposium**
Content	Student presentations Nexus stakeholder panel discussion between students and decision-makers from the public and private sector
Week 16 May 4th	**Final Report Due**

Johnson, LaRhesa J

From: Bright Jr, Leonard A
Sent: Thursday, December 10, 2015 10:28 AM
To: Mark Zoran
Cc: Matthew Pariyothorn; Prasad Enjeti; Johnson, LaRhesa J
Subject: RE: RE: GC Friendly Amendment

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

From: Mumpower, Jeryl L
Sent: Thursday, December 10, 2015 10:03 AM
To: Bright Jr, Leonard A <lbright@tamu.edu>
Cc: Portney, Kent E <kportney@tamu.edu>; Vedlitz, Arnold <avedlitz@tamu.edu>
Subject: Re: RE: GC Friendly Amendment

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)

RECEIVED
10 OCT 2015
GRADUATE STUDIES

Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional

• Submit original form and attach a course syllabus.•

RECEIVED
OCT 16 2015
EASA

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
3. Course prefix, number and complete title of course: BMEN 637, Pathologic Basis of Implantable Devices
4. Catalog course description (not to exceed 50 words):
Understanding the relationship that clinical presentation has for patients with primary heart disease; inflamation and repare, systeming pathology emphasis on cardiovascular disease, and the implantable device intervemtnio 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 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. 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	637	PATHOL BASIS IMPLANT DEVICES

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code	Level
3.00	0.00	0.00	3.00	1405010006	0450	16 - 17	003632	6

Approval recommended by:

Kristen Maitland 10/15/15
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

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: 979/229-9862,
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 (9th 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	**Week(s)**
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%)

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.

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GRADUATE STUDIES

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OCT 23 2015
ESSAP

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
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
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)*
       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

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code	Level
3.00	0.00		3.00	1405010006	0450	16 - 17	003632	6

Approval recommended by:

Kristen Maitland 10/15/15
Department Head or Program Chair *(Type Name & Sign)* Date

Chair, College Review Committee 11/17/2015 Date

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

Dean of College 11/17/2015 Date

Chair, GC or UCC 12-15-15 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

TEXAS A&M UNIVERSITY

SYLLABUS

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,

Morgan & Claypool 2009, ISBN: 9781598292985 (paperback), ISBN: 9781598292992 (ebook).
The Craft of Scientific Writing, Michael Alley, Springer; 3rd edition 1998, ISBN 9780387947662.
The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid, Michael Alley, Springer 2007, ISBN 9780387947662.
The Craft of Editing, Michael Alley, Springer 1999, ISBN 9780387989648

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

		Grade Scale
		90-100%.....A
BMEN 689		80-89.99%.....B
Writing Assignments:	60%	70-79.99%.....C
Oral Assignment:	40%	60-69.99%.....D
		<60%.....F

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 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.
- 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

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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)

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

Last modified: 1/15/15 @ 11:00 AM

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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)*: Zachry 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: _____
   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)*
       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.

Prefix	Course #	Title (excluding punctuation)
CVEN	602	Remote Sensing in Hydrology

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year		EDI Code					
3.00	0	0	3.0	14080100G	0630	16	- 17	0	0	3	6	3	2

Level: G

Approval recommended by:

Dr. Robin Autenrieth — Department Head or Program Chair *(Type Name & Sign)* — 11-1-15 Date

Chair, College Review Committee — 11/17/2015 Date

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

Dean of College — 11/17/2015 Date

Submitted to Coordinating Board by:

Chair, GC or UCC — 12-15-15 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: hgao@civil.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

Text book: G.A. Schultz and E.T. Engman (2000): *Remote sensing in hydrology and water resources*. ISBN 978-3-642-59583-7.

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

Task	Percentage of Grade	Grade Ranges
Class participation	5%	A $\geq$ 90% 80% $\leq$ B < 90% 70% $\leq$ C < 80% 60% $\leq$ D < 70% F < 60%
Homework	40%	
Midterm	20%	
Final project	35%	

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

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

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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)*: Zachry Department of Civil Engineering
3. Course prefix, number and complete title of course: CVEN 642 Water-Engergy-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: BAEN 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 (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)*
       MS CVEN, MEn CVEN, PhD CVEN
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)
CVEN	642	WEF Nexus Sust Res Mgmt

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			HEGI Code					Level
3.00	0.00	0.00	3.00	1408050000	0433	16	-	17	0	0	3	6	3	2	6

Approval recommended by:

Robin Autenrieth — 11-5-15
Department Head or Program Chair *(Type Name & Sign)* Date

Chair, College Review Committee — 11/17/2015
Date

Stephen W. Searcy — 10/30/15
Department Head or Program Chair *(Type Name & Sign)* Date
(if cross-listed course)

Dean of College — 11/17/2015
Date

Submitted to Coordinating Board by:

Chair, GC or UCC — 12-15-15
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

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 too 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.

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Academic Integrity Statement and Policy - website link http://aggiehonor.tamu.edu
"An Aggie does not lie, cheat or steal, or tolerate those who do."

Class by Topics and Readings

Week 1 Jan 21st	**Resource scarcity and spatial variability**
Content	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)
Readings	World Economic Forum. 2011. The Water-Energy-Food-Climate Nexus: Island Press: London. World Economic Forum. 2014. *The Future Availability of Natural Resources A New Paradigm for Global Resource Availability.* The United Nations. 2014. "The United Nations World Water Development Report- Water and Energy." [chapter 2 and 9 for this week] http://unesdoc.unesco.org/images/0022/002257/225741e.pdf. Brown, Becky J., Mark E. Hanson, Diana M. Liverman, and Robert W. Merideth. 1987. "Global Sustainability: Toward Definition." *Environmental Management* 11 (6): 713–19. Amigun, Bamikole, Josephine Kaviti Musango, and William Stafford. 2011. "Biofuels and Sustainability in Africa." *Renewable and Sustainable Energy Reviews* 15 (2): 1360–72. Gleick, PH, and M Palaniappan. 2010. "Peak Water Limits to Freshwater Withdrawal and Use." http://www.pnas.org/content/107/25/11155.full.pdf Immerzeel, Walter etal. 2011. "Middle-East and Northern Africa Water Outlook." *World Bank.* http://siteresources.worldbank.org/INTMNAREGTOPWATRES/Resources/MNAWaterOutlook_to_2050.pdf. Shi, Daniel; Naresh, Devineni; Upmanu, Lall; Edwin, Piñero. 2013. "America's Water Risk: Water Stress and Climate Variability – Columbia Water Center." *Columbia Water Center.* http://water.columbia.edu/2013/06/10/americas-water-risk-water-stress-and-climate-variability/.

Week 2 Jan 28th	Interdependencies in resources I
Content	Nexus elements a. Water for food b. Water for energy
Assignment	Individual Semester Class Project Scope Online data resources for water-energy-food
Readings	Texas Water Plan http://www.twdb.texas.gov/waterplanning/swp/ Hanjra, Munir A., and M. Ejaz Qureshi. 2010. "Global Water Crisis and Future Food Security in an Era of Climate Change." *Food Policy* 35 (5): 365–77. Hoekstra, A. Y. 2012. "The Hidden Water Resource Use behind Meat and Dairy." *Animal Frontiers* 2 (2). American Society of Animal Science: 3–8. Faeth, Paul. 2012. "U.S. Energy Security and Water: The Challenges We Face." *Environment: Science and Policy for Sustainable Development.* The United Nations. 2014. "The United Nations World Water Development Report- Water and Energy." [chapter 3 and 6 for this week] http://unesdoc.unesco.org/images/0022/002257/225741e.pdf.

Week 3 Feb 2nd	Interdependencies in resources II
Content	Nexus elements a. Energy for water b. Energy for food c. Food for energy Introduction to the nexus
Assignment	Project Groups and Project Timeline
Readings	Hoff, H. 2011. "Understanding the Nexus." *Background Paper.* Rabi H. Mohtar, and Bassel Daher. 2010. "Water, Energy, and Food: The Ultimate Nexus." U.S. Department of Energy. 2014. "The Water-Energy Nexus: Challenges and Opportunities."

	http://www.energy.gov/articles/department-energy-releases-water-energy-nexus-report. Gleick, P H. 1994. "Water and Energy." *Annual Review of Energy and the Environment* 19 (1). Murkowski, Lisa. 2014. *The Energy-Water Nexus Interlinked Resources That Are Vital For Economic Growth and Sustainability. An Energy 20/20 White Paper.* Fraiture, Charlotte de, Mark Giordano, and Yongsong Liao. 2008. "Biofuels and Implications for Agricultural Water Use: Blue Impacts of Green Energy." *Water Policy* 10 (S1): 67. Gerbens-Leenes, P.W., A.Y. Hoekstra, and Th. van der Meer. 2009. "The Water Footprint of Energy from Biomass: A Quantitative Assessment and Consequences of an Increasing Share of Bio-Energy in Energy Supply." *Ecological Economics* 68 (4): 1052–60. Cuéllar, Amanda D, and Michael E Webber. 2010. "Wasted Food, Wasted Energy: The Embedded Energy in Food Waste in the United States." *Environmental Science & Technology* 44 (16). American Chemical Society: 6464–69. Sanders, Kelly T, and Michael E Webber. 2012. "Evaluating the Energy Consumed for Water Use in the United States." *Environmental Research Letters*.

Week 4 Feb 9th	**Virtual Water (guest lecture by Tony Allan, King's College London)**
Content	History of the virtual water concept What is food-water Analysis of the nexus through a supply chain framework
Assignment	Articulate research questions Outline project timeline Describe system inter-dependencies
Readings	Virtual Water by Tony Allan http://www.amazon.com/gp/offer-listing/1845119843/ref=tmm_pap_used_olp_sr?ie=UTF8&condition=used&sr=&qid=

Week 5 Feb 16th	**Nexus Success Stories**
Content	. Energy (renewables, example solar farm)Water (alternative water,

	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 http://wwf.panda.org/what_we_do/how_we_work/conservation/freshwater/water_management/ Giampietro, et al. 2013. "An Innovative Accounting Framework for the Food-Energy-Water Nexus : Application of the MuSIASEM Approach to Three Case Studies." *FAO*. [Chapter 1]

Week 6 Feb 23rd	**Localizing water and food security**
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) Lele, U., M. Klousia-Marquis, and S. Goswami. 2013. "Good Governance for Food, Water and Energy Security." *Aquatic Procedia* 1 (January): 44–63. World Energy Council. 2014. *LAC Region High Level Scenario Explorations*. Perrone, Debra, Jennifer Murphy, and George M. Hornberger. 2011. "Gaining Perspective on the Water-Energy Nexus at the Community Scale." *Environmental Science and Technology* 45 (10): 4228–34. Qadir, M., B.R. Sharma, A. Bruggeman, R. Choukr-Allah, and F. Karajeh. 2007. "Non-Conventional Water Resources and Opportunities for Water Augmentation to Achieve Food Security in Water Scarce Countries." *Agricultural Water Management* 87 (1): 2–22. Sposito, Garrison. 2013. "Green Water and Global Food Security."

	Vadose Zone Journal 12 (4). The Soil Science Society of America, Inc. doi:10.2136/vzj2013.02.0041.

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

Week 8 March 9th	**Quantitative Nexus Framework**
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-Friday: Spring Break (Wed-Fri Faculty and Staff holiday)**

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

Week 11 March 30th	**Nexus Tool 2.0**
Content	Examples case studies using the nexus tools by the instructor. Data preparation and file management
Assignment	Updated report draft
Readings	Same as above

Week 12 April 6th	**Catching up with unfinished material from nexus analytics**

Week 13 April 13th	**Environmental policy (guest lecture by Gabe Eckstein, Raya Stephan, Ron Kaiser)**
Content	Environmental policy Regulations Policy reform
Assignment	Report draft
Readings	TBD

Week 14 April 20th	Lessons learned and current gaps
Content	From Science to policy (framework elaborated) Lessons learned Future Nexus governance
Assignment	Enhanced project report
Readings	No reading assignment
Week 15 April 27th	**One Day Symposium**
Content	Student presentations Nexus stakeholder panel discussion between students and decision-makers from the public and private sector

Week 16 May 4th	Final Report Due

Johnson, LaRhesa J

om: Bright Jr, Leonard A
Sent: Thursday, December 10, 2015 10:28 AM
To: Mark Zoran
Cc: Matthew Pariyothorn; Prasad Enjeti; Johnson, LaRhesa J
Subject: RE: RE: GC Friendly Amendment

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

om: Mumpower, Jeryl L
Sent: Thursday, December 10, 2015 10:03 AM
To: Bright Jr, Leonard A <lbright@tamu.edu>
Cc: Portney, Kent E <kportney@tamu.edu>; Vedlitz, Arnold <avedlitz@tamu.edu>
Subject: Re: RE: GC Friendly Amendment

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)

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GRADUATE STUDIES

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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)*: Zachry 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
   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)*
       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 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)
CVEN	650	Stochastic Mechanics

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
3	0	0	3.0	14080 1006	0630	16	-	17	0	0	3	6	3	2

Level: 6

Approval recommended by:

YONLONG ZHANG 11/09/15
Department Head or Program Chair *(Type Name & Sign)* Date

Chair, College Review Committee 11/17/2015 Date

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

Dean of College 11/17/2015 Date

Submitted to Coordinating Board by:

Chair, GC or UCC 12-15-15 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

SYLLABUS

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

Topic	Week
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).	1
Elements of Statistics and Probability.	2
Design of Experiments	3
Simulation of Random Fields and Stochastic Processes: From Spatial and Temporal to Spatio-Temporal; from Single to Multivariate; from Stationary Gaussian to Non-Stationary Non-Gaussian Spectral Methods Geostatistical Methods Series Expansion Methods: Karhunen-Loeve and Polynomial Chaos Kalman Filtering Bayesian Forecasting	 4 5 6 7
Causal Probability Bayesian Networks	 8
Inverse Problem Theory: Deterministic and Probabilistic Elements of Inverse Theory Experimental Observations Optimization-Based Approach Bayesian Approach Tarantola's Approach	 9 10 11 12
Computational Statistics Markov Chain Monte Carlo Parallel Computing	 13
Sensitivity Analysis	14
Use of Surrogate Models	15

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 3rd week of March.
  - *Final exam* scheduled according to the Registrar's office: http://registrar.tamu.edu/.

The final grade will be comprised of:

Evaluation Method	%
Assignments	30
Midterm	30
Final	40
Total	**100**

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

Grade	Criteria
A	*Outstanding* ability for problem solving, logic and cleanliness in the presentation of results. Greater than or equal to 90 % credit
B	*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
C	*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
D	*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
F	*Unacceptable* ability for problem solving, logic and cleanliness in the presentation of results. Less than 60 % credit

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*:

Ang, A.H-S. and Tang W.H., (2007). Probability Concepts in Engineering: Emphasis on Applications to Civil and Environmental Engineering, 2nd Edition, Wiley.

Aster R.C., Borchers B. and Thurber C.H. (2005). Parameter Estimation and Inverse Problems, Elsevier, Burlington MA, USA.

Benjamin, J.R. and C.A. Cornell (1970), "Probability, Statistics, and Decision for Civil Engineers," McGraw-Hill.

Congdon P. (2006). Bayesian Statistical Modeling, 2nd Edition, Wiley, West Sussex UK.

Dale A.I. (1999). A History of Inverse Probability. From Thomas Bayes to Karl Pearson. 2nd Edition. Springer, New York.

Denison D.G.T., Holmes C.C., Mallick B.K., A.F.M. Smith (2002). Bayesian Methods for Nonlinear Classification and Regression, Wiley, England.

Gentle J.E., Hardle W. and Mori Y. eds. (2004). Handbook or Computational Statistics, Concepts and Methods, Springer, Fairfax USA.

Ghanem R. and Spanos P.D. (2003). Stochastic Finite Elements: A Spectral Approach, Revised Edition, Dover Publications, New York.

Grigoriu M. (1995). Applied Non-Gaussian Processes: Examples, Theory, Simulation, Linear Random Vibration, and Matlab Solutions. Prentice Hall, New Jersey.

Grigoriu M. (2002). Stochastic Calculus, Birkhauser, Boston USA.

Jaynes E.T. (2003). Probability Theory, The Logic of Science, Cambridge UK.

Korb K. B. and Nicholson A.E. (2003). Bayesian Artificial Intelligence, Chapman and Hall/CRC, London UK.

Martinez W.L. and Martinez A.R. (2007). Computational Statistics Handbook with MATLAB, 2nd Edition, Chapman Hall.

Neapolitan R. E. (2004). Learning Bayesian Networks, Prentice Hall, Upper Saddle River NJ, USA.

Robert C.P. and Casella G. (2004). Monte Carlo Statistical Methods, 2nd Edition, New York, USA.

Mood A.M. and Graybill F.A. (1970). Mcgraw Hill Higher Education; 3rd edition, USA.

Myers R.H. and Montgomery D.C. (1995). *Response Surface Methodology: Process and Product in Optimization Using Designed Experiments*. John Wiley and Sons Inc. New York.

Papoulis A. (2002). Probability, Random Variables and Stochastic Processes, McGraw-Hill Europe, 4th edition.

Press, J. (2003). Subjective and Objective Bayesian Statistics: Principles, Models, and Applications, 2nd Edition. Wiley-Inter Science, New Jersey.

Robert C. P. and Casella G. (2005). Monte Carlo Statistical Methods. Springer, New York USA.

Robert C.P. (2001). The Bayesian Choice, Springer-Verlag, New York USA.

Santamarina C. and Fratta D. (2005). Discrete Signals and Inverse Problems: An Introduction for Engineers and Scientists. John Wiley & Sons Ltd, West Sussex, UK.

Tarantola A. (2004). Inverse Problem Theory and Methods for Model Parameter Estimation, SIAM, Philadelphia USA.

Tikhonov A.N., Goncharsky A.V., Stepanov V.V. and Yagola A.G. (1995). Numerical Methods for the Solution of Ill-Posed Problems. Luwer Academic Publishers, Netherlands.

Van Trees H.L. (2001). Detection, Estimation, and Modulation Theory. Part I. John Wiley and Sons Inc., New York.

- *Scientific Journals*:

Chu T.C., Ranson W.F., Sutton M.A. and Peters W.H. (1985) Applications of digital-image-correlation techniques to experimental mechanics. Experimental Mechanics, 25, 232-244.4

Desceliers C., Ghanem R. and Soize C. (2006). Maximum likelihood estimation of stochastic chaos representations from experimental data. International Journal for Numerical Methods in Engineering, 66(6), 978-1001.

Fadale T.D., Nenarokomov A.V. and Emery A.F. (1995). Uncertainties in parameter estimation: The inverse problem. International Journal of Heat and Mass Transfer, 38 (3), 511-518.

Fitzpatrick B.G. (1991). Bayesian analysis in inverse problems. Inverse Problems, 7, 675-702.

Ghanem R. (1999). "Ingredients for a General Purpose Stochastic Finite Elements Implementation," Computer Methods in Applied Mechanics and Engineering, 168, 19-34.

Ghanem R. and Doostan A. (2006). On the construction and analysis of stochastic models: Characterization and propagation of the errors associated to limited data. Journal of Computational Physics, 217, 63-81.

Grigoriu M. (1993). Simulation of stationary processes via the sampling theorem. Journal of Sound and Vibration, 166 (22), 301-313.

Grigoriu M. (1993). Simulation of stationary processes via the sampling theorem. Journal of Sound and Vibration, 166 (22), 301-313.

McLaughlin D. and Townley L.R. (1996). A reassessment of the groundwater inverse problem. Water Resources Research. 32 (5), 1131-1161.

Sakamoto S. and Ghanem R. (2002a). Simulation of multi-dimensional non-Gaussian non-stationary random fields. Probabilistic Engineering Mechanics, 17 (2), 167-176.

Sakamoto S. and Ghanem R. (2002b). Polynomial chaos decomposition for the simulation of non-Gaussian non-stationary stochastic processes. Journal of Engineering Mechanics, 128 (2), 190-201.

Schueller G.I. ed. (1997). "A State-of-the-Art Report on Computational Stochastic Mechanics," Probabilistic Engineering Mechanics, 12 (4), 197-321.

Schueller G.I. (2011). "Computational Stochastic Mechanics – Recent Advances," *Computers and Structures*, 79, 2225-2234.

Shinozuka M. and Deodatis G. (1991). Simulation of stochastic processes by spectral representation. Applied Mechanics Reviews, 44(4), 191-204.

Snyman J.A. (2000). The LFOPC Leap-Frog algorithm for constrained optimization. Computers and Mathematics with Applications. 40, 1085-1096.

Sutton, M.A., McNeill, S.R., Helm, J.D. and Chao, Y.J. (2000). Advances in two-dimensional and three-dimensional computer vision. *Photomechanics, Topics in Applied Physics*, 77, 323-372.

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.

- 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.•

RECEIVED
OCT 19 2015
ESSAP

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 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: _____

   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)*

    Masters and Ph.D. students in Electrical Engineering, and Computer 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)
ECEN	765	MACH LEARN W/ NET

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code						Level
3.00	0.00		3.00	1410010006	0936	16	-	17	0	0	3	6	3	2	6

Approval recommended by:

Jose Silva-Martinez — 10/15/2015
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:

12-15-15
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

TEXAS A&M UNIVERSITY

SYLLABUS

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:
1. Machine Learning in Action by *P Harrington* (ISBN 9781617290183)

2. Networks: An Introduction by *MEJ Newman* (ISBN 9780199206650)
3. Machine Learning by *KP Murphy* (ISBN 9780262018029)
4. Elements of Statistical Learning by *T Hastie, R Tibshirani*, and *J Friedman* (ISBN 0387952845)
5. Pattern Classification (Second Edition) by *RO Duda, PE Hart*, and *DG Stork* (ISBN 0471056693)
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.•

RECEIVED
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GRADUATE STUDIES

Form Instructions

1. Course request type: ☐ Undergraduate ☑ Graduate ☐ First Professional (DDS, MD, JD, PharmD, DVM)
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
   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. 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 11/16/15
Department Head or Program Chair *(Type Name & Sign)* Date

Chair, College Review Committee 11/17/2015
Date

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

Dean of College 11/17/2015
Date

Submitted to Coordinating Board by:

Chair, GC or UCC 12-15-15
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

ENGINEERING
TEXAS A&M UNIVERSITY

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.

- American Petroleum Institute (API) Subcommittee (SC) 17 Standards Series Recommended Practices.
- Bai, Y. and Bai, Q. (2012), Subsea Engineering Handbook, 1 edition, Gulf Professional Publishing.
- 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.
To login to eCampus:

- Go to 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/publickbarticleview?id=kA770000000CbIW 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

Technology Support:

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

- Student eCampus Help Website, http://ecampus.tamu.edu/student-help.php
- TAMU IT Help Desk:
  - Website: 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.

Assessments	Percentage
Weekly Scenarios Assignments	25%
2 Quizzes	10%
Midterm Exam	20%
Final Exam	25%
Final Project	20%
Total	100%

Determination of Final Grades within the Course

Letter Grade	Percentage
A	100.00%-90.00%
B	89.99%-80.00%
C	79.99%-70.00%
D	69.99%-60.00%
F	Less than 60.00%

Course Outline

Module 1: Introduction and Overview	
Module 1.1: Subsea Engineering Overview; Geology Overview; Reservoir Overview	
Watch: Introduction to Subsea Engineering Part 1, 2 and 3 Videos	
Watch: Geology Overview Video	
Participate: Synchronous Weekly Class Meeting	
Post: Introduce Yourselves Forum	
Solve: Scenario 1	
Module 1.2: Subsea Well Construction Overview	
Watch: Drilling Basics Part 1 Video	
Interact: Basic Drilling Process / Prepared by Cameron & One Subsea	
Watch: Drilling Basics Part 2 Video	
Interact: Well Heads / Prepared by Cameron & One Subsea	
Watch: Drilling Basics Part 3 & 4 Videos	
Participate: Synchronous Weekly Class Meeting	
Solve: Scenario 2	
Module 2: Subsea Field Architecture	
Read: Subsea Field Architecture	
Read: API 17A - Design and Operation of Subsea Production Systems	
Read: API 17TR13 - General Overview of Subsea Production Systems	
Supplemental: Subsea Engineering Handbook - Part I Subsea Production Systems, Chapters 1 & 2	
Interact: Introduction to Subsea Production Systems / Prepared by Cameron & One Subsea	
Watch: Subsea Field Development Planning Parts 1 - 4 Videos	
Participate: Synchronous Weekly Class Meeting	
Solve: Scenario 3	
Answer: Quiz 1	
Module 3: Deepwater Riser Design	
Read: OMAE2014-24240 from the Proceedings of the ASME 2014 33rd International Conference on...	
Read: Deepwater Riser Design, Fatigue Life and Standards Study Report; TA&R Project Number 572...	
Read: Drilling Riser Management In Deepwater Environments, Madhu Hariharan, Ricky Thethi, 2H...	
Supplemental: API 17A Annex A A.10, A.11	
Supplemental: SHE - Part IV Subsea Umbilicals, Risers, and Flow lines Chapters 25, 26	
Supplemental: OTC 23161 - Subsea Well Intervention Vessel and Systems	
Watch: Risers Part 1-5 Videos	
Watch: Subsea E&A Subsea Landing String Assembly Video	
Participate: Synchronous Weekly Class Meeting	
Solve: Scenario 4	
Module 4: Flow Assurance and Operability	
Read: Flow Assurance Considerations in Subsea Production Systems	
Read: World Oil Recommended Practices for Hydrate Control and Remediation, Steven Cochran	
Supplemental: Subsea Engineering Handbook – Part II Flow Assurance and Sys Eng, Chapters 12-18	
Watch: Flow Assurance Parts 1 - 9 Videos	
Participate: Synchronous Weekly Class Meeting	
Solve: Scenario 5	

Module 5: Deepwater Pipeline Design	
Watch: Pipeline Design Parts 1 - 4 Videos	
Read: SEH – Part IV Subsea Umbilicals, Risers, and Flowlines Chapter 27 Subsea Pipelines	
Read: US Code of Federal Regulations: 30CFR250, Subpart J, specifically § 250.1001 - § 250.1007	
Read: Red Hawk project drawings – included in eCampus	
Supplemental: S.K. Rich, A.G. Alleyne, System Design for Buried, High Temperature and Pressure Pipelines	
Watch: SAGE Profile 3D - Subsea Pipeline Analysis Software Video	
Watch: J Lay Virtual Tour Video	
Supplemental: Popular Videos - Ormen Lange	
Watch: Ultimate Engineering: Super Pipeline Construction of Ormen Lange Natural Gas Pipeline Video	
Participate: Synchronous Weekly Class Meeting	
Solve: Scenario 6	
Module 6: Subsea Equipment: Components and Design Considerations I	
Read: API 17TR13 Sections 1 – 7, 14	
Read: RP 17A Annex A A.4	
Read: Subsea Solutions Oilfield Review Article, Winter 2000, Schlumberger	
Supplemental: SEH – Pt. I Subsea Prod Sys, Ch. 11 Subsea Equip RBI; Pt. III Subsea Struct and Equip, Ch. 19 - 23	
Interact: Subsea Trees 1 & 2 / Prepared by Cameron & One Subsea	
Participate: Synchronous Weekly Class Meeting	
Solve: Scenario 7	
Module 7: Subsea Equipment: Components and Design Considerations II	
Read: API 17TR13 Section 11	
Supplemental: SEH - Part I Subsea Production Systems, Chapter 11 Subsea Equipment RBI; Part III	
Supplemental: Subsea Structures and Equipment, Chapters 19 - 23	
Interact: Subsea Mainfolds / Prepared by Cameron & One Subsea	
Interact: Connectors and Well/Flowline Tie-in Jumpers / Prepared by Cameron & One Subsea	
Watch: ROV Orientation Video	
Participate: Synchronous Weekly Class Meeting	
Assessment: Mid-term Exam	
Solve: Scenario 8	
Module 8: Subsea Materials	
Read: API 17TR13 Section 11	
Supplemental: SEH - Part I Subsea Production Systems, Chapter 11 Subsea Equipment RBI; Part III	
Supplemental: Subsea Structures and Equipment, Chapters 19 - 23	
Interact: Subsea Mainfolds / Prepared by Cameron & One Subsea	
Interact: Connectors and Well/Flowline Tie-in Jumpers / Prepared by Cameron & One Subsea	
Watch: Subsea Materials Parts 1 & 2 Video	
Participate: Synchronous Weekly Class Meeting	
Solve: Scenario 9	
Module 9: Subsea Controls, Umbilicals, Distribution System Part I	
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	
Watch: Subsea Controls Parts 1, 2 and 3 Videos	

Interact: Introduction to Control Systems / Prepared by Cameron & One Subsea	
Interact: Subsea Control Equipment / Prepared by Cameron & One Subsea	
Interact: Subsea Control Modules / Prepared by Cameron & One Subsea	
Participate: Synchronous Weekly Class Meeting	
Solve: Scenario 10	
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

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 me 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 it 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 rare 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

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

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/aggiecode 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.

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GRADUATE STUDIES

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 Geology and Geophysics
3. Course prefix, number and complete title of course: GEOL 647: Radiogenic Isotope Geology
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 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)*
       MS, PhD in Geology
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	FICE Code
3.00	0.00		3.00			16 - 17	003632

Level: _____

Approval recommended by:

ME for Michael Pope — Nov. 11/15
Department Head or Program Chair *(Type Name & Sign)* Date

Chair, College Review Committee — 11/11/15 Date

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

Dean of College — 11/11/15 Date

Submitted to Coordinating Board by:

Chair, GC or UCC — 12-15-15 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

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 Halbouty

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

Isotopes Principles and Applications, 3rd ed, G. Faure and T. Mensing, 2005, Wiley.

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

100 points total

Problem Sets	50 points	will involve quantitative manipulation and analysis of isotope geochemical data sets.
Presentations	25 points	
Paper	25 points	

Course Topics, Tentative Calendar of Activities

Week	Topic
1	Introduction to nuclear systematics; decay modes of radionuclides
2	Atom physics problem set
3	Introduction to radioactive decay; geochronometry; mass spectrometry
4	Rb-Sr, Sm-Nd methods
5	K-Ar, $^{40}Ar^*/^{39}Ar$ methods
6	U-Th-Pb, Re-Os methods
7	Radiogenic isotope mixing theory; radiogenic isotopes in rivers
8	Radiogenic isotopes in the oceans
9	Short-lived radionuclides; U-Th disequilibrium;

10	U-Th Bateman equations; Cosmogenic radionuclides
11	Radiogenic isotopes and the origin of igneous rocks
12	Student Presentations
13	Student Presentations
14	Student Presentations
15	Student Presentations

Americans with Disabilities Act

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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."

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 *(DDS, MD, JD, PharmD, DVM)*
2. Request submitted by *(Department or Program Name)*: Department of Geology and Geophysics
3. Course prefix, number and complete title of course: GEOP 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: ATMO 618 and OCNG 618 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)
GEOP	618	NUMERICAL METHODS GEOSCIENCES

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
03	00	00	03	4006070002	1305	16	-	17	0	0	3	6	3	2

Level 6

Approval recommended by:

Michael Pope Michael C Pope 11/09/15
Department Head or Program Chair *(Type Name & Sign)* Date

Deborah Thomas 11/10/15
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 11/11/15 Date

Dean of College 11/14/15 Date

Chair, GC or UCC 12-15-15 Date

Effective Date

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

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.

TEXAS A&M UNIVERSITY

SYLLABUS

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:

1. Roache, J.P., Fundamentals of Computational Fluid Dynamics, Hermosa Publishers, 1988
2. Ferziger, J.H., Peric, M., Computational Methods for Fluid Dynamics, 3rd rev. ed., Springer-Verlag Berlin Heidelberg, 2002
3. Fletcher, C.A.J., Computational Techniques for Fluid Dynamics, Volume 1: Fundamental and General Techniques, Springer-Verlag, Berlin, 1988
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13. Pujol, J., Elastic Wave Propagation and Generation in Seismology, Cambridge University Press, 2003
14. Yanfei Wang, Anatoly G. Yagola, Changchun Yang (Eds.), Computational Methods for Applied Inverse Problems. Higher Education Press, 2012

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

Please consult University Student Rule 10 (Grading) at 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 for details on university-excused absences and make-up policies.

Course Topics, Calendar of Activities, Major Assignment Dates

Week	Topic	Assignment
Week 1	Introduction to fundamental physical systems and processes in Geosciences that can be represented using continuum partial differential equations (PDEs). Basic concepts in numerical modeling.	
Week 2	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.	
Week 3	Fundamental equations in the Geosciences. Traditional working approximations. Primitive equations: continuity, momentum, thermal energy. Beta plane approximation in fluid dynamics.	
Week 4	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).	
Week 5-6	Discretization techniques for PDEs: Finite Difference Method (FDM), Finite Element Method (FEM), Spectral Method, Pseudospectral Method.	
Week 7	Consistency, convergence, and stability of numerical solutions of initial value problems by FDMs. Equivalence theorem.	
Week 8	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.	
Week 8		**Midterm Exam**
Week 9	Modeling diffusive processes: explicit and implicit methods.	

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, 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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"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

SYLLABUS

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.

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

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Academic Integrity

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TEXAS A&M UNIVERSITY

SYLLABUS

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.

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Prerequisites: Graduate classification or approval of instructor.

Learning Outcomes

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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

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

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10. Haltiner, G.J., Williams, R.T., Numerical Prediction and Dynamic Meteorology, Wiley, 1980
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12. Bedford, A., Drumheller, D.S., Introduction to Elastic Wave Propagation, Wiley, 1994
13. Pujol, J., Elastic Wave Propagation and Generation in Seismology, Cambridge University Press, 2003
14. Yanfei Wang, Anatoly G. Yagola, Changchun Yang (Eds.), Computational Methods for Applied Inverse Problems. Higher Education Press, 2012

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

Please consult University Student Rule 10 (Grading) at 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 for details on university-excused absences and make-up policies.

Course Topics, Calendar of Activities, Major Assignment Dates

Week	Topic	Assignment
Week 1	Introduction to fundamental physical systems and processes in Geosciences that can be represented using continuum partial differential equations (PDEs). Basic concepts in numerical modeling.	
Week 2	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.	
Week 3	Fundamental equations in the Geosciences. Traditional working approximations. Primitive equations: continuity, momentum, thermal energy. Beta plane approximation in fluid dynamics.	
Week 4	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).	
Week 5-6	Discretization techniques for PDEs: Finite Difference Method (FDM), Finite Element Method (FEM), Spectral Method, Pseudospectral Method.	
Week 7	Consistency, convergence, and stability of numerical solutions of initial value problems by FDMs. Equivalence theorem.	
Week 8	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.	
Week 8		**Midterm Exam**
Week 9	Modeling diffusive processes: explicit and implicit methods.	

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, 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.

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 *(DDS, MD, JD, PharmD, DVM)*
2. Request submitted by *(Department or Program Name)*: Department of Geology and Geophysics
3. Course prefix, number and complete title of course: GEOP 634 - Fundamentals of High Performance Computing for the Geosciences
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 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)
GEOP	634	FUND HPC GEOSCIENCES

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code
03	02	00	04	4006990202	1305	16 - 17	003632 Level 6

Approval recommended by:

Michael Pope Michael Pope 11/09/15
Department Head or Program Chair *(Type Name & Sign)* Date

Deborah Thomas DT 11/10/15
Department Head or Program Chair *(Type Name & Sign)* Date
(if cross-listed course)

Submitted to Coordinating Board by:

Associate Director, Curricular Services

Chair, College Review Committee 11/11/15 Date

Dean of College 11/11/15 Date

Chair, GC or UCC 12-15-15 Date

Date

Effective Date

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

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.

TEXAS A&M UNIVERSITY

SYLLABUS

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:

1. Chivers, I., Sleightholme, J., Introduction to Programming with Fortran, 2nd Ed., Springer, 2012, ISBN 978-0-85729-232-2.
2. Akin, E., Object Oriented Programming via Fortran 90/95, 1st Ed., Cambridge University Press, 2003, ISBN 0-521-52408-3.
3. Chapman, S.J., Fortran 95/2003 for Scientists and Engineers, 3rd Ed., McGraw-Hill, 2007, ISBN 978-0-07-319157-7.
4. Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flannery, B.P., Numerical Recipes: The Art of Scientific Computing, Third Edition, Cambridge University Press, 2007, ISBN 978-0-521-88068-8. See also, by the same authors: Fortran Numerical Recipes, 2nd Edition, Vol. 1 and 2, Cambridge University Press, 1992, 1997, available on line at: http://apps.nrbook.com/fortran/index.html.
5. McCool, M., Robinson, A., Reinders, J., Structured Parallel Programming: Patterns for Efficient Computation, Morgan Kaufmann, 2012, ISBN: 978-0-12-415993-8. See also: http://parallelbook.com
6. Foster, I., Designing and Building Parallel Programs: Concepts and Tools for Parallel Software Engineering, Addison-Wesley, 1995, ISBN: 978-0-20-157594-1.
7. Mattson, T.G., Sanders, B.A., Massingill, B.L., Patterns for Parallel Programming, Addison-Wesley Professional, 2013, ISBN 978-0-32-194078-0.
8. Hager, G., Wellein, G., Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4398-1192-4.
9. Levesque, J., Wagenbreth, G., High Performance Computing: Programming and Applications, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4200-7705-6.
10. Zhao, C., Hobbs, B.E., Ord, A., Fundamentals of Computational Geoscience, Numerical Methods and Algorithms, Lecture Notes in Earth Sciences, Vol. 122, Springer-Verlag Berlin Heidelberg, 2009, ISBN 978-3-540-89742-2.

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:

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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.

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Course Topics, Calendar of Activities, Major Assignment Dates

Week	Topic	Assignment
Week 1	Introduction to the architecture and design of state-of-the-art High Performance Computing systems	
Week 2	Description of the UNIX operating system, including the shell environment.	
Week 3	Algorithm design and basic principles of computer programming.	
Week 4-5	Fundamentals of Fortran programming language.	
Week 6	Advanced Fortran features for computational Geosciences. Introduction to structured programming. Pattern-based serial programming.	**Assignment #1 due:** Serial codes for one-dimensional physical models

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
Week 8		**Midterm Exam**
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
Week 12-13	Distributed-memory parallelism with the Message Passing Interface (MPI)	**Assignment #4 due:** Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.
Week 14	Concepts and tools for empirical performance analysis of parallel codes.	**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.

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Academic Integrity

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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 the 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.

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.

TEXAS A&M UNIVERSITY

SYLLABUS

Course title and number	**Fundamentals of High Performance Computing for the Geosciences, ATMO 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:

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2. Akin, E., Object Oriented Programming via Fortran 90/95, 1st Ed., Cambridge University Press, 2003, ISBN 0-521-52408-3.
3. Chapman, S.J., Fortran 95/2003 for Scientists and Engineers, 3rd Ed., McGraw-Hill, 2007, ISBN 978-0-07-319157-7.
4. Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flannery, B.P., Numerical Recipes: The Art of Scientific Computing, Third Edition, Cambridge University Press, 2007, ISBN 978-0-521-88068-8. See also, by the same authors: Fortran Numerical Recipes, 2nd Edition, Vol. 1 and 2, Cambridge University Press, 1992, 1997, available on line at: http://apps.nrbook.com/fortran/index.html.
5. McCool, M., Robinson, A., Reinders, J., Structured Parallel Programming: Patterns for Efficient Computation, Morgan Kaufmann, 2012, ISBN: 978-0-12-415993-8. See also: http://parallelbook.com
6. Foster, I., Designing and Building Parallel Programs: Concepts and Tools for Parallel Software Engineering, Addison-Wesley, 1995, ISBN: 978-0-20-157594-1.
7. Mattson, T.G., Sanders, B.A., Massingill, B.L., Patterns for Parallel Programming, Addison-Wesley Professional, 2013, ISBN 978-0-32-194078-0.
8. Hager, G., Wellein, G., Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4398-1192-4.
9. Levesque, J., Wagenbreth, G., High Performance Computing: Programming and Applications, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4200-7705-6.
10. Zhao, C., Hobbs, B.E., Ord, A., Fundamentals of Computational Geoscience, Numerical Methods and Algorithms, Lecture Notes in Earth Sciences, Vol. 122, Springer-Verlag Berlin Heidelberg, 2009, ISBN 978-3-540-89742-2.

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

Week	Topic	Assignment
Week 1	Introduction to the architecture and design of state-of-the-art High Performance Computing systems	
Week 2	Description of the UNIX operating system, including the shell environment.	
Week 3	Algorithm design and basic principles of computer programming.	
Week 4-5	Fundamentals of Fortran programming language.	
Week 6	Advanced Fortran features for computational Geosciences. Introduction to structured programming. Pattern-based serial programming.	**Assignment #1 due:** Serial codes for one-dimensional physical models

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
Week 8		**Midterm Exam**
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
Week 12-13	Distributed-memory parallelism with the Message Passing Interface (MPI)	**Assignment #4 due:** Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.
Week 14	Concepts and tools for empirical performance analysis of parallel codes.	**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

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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.

TEXAS A&M UNIVERSITY

SYLLABUS

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:

1. Chivers, I., Sleightholme, J., Introduction to Programming with Fortran, 2nd Ed., Springer, 2012, ISBN 978-0-85729-232-2.
2. Akin, E., Object Oriented Programming via Fortran 90/95, 1st Ed., Cambridge University Press, 2003, ISBN 0-521-52408-3.
3. Chapman, S.J., Fortran 95/2003 for Scientists and Engineers, 3rd Ed., McGraw-Hill, 2007, ISBN 978-0-07-319157-7.
4. Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flannery, B.P., Numerical Recipes: The Art of Scientific Computing, Third Edition, Cambridge University Press, 2007, ISBN 978-0-521-88068-8. See also, by the same authors: Fortran Numerical Recipes, 2nd Edition, Vol. 1 and 2, Cambridge University Press, 1992, 1997, available on line at: http://apps.nrbook.com/fortran/index.html.
5. McCool, M., Robinson, A., Reinders, J., Structured Parallel Programming: Patterns for Efficient Computation, Morgan Kaufmann, 2012, ISBN: 978-0-12-415993-8. See also: http://parallelbook.com
6. Foster, I., Designing and Building Parallel Programs: Concepts and Tools for Parallel Software Engineering, Addison-Wesley, 1995, ISBN: 978-0-20-157594-1.
7. Mattson, T.G., Sanders, B.A., Massingill, B.L., Patterns for Parallel Programming, Addison-Wesley Professional, 2013, ISBN 978-0-32-194078-0.
8. Hager, G., Wellein, G., Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4398-1192-4.
9. Levesque, J., Wagenbreth, G., High Performance Computing: Programming and Applications, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4200-7705-6.
10. Zhao, C., Hobbs, B.E., Ord, A., Fundamentals of Computational Geoscience, Numerical Methods and Algorithms, Lecture Notes in Earth Sciences, Vol. 122, Springer-Verlag Berlin Heidelberg, 2009, ISBN 978-3-540-89742-2.

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

Week	Topic	Assignment
Week 1	Introduction to the architecture and design of state-of-the-art High Performance Computing systems	
Week 2	Description of the UNIX operating system, including the shell environment.	
Week 3	Algorithm design and basic principles of computer programming.	
Week 4-5	Fundamentals of Fortran programming language.	
Week 6	Advanced Fortran features for computational Geosciences. Introduction to structured programming. Pattern-based serial programming.	**Assignment #1 due:** Serial codes for one-dimensional physical models

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
Week 8		**Midterm Exam**
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
Week 12-13	Distributed-memory parallelism with the Message Passing Interface (MPI)	**Assignment #4 due:** Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.
Week 14	Concepts and tools for empirical performance analysis of parallel codes.	**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.

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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)*: 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
   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)*
       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 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)											
INTA	638	Pol Econ of Dev in Africa											
Lect.	**Lab**	**Other**	**SCH**	**CIP and Fund Code**	**Admin. Unit**	**Acad. Year**			**FICE Code**				
3.00	0.00	0.00	3.00	[redacted]	1364	17	-	18	0	0	3	6	3	2
												Level	6

Approval recommended by:

F. Gregory Gause, III — Department Head or Program Chair *(Type Name & Sign)* — Date

Richard Bright — Chair, College Review Committee — 11/12/15 — Date

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

Arnold Vedlitz — Dean of College — 11-13-15 — Date

Submitted to Coordinating Board by:

Chair, GC or UCC — 12-15-15 — 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

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

Todd Moss. 2011. *African Development: Making Sense of the Issues and Actors.*

Edward Miguel. 2009. *Africa's Turn?* MIT Press.

Maryse Condé. 1987. *Segu.*

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

Binyavanga Wainaina. 2005. "How to Write About Africa." *Granta* 92.

Robert Bates. 1976. *Rural Responses to Industrialization: A Study of Village Zambia.* Introduction. Pages 1-6.

E.E. Evans-Pritchard. 1940. "The Political System," in *The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic People*. Oxford: Clarendon Press. Chapter 4.

Nicola Gennaioli & Ilia Rainer. 2007. "The modern impact of precolonial centralization in Africa." *Journal of Economic Growth* 12(3): 185-234.

Nathan Nunn. 2008. "The Long Term Effects of Africa's Slave Trades." *Quarterly Journal of Economics* 123(1): 139-176.

Further reading:

Nathan Nunn, and Leonard Wantchekon. 2011. "The Slave Trade and the Origins of Mistrust in Africa." *American Economic Review* 101(7): 3221-52.

Week 2. De-colonization

In class: Screening of the movie *Lumumba* (2000)

Maryse Condé. 1987. *Segu.*

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

Leander Heldring, James A. Robinson. 2012. "Colonialism and Economic Development in Africa." *NBER Working Paper No. 18566.*

Crawford Young. 1997. *The African Colonial State in Comparative Perspective.* Chapters 8 & 9.

Mahmood Mamdani. 1996. *Citizen and Subject: Contemporary Africa and the Legacy of Late Colonialism*. Princeton: Princeton University Press. Chapter 2 (and other selected chapters).

*Alexander Lee and Ken Schultz. 2010. "Comparing British and French Colonial Legacies: A Discontinuity Analysis of Cameroon." *Quarterly Journal of Political Science.*

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

*Osafo-Kwaako, Philip, and James A Robinson. 2013. "Political Centralization in Pre-Colonial Africa." *Journal of Comparative Economics* 41(1): 534-564.

Zolberg, Aristide R. (1968) "The Structure of Political Conflict in the New States of Tropical Africa," *American Political Science Review* 62(1): 70-87.

Robert Jackson and Carol Rosberg, 1982. "Why Africa's Weak States Persist: The Empirical and Juridical in Statehood." *World Politics* 35(1): 1-24.

Moss. Chapter 3. "Big Men, Personal Rule, and Patronage Politics."

Further reading:

Tilly, Charles. 2012. "Coercion, Capital, and European States [1990]." in *Contemporary Sociological Theory* pp. 251-265.

Catherine Boone. 2003. *Political Topographies of the African State: Territorial Authority and Institutional Choice.* Cambridge: Cambridge University Press.

Week 5. ***Geography and natural resources***

Herbst, Jeffrey. 2000. *States and Power in Africa: Comparative Lessons in Authority and Control.* Princeton: Princeton University Press. Chapters 1, 4 and 5.

Jared Diamond. 1997. *Guns, Germs, and Steel.* New York: W.W. Norton & Co. Chapter 4.

*Engerman, Stanley L. and Kenneth L. Sokoloff. 2002. "Factor Endowments, Inequality, and Paths of Development among New World Economies." *Economia* 3(1): 41-88.

Further reading:

Sala-i-Martin, Xavier, and Arvind Subramanian. 2003. *Addressing the natural resource curse: An illustration from Nigeria*. No. w9804. National Bureau of Economic Research.

Nathan Nunn and Diego Puga. 2012. "Ruggedness: The blessing of bad geography in Africa." *Review of Economics and Statistics* 94(1): 20-36.

Daron Acemoglu, James Robinson, and Simon Johnson. 2001. "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review* 91(5): 1369-1401.

David D. Laitin, Joachim Moortgat, and Amanda Lea Robinson. 2012. "Geographic axes and the persistence of cultural diversity." *Proceedings of the National Academy of Sciences* 109(26): 10263-10268.

Week 6. Insurgency and civil war

Moss. Chapter 4. "Violent Conflict and Civil War."

Phillip Roessler. 2011. "The Enemy Within: Personal Rule, Coups, and Civil War in Africa." *World Politics* 63(2): pp. 300-346.

Blattman, Christopher, and Edward Miguel. 2010. "Civil war." *Journal of Economic Literature* 48(1): 3-57.

*Macartan Humphreys and Jeremy Weinstein, 2008. "Who Fights? The Determinants of Participation in Civil War," *American Journal of Political Science* 52(2): pp. 436-455.

Further reading:

James Fearon and David Laitin, 2003. "Ethnicity, Insurgency, and Civil War," American Political Science Review 97(1): pp. 75-90.

Katherine Casey, Rachel Glennerster, and Edward Miguel. 2012. "Reshaping Institutions: Evidence on Aid Impacts Using a Preanalysis Plan." *The Quarterly Journal of Economics* 127(4): 1755-1812.

James D. Fearon, Macartan Humphreys, and Jeremy M. Weinstein. 2009. "Can development aid contribute to social cohesion after civil war? Evidence from a field experiment in post-conflict Liberia." *The American Economic Review* 99(2): 287-291.

Week 7. Economic crisis and reform

Moss. Chapter 7. "Economic Reform and the Politics of Adjustment."

*Nicolas van de Walle. 2001. *African Economies and the Politics of Permanent Crisis, 1979-1999.* Introduction, Chapters 1 and 4.

Bates, Robert. 2005. *Markets and States in Tropical Africa: The Political Basis of Agricultural Policies*. Introduction and Conclusion.

Crawford Young. 2004. "The end of the post-colonial state in Africa? Reflections on changing African political dynamics." *African Affairs* 103(410): 23-49.

Week 8. Ethnicity and nationalism

Edward Miguel, 2004. "Tribe or Nation? Nation-Building and Public Goods in Kenya versus Tanzania," *World Politics* 56 (3): pp. 327-362.

*James Habyarimana, Macartan Humphreys, Daniel Posner, and Jeremy Weinstein, 2007. "Why Does Ethnic Diversity Undermine Public Goods Provision," *American Political Science Review* 101(4).

Daniel Posner. 2004. "The Political Salience of Cultural Difference: Why Chewas and Tumbukas are Allies in Zambia and Adversaries in Malawi." *American Political Science Review* 98(4): 529-46.

Ichino, Nahomi, and Noah L. Nathan. 2013. "Crossing the Line: Local Ethnic Geography and Voting in Ghana." *American Political Science Review* 107(2): 344-361.

Further reading:

Michalopoulos, Stelios and Papaioannou, Elias. 2014. "National Institutions and Subnational Development in Africa." *Quarterly Journal of Economics* 129 (1): 151-213.

Leonardo Arriola. 2012. "Capital and Opposition in Africa: Coalition Building in Multiethnic Societies." *World Politics* 65(2): 233-272.

Kimuli Kasara. 2007. "Tax Me If You Can: Ethnic Geography, Democracy, and the Taxation of Agriculture in Africa." *American Political Science Review* 101(1): 159-172.

Week 9. Clientelism

Goran Hyden. 2013. "The Economy of Affection" in *African Politics in Comparative Perspective*.

James C. Scott. 1979. "The Economics and Sociology of the Subsistence Ethic" in *The Moral Economy of the Peasant.* New Haven: Yale University Press. Chapter 1.

*Leonard Wantchekon. 2003. "Clientelism and Voting Behavior: Evidence from a Field Experiment in Benin." *World Politics* 55(3): 399-422.

Staffan Lindberg. 2003. "It's Our Time to Chop: Do Elections in Africa Feed Neopatrimonialism rather than Counteract It?" *Democratization* 10, pp. 121-140.

Further reading:

De Kadt, Daniel and Horacio Larreguy. 2014. "Agents of the Regime? Traditional Leaders and Electoral Behavior in South Africa." *Unpublished manuscript.* https://www.dropbox.com/s/9dfr6thvt94e896/bantustans_draft9.pdf?dl=0

Week 10. Democracy and accountability

Moss. Chapter 5. "Political Change and Democratization."

Michael Bratton and Nicolas Van de Walle. 1997. *Democratic Experiments in Africa: Regime Transitions in Comparative Perspective*. Cambridge: Cambridge University Press. Chapters 2-3.

Staffan Lindberg, "What Accountability Pressures do MPs in Africa Face and How Do They Respond? Evidence from Ghana," *Journal of Modern African Studies* 48, 1 (2010), pp. 117-142.

Robin Harding and David Stasavage. 2012. "What Democracy Does (and Doesn't Do) for Basic Services: School Fees, School Inputs, and African Elections." Forthcoming *Journal of Politics.*

*Ritva Reinikka and Jakob Svenson. 2005. "Local Capture: Evidence from a Central Government Transfer Program in Uganda." *Quarterly Journal of Economics* 119: 679-705.

Further reading:

Rakner, Lise and Nicolas Van de Walle. 2009. "Opposition Weakness in Africa." *Journal of Democracy* 20(3): 108-21.

Schaffer, Frederic. 1998. *Democracy in Translation: Understanding Politics in an Unfamiliar Culture*. Ithaca, NY: Cornell University Press. Pages 54-64, 96-99.

Arriola, Leonardo. 2013. *Multi-Ethnic Coalitions in Africa*. New York: Cambridge University Press. Chapter 2.

Week 11. Poverty and Growth

Tim Besley. 2012. "Poor Choices." *Foreign Affairs* January/February 2012.

Moss. Chapters 6, 9 and 13. "Africa's Growth Puzzle," "Debt Burdens and Debt Relief," and "Private Investment and the Business Environment."

Paul Collier and Willem Jan Gunning. 1999. "Why Has Africa Grown Slowly?" *Journal of Economic Perspectives* 13(31): 3-22.

*Margaret S. McMillan, Kenneth Harttgen. 2014. "What is driving the 'African Growth Miracle'?" *NBER Working Paper No. 20077.*

Daron Acemoglu and James A. Robinson. "The Making of Prosperity and Poverty" in *Why Nations Fail.* Pp. 70-95.

Week 12. Politics of foreign aid and humanitarianism

Moss. Chapter 8. "The International Aid System."

James Ferguson. 1990. *The Anti-Politics Machine.* Preface; 254-6.

William Easterly. 2009. "Can the West Save Africa?" *Journal of Economic Literature* 47: 373-447.

*Michael Kremer and Edward Miguel. 2007. "The Illusion of Sustainability," *Quarterly Journal of Economics* 112: 1007-1065.

Further reading:

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

William Easterly. 2006. "The big push déjà vu: A review of jeffrey sachs's the end of poverty: Economic possibilities for our time." *Journal of Economic Literature* 44(1): 96-105.

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

Moss. Chapter 10. "Poverty, Human Development, and HIV/AIDS."

John Iliffe. 2006. *The African AIDS Epidemic.* Columbus, OH: James Currey. Chapters 8-9, 13.

*Guy Grossman. 2015. "Renewalist Christianity and the Political Saliency of LGBTs: Theory and Evidence from Sub-Saharan Africa." *Journal of Politics.*

Gottlieb, Jessica. 2013. "Why Women Participate Less in Civic Activity: Evidence from Mali." *Unpublished manuscript.*

Week 14. Student presentations

Edward Miguel. 2009. *Africa's Turn?* MIT Press. (Includes responses by Robert Bates, Ken Banks, David Weil, Jeremy Weinstein, Smita Singh, Paul Collier, and Rachel Glennerster.

Richard Dowden. 2008. "Phones, Asians and the Professionals: The New Africa," in *Africa: Altered States, Ordinary Miracles.* London: Portobello Books. Chapter 18.

***

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."

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, DVM)*
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
   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)*
       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-controls/export-controls-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	FICE Code	Level
3.00	0.00	0.00	3.00	45.1001.00.01	1364	17 - 18	003632	6

Approval recommended by:

F. Gregory Gause, III 10-8-15
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

Leonard Bright 11/12/15
Chair, College Review Committee Date

Arnold Vedlitz 11-13-15
Dean of College Date

12-15-15
Chair, GC or UCC Date

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

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 midterm 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 . 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 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 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.

Michael McFaul. 2010. *Advancing Democracy Abroad.* Rowman & Littlefield.

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)

Diana Hacker and Nancy Sommers. *A Pocket Style Manual*. Sixth Edition. St. Martens, 2011

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?

Week 1

Introductory Lecture/Syllabus Review/Course Requirements

The Economist. "What's gone wrong with democracy"

http://www.economist.com/news/essays/21596796-democracy-was-most-successful-political-idea-20th-century-why-has-it-run-trouble-and-what-can-be-do

Week 2

What is Democracy Promotion? Introduction to Theories and Concepts

Peter Burnell. "Democracy Promotion: The Elusive Quest for Grand Strategies." Accessible: http://www.fes.de/ipg/IPG3_2004/ARTBURNELL.PDF

Michael Doyle, "Peace, Liberty, and Democracy: Realists and Liberals Contest a Legacy," in Cox, Ikenberry, and Inoguchi, eds. *American Democracy Promotion: Impulses, Strategies, and Impacts.* Oxford: Oxford University Press, 2000.

Michael McFaul, *Advancing Democracy Abroad,* Chapters 1-2

Thomas Carothers. *Aiding Democracy Aboard.* Chapters 2, 3, and 5

Week 3

Justifying Democracy Promotion

Tony Smith. "National Security Liberalism and American Foreign Policy" in Cox, Ikenberry, and Inoguchi, eds. *American Democracy Promotion: Impulses, Strategies, and Impacts.* Oxford: Oxford University Press, 2000

Randall L. Schweller, "US Democracy Promotion: Realist Reflections," in Cox, Ikenberry, and Inoguchi, eds. *American Democracy Promotion: Impulses, Strategies, and Impacts.* Oxford: Oxford University Press, 2000

Steve Smith. "US Democracy Promotion: Critical Questions." in Cox, Ikenberry, and Inoguchi, eds. *American Democracy Promotion: Impulses, Strategies, and Impacts.* Oxford: Oxford University Press, 2000

Roland Rich, "Bringing Democracy into International Law," *Journal of Democracy,* July 2001 http://muse.jhu.edu/journals/journal_of_democracy/v012/12.3rich.html

Jonathan Monten. "The Roots of the Bush Doctrine. *International Security.* 2005 http://www.mitpressjournals.org/doi/abs/10.1162/isec.2005.29.4.112

Michael McFaul. *Advancing Democracy Abroad.* Chapter 3.

Michael McFaul, "Democracy Promotion as a World Value," *Washington Quarterly* 28:

Week 4

Defining Democracy and Democratization

Joseph A. Schumpeter. *Capitalism, Socialism, and Democracy.* (New York: Harper & Row, 1947) 235-249

Robert A. Dahl. *Polyarchy: Participation and Opposition* (New Haven: Yale University Press, 1971) 1-16; 246-249

Philippine C. Schmitter and Terry Karl. "What Democracy Is...And Is Not," in Larry Diamond and Marc F. Plattner, eds. *The Global Resurgence of Democracy.* (Baltimore: Johns Hopkins University Press, 1993) 39-52.

Amartya Sen. "Democracy as a Universal Value." *Journal of Democracy.* 10 (July 1999) pp. 3-17.

Fareed Zakaria. "The Rise of Illiberal Democracy." *Foreign Affairs.* 76 (Nov/Dec 1997) pp. 22-43

Lincoln Allison, "On the Gap between Theories of Democracy and Theories of Democratization," *Democratization.* 1:1 (1994) pp 8-26

David Collier and Steven Levitsky, "Democracy with Adjectives: Conceptual Innovation in Comparative Research," *World Politics* 49 (April 1997) pp. 430-451

Jay Ufelder. "Democracy and Development Revisited...Again." 2012. Blog Post for *Dart Throwing Chimp* https://dartthrowingchimp.wordpress.com/2012/09/12/democracy-and-development-revisited-again/

Week 5

Who Promotes Democracy?

John G. Ikenberry. 1999 "Why Export Democracy?" Wilson Quarterly. http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=1763640&site=ehost-live

Richard Youngs, "Europe's Uncertain Pursuit of Middle East Reform," in Carothers and Ottaway, Uncharted Journey, Ch. 12.

McFaul. *Advancing Democracy Abroad.* Chapter 6.

Nigel White, "The United Nations and Democracy Assistance: Developing Practice within a Constitutional Framework," in Peter Burnell (ed) *Democracy Assistance: International Cooperation for Democratization.* (London: Frank Cass, 2000) pp 67-89

James Scott, "Transnationalizing Democracy Promotion: The Role of Western Political Foundations and Think-Tanks," *Democratization* 6:3 (1999) pp 146-70

Thomas Melia, "Toolbox," *The American Interest* (Summer 2006) pp 122-30

Week 6

Democratization: More than Domestic Politics?

Gleditsch and Ward. 2006. "Diffusion and the International Context of Democratization." *International Organization*. http://journals.cambridge.org/action/displayAbstract?aid=531044

Thomas Carothers, "The End of the Transition Paradigm," Journal of Democracy, Jan. 2002. http://muse.jhu.edu/journals/journal_of_democracy/v013/13.1carothers.html

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

Alexandra Silver. "Soft Power: Democracy Promotion and U.S. NGOs." Council on Foreign Relations. March 16, 2006. Backgrounder. http://www.cfr.org/democratization/soft-power-democracy-promotion-us-ngos/p10164

Milja Kurki. "Democracy and Conceptual Contestability: Reconsidering Conceptions of Democracy in Democracy Promotion." *International Studies Review*. 12:3 2010. 362-386

Levitsky and Way. 2005. "International Linkage and Democratization." *Journal of Democracy*. http://muse.jhu.edu/journals/journal_of_democracy/v016/16.3levitsky.html

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

S. Finkel, A. Perez-Linan, M. Seligson, and D. Azpuru, "Effects of U.S. Foreign Assistance on Democracy Building, 1990-2003" *World Politics*, Available at
http://muse.jhu.edu/journals/world_politics/v059/59.3finkel.html

Michael McFaul, *Advancing Democracy Abroad,* Chapter 5.

Carl Henrik Knutsen, "Measuring Effective Democracy," *International Political Science Review* 31, no. 2 (2010)

National Research Council. *Improving Democracy Assistance.* Chapter 1 (Summary) and Chapter 5.

James Scott and Carrie Steele, "Assisting Democrats or Resisting Dictators? The Nature and Impact of Democracy Support by the United States National Endowment for Democracy, 1990-99," *Democratization*. 12:4 (2005) pp. 439-60.

Carothers, *ADA* Chapters 9-11

Andrew Green and Richard Kohl, "Research and Evaluation of Democracy Promotion," Perspectives from the Donor Side," *Democratization* 2007

Joel Barkin. "Perceptions of Democracy Assistance: Findings from a Survey of Recipients." World Movement for Democracy, Washington, D.C. 2011
http://www.wmd.org/documents/Perceptions_final_report.pdf

Week 8
Mid-Term Take Home Exam Due
Considering Context and Culture

Sami Baroudi. 2004. "The 2002 Arab Human Development Report: Implications for Democracy." *The Middle East Report.* http://mepc.org/journal_vol11/baroudi.pdf

Mendelson, Sarah. 2001. "Democracy Assistance and Political Transition in Russia: Between Success and Failure." *International Security*
http://muse.jhu.edu/journals/international_security/v025/25.4mendelson.html

Stephen Brown. 2005. Lessons from Africa. *European Journal of Development Research.* Available at: http://aix1.uottawa.ca/~brown/pages/Stephen_Brown_EJDR.pdf

Finkel, Horowitz, and Rojo-Mendoza, "Civic Education and Democratic Backsliding in the Wake of Kenya's Post-2007 Election Violence," *Journal of Politics.* 74:1 January 2012 pp 52-65 http://www.stevenfinkel.info/files/JoP/Finkel.Horowitz.Rojo-Mendoza.Civic%20Education%20and%20Democratic%20Backsliding.JOP.2012.pdf

Aker, Collier and Vicente, "Is Information Power? Using Mobile Phones and Free Newspapers during an Election in Mozambique," May 2013, Working Paper, http://www.pedrovicente.org/cell.pdf

Mark Thompson. 2001. "Whatever Happened to "Asian Values"? *Journal of Democracy.* http://muse.jhu.edu/journals/journal_of_democracy/v012/12.4thompson.html

No Class, Spring Break!

Week 9

Varieties of Democracy Assistance

Guest: Ebie DuPont, The Carter Center
Elections and Election Observation

Thomas Carothers. 1997. The Observers Observed. *Journal of Democracy.*
http://muse.jhu.edu/journals/journal_of_democracy/v008/8.3carothers.html

Eric Bjornlund. *Beyond Free and Fair.* Chapter 4

Judith Kelly, "Elections Observers and their Biases," *Journal of Democracy* 21:3 (2010) 158-172.

Susan Hyde, "The Observer Effect in International Politics: Evidence from a Natural Experiment," *World Politics* 2007, 60:1

Bunce and Wolchik. "Defeating Dictators: Electoral Change and Stability in Competitive Authoritarian Regimes," *World Politics* 2010 62:1

Civil Society and Political Parties

SE Mendelson, JK Glenn. 2002. The power and limits of NGOs: A critical look at building democracy in Eastern Europe and Eurasia / Sarah E. Mendelson and John K. Glenn, editors. Chapter 1.

Ottoway and Carothers. *Funding Virtue: Civil Society Aid and Democracy Promotion.* Chapter 11.

Carl Gershman. 2004. "Democracy promotion: the relationship of political parties and civil society." *Democratization.*

Thomas Carothers. *Confronting the Weakest Link: Aiding Political Parties in New Democracies.* Chapters 4 and 7.

Week 10

Administration and Occupation

Guest Speaker: Caitlin McNary, Syria Desk Officer, International Medical Corps

James Meernick. "United States Military Intervention and the Promotion of Democracy," *Journal of Peace Research.*

Bruce Bueno de Mesquita and George W. Downs. 2006. "Intervention and Democracy". *International Organization.*

Jeffrey Pickering and Mark Peceny. 2006. "Forging Democracy at Gunpoint." *International Studies Quarterly.*

Hysa, Ylber. 2004. "Kosovo: A permanent international protectorate?" In Edward Newman and Roland Rich. *The UN Role in Promoting Democracy: Between Ideals and Reality.*

Eva Bellin, "The Iraqi Intervention and Democracy in Comparative Perspective,"
Political Science Quarterly, 119, 4, 2004-5.

Alternative Motivations

Barry Gills and Joel Rocamora. "Low Intensity Democracy." *Third World Quarterly.* 13:3 pp. 501-523.

William I. Robinson. "Globalization, the World System, and 'Democracy Promotion' in U.S. Foreign Policy," *Theory and Society.*

Week 11

Approaches to Democracy: Comparing US and European Approaches to Democracy Promotion

Minxin Pei and Sara Kasper, "Lessons from the Past: The American Record on Nation Building," *Carnegie Papers* 24 (May 2003) pp1-7

Peter Schraeder, "The State of the Art in International Democracy Promotion: Results of a Joint North American-European Research Network," *Democratization* 10:2 (2003) pp21-44

Thomas Carothers. "The Clinton Record on Democracy Promotion." *Carnegie Endowment for International Peace.* 2005.

George W. Bush, Speech on War on Terror to National Endowment for Democracy, October 6, 2005: www.whitehouse.gov/news/releases/2005/10/20051006-3.html

Michele Dunne, "Integrating Democracy into the U.S. Policy Agenda," in Carothers and Ottaway, *Uncharted Journey,* Ch 11.

Marc Beissinger, "Promoting Democracy: Is Exporting Democracy a Good Strategy?" *Dissent* Winter (2006) pp 18-24

Peter Burnell, "Political Strategies of External Support," *Foreign Policy Analysis* 1:3 2005

Richard Youngs. *Trends in Democracy Assistance: What has Europe Been Doing? FRIDE, 2008* http://fride.org/download/ART_EU_Democracy_Aid_EN_abr08.pdf

Noam Chomsky, *What We Say Goes: Conversations on U.S. Power in a Changing World* (2007) pp 41-72
Pavol Demes. "Twenty Years of Western Democracy Assistance in Central and Eastern Europe." International Institute for Democracy and Electoral Assistance. 2010.

Thomas Carothers et al. "Is there a Convergence Between U.S. and European Policy on Democracy Support?" November 20, 2009 CEIP
http://carnegieendowment.org/2009/11/20/is-there-convergence-between-u.s.-and-european-policy-on-democracy-support/470r

Jeffrey Kopstein. "The Transatlantic Divide over Democracy Promotion." *Washington Quarterly.* Spring 2006.

Gerald Knaus and Marcus Cox, "The 'Helsinki Moment,' in Southeastern Europe," *Journal of Democracy* January 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

Week 12

Promoting Democracy in the Middle East—Support for Democracy or the Status Quo?

Sheila Carapico. *Political Aid and Arab Activism.* Read: Introduction and Chapters 1 &2
Robert Vitalis, "The Democratization Industry and the Limits of the New Interventionism," *Middle East Report* 187/188 (March-June 1994) pp 46-50

Katerina Dalacoura. "U.S. Democracy Promotion in the Arab Middle East since 11 September 2001: A Critique," *International Affairs*

Tamara Cofman Wittes and Andrew Masloski. "Democracy Promotion Under Obama: Lessons from the Middle East Partnership Initiative." Brookings Institution. *Middle East Memo.*

http://www.brookings.edu/~/media/research/files/papers/2009/5/democracy%20promotion%20wittes/05_democracy_promotion_wittes

Amaney A. Jamal. *Of Empires and Citizens: Pro American Democracy or No Democracy at All?* Princeton: Princeton University Press, 2012 *Introduction Only*

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

Jeremy M. Sharp. "Egypt: Background and U.S. Relations." *Congressional Research Service*. June 2014 https://www.fas.org/sgp/crs/mideast/RL33003.pdf

Yasmine Fathi and Dina Samak. "Egypt authorities raid and close 17 NGO offices in Cairo." December 30, 2011. *Al Ahram Online* http://english.ahram.org.eg/NewsContent/1/64/30517/Egypt/Politics-/Egypt-authorities-raid-and-close--NGO-offices-in-C.aspx

"Egypt outlines evidence in case against Americans." *Associated Press* February 8, 2012. http://news.yahoo.com/egypt-outlines-evidence-case-against-americans-145315232.html

William Wan and Ernesto Londono, "Egypt's aid from U.S. in peril amid crackdown on pro-democracy groups." *Washington Post* February 12, 2012

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

Week 14

Ethics and Aid: Challenges for International Democracy Promotion

Michael Walzer. "On Promoting Democracy" *Ethics and International Affairs.* 22:2 (Winter 2008)

"Multilateral Strategies to Promote Democracy: First Report of the Empire and Democracy Project." Carnegie Council on Ethics and International Affairs. https://www0.gsb.columbia.edu/faculty/jstiglitz/download/2004_Multilateral_Strategies_to_Promote_Democracy.pdf

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Case Study Presentations

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.ceip.org
Middle East Institute: www.mideasti.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

Truman Institute: http://truman.huji.ac.il/
Dayan Center: http://www.dayan.org/
Economic Research Forum: www.erf.org.eg

Data

Foreign Aid:

US Foreign Assistance *http://www.foreignassistance.gov/web/default.aspx*
Aid Data: Open Data for International Development: 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
Millennium Challenge Indicators: http://www.mcc.gov/selection/indicators/index.php
Brookings Iraq Index: http://www.brookings.edu/saban/iraq-index.aspx

Democracy and Governance Measures

BTI - Bertelsmann Transformations Index:
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
Democracy index based on political (among others Frredom House, CPI) and socioeconmic factors. Available for 100 countries between 2008 and 2010.

Democratic Audit:
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
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 countriesin the years 2006, 2008 and 2010).

Freedom House: Freedom in the World Reports:
http://www.freedomhouse.org
Ratings on the guarantee of politicla 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/~mcoppedg/crd/datacrd.htm
Democracy index based on Robert Dahl's (1971) concept of polyarchy. Developed by Michael Coppedge (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.prio.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):
http://info.worldbank.org/governance/wgi/index.asp
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:
http://www.amnesty.org/en/human-rights
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. Cingarelli (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 Innequality Inedx (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/pitfpset.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.politicalterrorscale.org
The index developed by Mark 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
Several criminal statistics for all countries worlwide (1970-2008).

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 betwwen 1975 and 2009.

Direct Democracy Database (C2D):
http://www.c2d.ch/inner.php?table=dd_db
Databank with detailed information on direct democratic insitutions and all popular votes held at the national, subnational and local level for all countries worldwide. The datank 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 handook 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/~jcarey/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-Parlamentary 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.

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
Informatin about election campaign and party financing worldwide.

Transparency International: Corruption Perception Index (CPI), Global Corruption Barometer (GCB) und 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: worlwide 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):
http://www.wan-press.org/worldpresstrends2010/home.php
Fee required press statistics (circulation, reach, consumption, advertisement and number of newspapers) provided by the INGO "World Assciation 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 approxiamately 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/
Pew Global Attitudes Project: http://www.pewglobal.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:

World Bank World Development Indicators: http://data.worldbank.org/data-catalog/world-development-indicators
Organization for Economic Cooperation and Development Aid Database (OECD):
http://www.oecd.org/dac/stats/
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:
http://info.worldbank.org/governance/wgi/index.aspx#home
Word Bank Country Policy and Institutional Assessment: http://data.worldbank.org/data-catalog/CPIA

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.•

Form Instructions

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 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
   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)*
       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-controls/export-controls-basics-for-distance-education).
13.

Prefix	Course #	Title (excluding punctuation)
INTA	662	Intel Thrts to Natl Security

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
3.00	0.00	0.00	3.00	45.0902.00.01	1364	17	-	18	0	0	3	6	3	2

Level: 6

Approval recommended by:

F. Gregory Gause, III 10-8-15
Department Head or Program Chair *(Type Name & Sign)* Date

Leonard Bright 11/12/15
Chair, College Review Committee Date

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

Arnold Vedlitz 11-13-15
Dean of College Date

12-15-15
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

INTA 662
INTELLIGENCE THREATS TO NATIONAL SECURITY IN THE MODERN ERA

Alex J. Vega IV
George Bush School of Government and Public Service
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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

Felshtinsky, Yuri, *The Corporation: Russia and the KGB in the Age of President Putin* (New York: Encounter Books, 2008)

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, Houghlin Mifflin Harcourt, 2011)

Eftimiades, Nicholas, *Chinese Intelligence Operations* (Washington D.C., Naval Institute Press, 1994)

Khalili, Reza, *A Time To Betray: The Astonishing Double Life of a CIA Agent Inside the Revolutionary Guards of Iran* (New York, Simon and Schuster, 2010)

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

TBD	Midterm Exam (In-Class, Handwritten Essay Blue Books)
TBD	Group Presentations
TBD	Final Exam Issue & Return (Take Home)

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.•

Form Instructions

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
   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)*
       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-controls/export-controls-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	Level
3.00	0.00	0.00	3.00	45.0901.00.01	1364	17 - 18	003632	6

Approval recommended by:

F. Gregory Gause, III — 10.8.15
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
Date

Leonard Bright — 11/12/15
Chair, College Review Committee Date

Arnold Vedlitz — 11-13-15
Dean of College Date

12-15-15
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

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 (ie., 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)
-William Quandt, Peace Process (Brookings Institution and the University of California Press, 2005)
-Ray Takeyh, Guardians of the Revolution: Iran and the World in the Age of the Ayatollahs (Oxford University Press, 2009)

-William McCants, The ISIS Apocalypse: The History, Strategy and Doomsday Vision of the Islamic State (St. Martin's Press, 2015)

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/sponsauth/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

-L. Carl Brown, International Politics of the Middle East (Princeton University Press, 1984), Introduction and Conclusion

-Etel Solingen, "Pax Asiatica versus Bella Levantina: The Foundations of War and Peace in East Asia and the Middle East," American Political Science Review, Vol. 101, No. 4 (November 2007)

-Benjamin Miller, "Balance of Power or the State-to-Nation Balance: Explaining Middle East War Propensity," Security Studies, Vol. 15, No. 4 (Oct.-Dec. 2006)

-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

-Malcolm Kerr, The Arab Cold War (3rd edition, Oxford University Press, 1971), entire

-William Quandt, Peace Process, Chapter 2

-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

-Fouad Ajami, "The End of Pan-Arabism?" Foreign Affairs, Vol. 57, No. 2 (Winter 1978-79)

-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

-Jacob M. Landau, The Politics of Pan-Islam: Ideology and Organization, Chapters 1, 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
-F. Gregory Gause, III, "Iraq's Decisions to Go to War, 1980 and 1990," Middle East Journal, Vol. 56, No. 1 (Winter 2002)

-Assignment #6: "The Iranian Revolution was the most important international event in the Middle East since World War II." Discuss. (3 single-spaced pages)

-Discussion Questions: 1) How did the Iranian Revolution change alliance patterns in the region? 2) What is the relationship of the Revolution to the wars of 1980 and 1990? Was the Revolution a cause of either? Of both? 3) Which framework is more important for explaining the effects of the Revolution – realist balance of power theory or Rubin's notion of "ideational threats"? 4) Why did the Iranian Revolution not spread to other countries?

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
-Hussein Agha and Robert Malley, "Camp David: The Tragedy of Errors," New York Review of Books, August 9, 2001, http://www.nybooks.com/articles/archives/2001/aug/09/camp-david-the-tragedy-of-errors/
-"From Oslo to Camp David to Taba: Setting the Record Straight," Interview with Dennis Ross, Washington Institute for Near East Policy, August 14, 2001, http://www.washingtoninstitute.org/policy-analysis/view/from-oslo-to-camp-david-to-taba-setting-the-record-straight

-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)

-Jeff D. Colgen, "Fueling the Fire: Pathways from Oil to War," International Security, Vol. 38, No. 2 (Fall 2013)

-Halliday, The Middle East in International Relations, Chapter 9

-Michael Klare, Blood and Oil, (Metropolitan Books, 2004), Chapter 4

- Steve A. Yetiv, "The Iraq War of 2003: Why Did the United States Decide to Invade?"Chapter 19 and Ali R. Abootalebi, "What Went Wrong in Iraq?" Chapter 20 in David W. Lesch and Mark L. Haas, The Middle East and the United States (5th edition, Westview Press, 2013)

-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

-National Commission on Terrorist Acts upon the United States, Final Report, Chapter 2 (http://govinfo.library.unt.edu/911/report/911Report_Ch2.pdf) and Chapter 10 (http://govinfo.library.unt.edu/911/report/911Report_Ch10.pdf)

-William McCants, The ISIS Apocalypse: The History, Strategy and Doomsday Vision of the Islamic State, entire.

-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

-F. Gregory Gause, III, "Sovereignty, Statecraft and Stability in the Middle East," Journal of International Affairs, Vol. 45, No. 2 (Winter 1992)

-Vali Nasr, "When the Shiites Rise," Foreign Affairs, July/August 2006

-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," Brookings Doha Center, July 2014 http://www.brookings.edu/~/media/research/files/papers/2014/07/22%20beyond%20sectarianism%20cold%20war%20gause/english%20pdf.pdf

-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

-Mohsen Milani, "Rouhani's Foreign Policy," Foreign Affairs (online), June 25, 2013, (http://www.foreignaffairs.com/articles/139531/mohsen-milani/rouhanis-foreign-policy)

-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 *(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 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 uprising in the region
5. Prerequisite(s): None
   Cross-listed with: n/a Stacked with: n/a
   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)*
       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-controls/export-controls-basics-for-distance-education).
13.

Prefix	Course #	Title (excluding punctuation)
INTA	668	Pol & His of Arab Spring

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
3.00	0.00	0.00	3.00	H5, 1001.00.01	1364	17	-	18	0	0	3	6	3	2

Level: 6

Approval recommended by:

F. Gregory Gause, III 10-8-15
Department Head or Program Chair *(Type Name & Sign)* Date

Leonard Bright 11/12/15
Chair, College Review Committee Date

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

Arnold Vedlitz 11-13-15
Dean of College Date

Submitted to Coordinating Board by:

12-15-15
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

INTA 668 The Politics and History of the Arab Spring

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:

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:

James Gelvin. *The Arab Uprisings: What Everyone Needs to Know*. Oxford University Press, 2012

Marc Lynch, ed. *The Arab Uprisings Explained: New Contentious Politics in the Middle East.* 2014. Columbia University Press.

Charles Tripp. *The Power and the People*. Cambridge University Press, 2012

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:

Roger Owen. *State, Power, and Politics in the Making of the Modern Middle East.* Routledge 2007

Jillian Schwedler and Deborah Gerner. *Understanding the Contemporary Middle East.* Lynne Rienner, 2008.

Seminar Schedule

Week One

Introductory Lecture and Syllabus Review: Beginnings

David A. Bell. "Inglorious Revolutions," *National Interest,* January-February 2013 http://nationalinterest.org/article/inglorious-revolutions-9641?page=show

James Gelvin. *The Arab Uprisings: What Everyone Needs to Know*. Oxford University Press, 2012

Week Two

The Arab Spring at Year Four: Origins and Theoretical Foundations

James Gelvin. *The Arab Uprisings: What Everyone Needs to Know*. Oxford University Press, 2012

Charles Tripp. *The Power and the People: Paths of Resistance in the Middle East*. Introduction-The Roots of Resistance, pp I-27

Lynch. Chapters 1-2

F. Gregory Gause III. "Why Middle East Studies Missed the Arab Spring: The Myth of Authoritarian Stability," *Foreign Affairs* 90.4 (July/August 2011): 81-90

Ellen Lust. "Why Now? Micro Transitions and the Arab Uprisings." http://themonkeycage.org/wp-content/uploads/2011/10/Ellen_Lust_final.pdf

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

Larry Diamond. (2010) "Why are there no Arab Democracies?" *Journal of Democracy* 21:1 January 2010 pp 93-112

Jason Brownlee. (2004) "Political Crisis and Restabilization: Libya, Iraq, Syria, and Tunisia," in Posusney and Angrist, eds. *Authoritarianism in the Middle East: Regimes and Resistance*. Lynne Rienner, 2005. Pp 43-62

Erica Chenoweth. "The Dissident's Toolkit," *Foreign Policy-Democracy Lab* October 25, 2013 http://www.foreignpolicy.com/articles/2013/10/24/the_dissidents_toolkit

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

Mancur Olson, "Logic of Collective Action" in Vincenzo Ruggiero and Nicola Montagna, eds., *Social Movements: A Reader* (London: Routledge, 2008), pp. 93-94.

Asef Bayat. "Paradoxes of Arab Refo-lutions," *Jadaliyaa*. March 2011. http://www.jadaliyya.com/pages/index/786/paradoxes-of-arab-refo-lutions

Kurt Weyland. "The Arab Spring: Why the Surprising Similarities with the Revolutionary Wave of 1848?" *Perspectives on Politics* 10:4 December 2012 pp 917-934

Timur Kuran, "Now out of Never: The Element of Surprise in the East European Revolution" *World Politics*, Vol. 44, No. 1 (Oct., 1993), pp. 7-48, http://www.jstor.org/stable/2010422

Charles Kurzman, "Structural Opportunity and Perceived Opportunity in Social Movement Theory: The Iranian Revolution of 1979" *American Sociological Review*, Vol. 61, No. 1 (1996), pp. 153-170, http://www.jstor.org/stable/2096411

Sharon Erickson Nepstad, *Nonviolent Revolutions: Civil Resistance in the late 20th century* (Oxford, England: Oxford University Press, 2011), pp. 21-37.

"The Protests Around the World: The March of Protest," *The Economist* June 29, 2013 http://www.economist.com/news/leaders/21580143-wave-anger-sweeping-cities-world-politicians-beware-march-protest

Susanne Lohmann, 1994 . "The Dynamics of Informational Cascades: The Monday Demonstrations in Leipzig, East Germany, 1989-1991 ." World Politics 47(1):42–101 .

Week Four

Tunisia

(Guest: Ines Bel Aiba, Journalist, Agence France Presse)

Lynch. Chapter 4

The Tunisian Moment: Scenes of a Street Revolution. January 14, 2011
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
http://www.theguardian.com/world/2011/oct/22/tunisian-elections-ben-ali

Sam Bollier. Who are Tunisia's political parties? October 27, 2011 *Al Jazeera online:*
http://www.aljazeera.com/indepth/features/2011/10/201110614579390256.html

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#

A. Allani. (2009) "The Islamists in Tunisia between confrontation and participation: 1980-2008," *The Journal of North African Studies*, 14:2 pp. 257-272.

F. Cavatorta and R. Haugbolle. (2012) "The End of Authoritarian Rule and the Mythology of Tunisia under Ben Ali," *Mediterranean Politics*. 17:2 pp. 179-195.

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

"A Clash of Civilizations in Tunisia?" Keftiji blog. http://kefteji.wordpress.com/2011/06/30/a-clash-of-civilizations-in-tunisia/

"Tunisia's new al Nahda," *Foreign Policy* June 29, 2011
http://lynch.foreignpolicy.com/posts/2011/06/29/tunisias_new_al_nahda

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

J. Dana Stuster, "Assassination and Protests Rock Tunisia," *Foreign Policy*. July 25, 2013
http://blog.foreignpolicy.com/posts/2013/07/25/assassination_and_protests_rock_tunisian_politics

Melani Cammett. "The limits of anti-Islamism in Tunisia," *Foreign Policy* October 31, 2011
http://mideast.foreignpolicy.com/posts/2011/10/31/will_an_islamist_victory_translate_to_democracy

Laryssa Chomiak and John P. Entelis. "The Making of North Africa's Intifadas," *Middle East Report.* Vol 41, Summer 2011

Monica Marks. "The Tunisian election result isn't simply a victory for secularism over Islamism." *The Guardian.* October 29, 2014 http://www.theguardian.com/commentisfree/2014/oct/29/tunisian-election-result-secularism-islamism-nidaa-tounes-ennahda

Laura Dean. "Tunisia may be a democracy now, but its jihadist problem is not going away." Global Post. November 5, 2014. http://www.globalpost.com/dispatch/news/regions/africa/141104/tunisia-may-be-democracy-now-its-jihadist-problem-not-going-away

Ursula Lindsey. "In Tunis," *London Review of Books Blog.* June 10, 2014. http://www.lrb.co.uk/blog/2014/06/10/ursula-lindsey/in-tunis/

Week Five

Egypt

(Guest: *Mahmoud Salem, Egyptian blogger (sandmonkey), columnist for the Daily News Egypt)*

Hosni Mubarak, "Last Official Address, February 20, 2011," in Council on Foreign Relations,

The New Arab Revolt: What Happened, What It Means, and What Comes Next, (CFR, May 2011) pgs 408-413

Charles Levinson and Margaret Coker. "The Secret Rally that Sparked an Uprising," February 11, 2011. *Wall Street Journal.* http://online.wsj.com/news/articles/SB10001424052748704132204576135882356532702

Rabab El Mahdi (2009) "The Democracy Movement: Cycles of Protest," in Rabab El Mahdi and Philip Marfleet, *Egypt: The Moment of Change, (*Zed Books: 2009) pp 87-102

Anne Alexander (2011). "Brothers in Arms? The Egyptian Military, the Ikhwan and the Revolutions of 1952 and 2011," *Journal of North African Studies* 16:4 p 533-554.

Joel Beinin. (2009) "Workers Struggles' under 'Socialism' and Neoliberalism," in El Mahdi and Marfleet, *Egypt: The Moment of Change,* pp. 68-86

Mona El-Ghobashy. "The Praxis of the Egyptian Revolution," in Sowers and Toensing, *Journey to Tahrir*, pp. 21-41

Ahmad Shokr. "The Eighteen Days of Tahrir," in Sowers and Toensing, *Journey to Tahrir*, pp. 41-47

Yasmine El Rashidi (2012) "Egypt on the Edge," *NY Review of Books* (5 pp) online

"Clampdown in Egypt: The Net Widens," *The Economist* December 22, 2013

Sarah Carr. "On Sheep and Infidels." Mada Masr. July 8, 2013
http://www.madamasr.com/opinion/sheep-and-infidels

Steven Cook. "Revisiting Rabaa," Council on Foreign Relations. September 19, 2014
http://blogs.cfr.org/cook/2014/09/19/revisiting-rabaa/#more-3840

Thanassis Cambanis. "Is Egypt on the Verge of Another Uprising?" *The Atlantic* January 16, 2015
http://www.theatlantic.com/international/archive/2015/01/the-egyptian-revolution-four-years-later/384593/

Week Six

Syria

(Guest: *Liam Stack, editor, "Watching Syria Project," New York Times)*

Bashar Al Assad, "Speech Before the Syrian People's Assembly, March 30, 2011" in C.F.R., *The New Arab Revolt*, pgs. 458-466.

Lynch. Chapter 7

Anthony Shadid. "In Assad's Syria, There is No Imagination,"

http://www.pbs.org/wgbh/pages/frontline/foreign-affairs-defense/syria-undercover/in-assads-syria-there-is-no-imagination/

Anthony Shadid. "Lyrical Message for Syrian Leader: 'Come on Bashar, Leave," *New York Times* July 21, 2011 http://www.nytimes.com/2011/07/22/world/middleeast/22poet.html?pagewanted=all

Anthony Shadid. "Syria Elite to Fight Protests to 'the End' May 10, 2011
http://www.nytimes.com/2011/05/11/world/middleeast/11makhlouf.html?_r=1&partner=rss&emc=rss&pagewanted=all

"Syria's Sons of No One," http://www.nytimes.com/2011/09/04/magazine/syrias-sons-of-no-one.html?_r=1&pagewanted=all

Hassan Abbas, "The Dynamics of the Uprising in Syria," *Jadaliyya*
http://www.jadaliyya.com/pages/index/2906/

Ellen Lust (2008). "Reform in Syria," in Marina Ottaway and Julia Choucair-Vizoso, eds. *Beyond the Façade: Political Reform in the Arab World,* (Carnegie Endowment for International Peace: 2008) Chapter 3, pp. 71-91.

Joshua Stacher (2011). "Reinterpreting Authoritarian Power: Syria's Hereditary Succession," *Middle East Journal* 65:2 pp. 197-212.

Steven Heydemann, "Syria's Uprisings: sectarianism, regionalism, and state order in Levant," FRIDE

http://www.fride.org/download/WP_119_Syria_Uprising.pdf

Raphaël Lefèvre. "The Muslim Brotherhood Prepares for a Comeback in Syria." *Carnegie Endowment for International Peace,* May 15, 2013
http://carnegieendowment.org/files/muslim_bro_comback.pdf

"America and Syria: No American Cavalry for Now," *The Economist* May 15, 2013.
http://www.economist.com/blogs/lexington/2013/05/america-and-syria

Joshua Stacher. "Reinterpreting Authoritarian Power: Syria's Hereditary Succession *Middle East Journal* 65:2 197-212

Week Seven

Yemen

Sheila Carapico. "No Exit." *Middle East Research and Information Project* May 3, 2011.
http://www.merip.org/mero/mero050311-1

"Popular Protest in North Africa and the Middle East (II): Yemen Between Reform and Revolution." *International Crisis Group:* Middle East/North Africa Report No. 102 10 March 2011. **Online**

Isa Blumi. "In Yemen, Hardly a Revolution." *New York Times.* April 9, 2011
http://www.nytimes.com/2011/04/09/opinion/09blumi.html

April Longley Alley. "Yemen Changes Everything...And Nothing." *Journal of Democracy* 24:4 October 2013, pp 74-85

Craig Whitlock, "U.S. was told of Yemen leader's vulnerability." *Washington Post* April 7, 2011.
http://www.washingtonpost.com/world/us-was-told-of-plot-to-overthrow-yemen-leader/2011/04/07/AFBCY7xC_story.html

Danya Greenfield. "Yemen's Economic Agenda," *Atlantic Council,* December 2013.
http://www.atlanticcouncil.org/images/publications/Yemens_Economic_Agenda.pdf

Dexter Filkins. "After the uprising: Can protestors find a path between dictatorship and anarchy?" *The New Yorker*. April 4, 2011. http://www.newyorker.com/magazine/2011/04/11/after-the-uprising

Stacey Philbrick Yadov. "Opposition to Yemen's Opposition," *The Middle East Channel. Foreign Policy. July 14, 2011*

http://mideastafrica.foreignpolicy.com/posts/2011/07/14/opposition_to_yemen_s_opposition#sthash.ZVeTUkEB.dpbs

Susanne Dahlgren. "A Poor People's Revolution: The Southern Movement Heads Toward Independence from Yemen." *MERIP* Vol. 273 Winter 2014.

Stacey Philbrick Yadav and Sheila Carapico. "The Breakdown of the GCC Initiative." *MERIP* Vol. 273 Winter 2014

Policy Briefs Due

Week Eight

Jordan and Morocco

Jordan

Dan Murphy, "Reform and Rumblings in Jordan," *Christian Science Monitor* April 27, 2012: http://www.csmonitor.com/World/Security-Watch/Backchannels/2012/0427/Reform-and-rumblings-in-Jordan

David Rohde, "In Jordan, the Arab Spring Isn't Over," *the Atlantic,* July 19, 2013 http://www.theatlantic.com/international/archive/2013/07/in-jordan-the-arab-spring-isnt-over/277964/

F. Gregory Gause III, "Kings for All Seasons: How the Middle East's Monarchies Survived the Arab Spring," *Brookings Doha Center Publication, No. 27* September 24, 2013: http://www.brookings.edu/research/papers/2013/09/24-resilience-arab-monarchies-gause

Sean L. Yom and Wael Al Khatib, "Jordan's new politics of tribal dissent," *Foreign Policy* August 7, 2012: http://mideast.foreignpolicy.com/posts/2012/08/07/jordans_new_politics_of_tribal_dissent

Sean Yom. "Jordan: The Ruse of Reform," *Journal of Democracy* 24:3 July 2013

Laurie A. Brand, "Why Jordan isn't Tunisia," *Foreign Policy* January 18, 2011: http://mideast.foreignpolicy.com/posts/2011/01/18/why_jordan_isn_t_tunisia

Curtis Ryan (2011) "Political Opposition and Reform Coalitions in Jordan," *British Journal of Middle Eastern Studies,* 38:3 p 367

Morocco

Paul Silverstein. "Weighing Morocco's New Constitution," *MERIP* July 5, 2011 http://www.merip.org/mero/mero070511

Lahcen Achy, Rachid Touhtou, and Mohemed El Hachimi. "State and Civil Society in Morocco: Assessing the Arab Spring Effect." *Carnegie Middle East Center* July 17, 2012 http://www.carnegie-mec.org/2012/07/17/state-and-civil-society-in-morocco-assessing-arab-spring-effect/duk1

Samia Errazzouki. "From Opposition to Puppet: Morocco's Party of Justice and Development," *Jadaliyya* November 24, 2012 http://www.jadaliyya.com/pages/index/8590/from-opposition-to-puppet_morocco%E2%80%99s-party-of-justi

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

Nicolas Pelham. "How Morocco Dodged the Arab Spring," *New York Review of Books*. July 5, 2012 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-idUSTRE71I3K220110219

Laila Lalami, "Arab Uprisings: What the February 20 Protests Tell Us About Morocco," *the Nation* February 17, 2011. http://www.thenation.com/blog/158670/arab-uprisings-what-february-20-protests-tell-us-about-morocco#

Haqed. Mouad Belghouat Alias, "Haqed, the Fanatical One" ARTE video, 4:19, http://monde-arabe.arte.tv/en/#/video_3269_mouad-belghouat-alias-haqed-the-fanatical-one

Nadim Audi. "Offering Slow, Small Changes, Morocco's King Stays in Power," *New York Times*. July 10, 2011. http://www.nytimes.com/2011/07/11/world/africa/11morocco.html?pagewanted=1

Further Reading: Michael Willis, *Politics and Power in the Maghreb*. Columbia: Columbia University Press, 2012

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

Sheila Carapico, "Foreign Aid for Promoting Democracy in the Arab World," *Middle East Journal* 56:3 (Summer 2002) pp. 379-395

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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)

Week Ten

International Intervention II: The Case of Libya

(Guest, Hadeel Al Shalchi, Reuters Libya correspondent)

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Recommended: Dirk Vandewalle, *A History of Modern Libya* (Intro, Chapters 4-7)

Week Eleven

Counter-Revolution

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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."

Lynch. Chapter 14. Michael Hoffman and Amaney Jamal. "Political Attitudes of Youth Cohorts." P 273.

Lynch. Chapter 9. Jillian Schwedler and Ryan King. "Political Geography," p 160

Tripp. Chapter 6. "Symbolic Forms of Resistance: Art and Power."

Loubna Skli Hanna, "Youth, Media, and the Art of Protest in North Africa," *Jadaliyya*

William Lafi Youmans and Jillian C. York, "Social Media and the Activist Toolkit: User Agreements, Corporate Interests, and the Information Infrastructure of Modern Social Movements," *Journal of Communication*. (March 2012) 1460-2466.

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Eric Denis, "Demographic Surprises Foreshadow Change in Neoliberal Egypt," in Sowers and Toensing *Journey to Tahrir* pp. 235-241,

Week Thirteen

Evaluating Economic Explanations for the Uprisings

Tripp, Chapter 3. "Imposition and Resistance in Economic Life"

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Adeel Malik and Bassem Awadallah, "The Economics of the Arab Spring," *World Development* vol 45 May 2013 pp 296-313 http://www.sciencedirect.com/science/article/pii/S0305750X1300003X

Timothy Mitchell. "Dreamland: The Neoliberalism of Your Desires," in Sowers and Toensing, pp224-234

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Week Fourteen

The Future of Democracy in the Middle East

Nathan Brown. "Egypt's Constitutional Ghosts: Deciding the Terms of Cairo's Democratic Transition," in CFR, *The New Arab Revolt* pgs 125-130

Jaml Benomar. "Justice After Transitions," *Journal of Democracy*. 4:1 January 1993, pp 3-14

Mehran Kamrava. "The Question of Democracy," in *The Modern Middle East* pgs 345-373

Hamid Dabashi. "Delayed Defiance," in *The Arab Spring pp 89-118*

Laleh Khalili. "Too Early to Tell: When is a Revolution a Revolution? In *Revolution in the Arab World: The Long View, 2011.*
http://ccas.georgetown.edu/document/1242771053546/Occ_Pap_Long_View.pdf

Group Presentations

Useful Resources

Arab spring: An interactive timeline of Middle East protests. Terrific visual resource from the Guardian

http://www.theguardian.com/world/interactive/2011/mar/22/middle-east-protest-interactive-timeline

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)
http://www.opec.org/library/Annual%20Statistical%20Bulletin/interactive/2008/FileZ/Main.htm

UN Development Program (UNDP) on Governance in the Arab Region (POLGAR)
http://www.pogar.org

Carnegie Endowment for International Peace (CEIP), "Arab Political Systems: Baseline Information and Reforms." http://m.ceip.org/2008/03/06/arab-political-systems-baseline-information-and-reforms/fazh

Regional News

Al Ahram English Weekly (Egypt): http://weekly.ahram.org.eg/

Daily News Egypt (Egypt): http://www.thedailynewsegypt.com/

Al Jazeera English (Qatar): http://english.aljazeera.net/

Al Bawaba (UK): http://www.albawaba.com/

Daily Star (Lebanon): http://www.dailystar.com.lb/

Ha'aretz English (Israel): http://www.haaretz.com/

Dar Al Hayat English (England/Lebanon): http://english.daralhayat.com/

Jerusalem Post (Israel): www.jpost.com

New York Times/ Middle East (USA): http://www.nytimes.com/pages/world/middleeast/

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 Sharq Al Awsat (England/Saudi Arabia): http://www.aawsat.com/

Al Ahram (Egypt): http://www.ahram.org.eg/

Al Ghad (Jordan): www.alghad.jo

Al Masri Al Youm (Egypt): http://www.almasry-alyoum.com/default.aspx?l=ar

Al Quds (Jerusalem): http://www.alquds.com/

Al Watan (Saudi Arabia): http://www.alwatan.com.sa/news/Index.asp?Issueno=3117

Al Shorouq (Algeria): http://www.echoroukonline.com/ara/index.php

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 Arabist/ Issandr El Amrani: www.arabist.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 Iris 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.blogspirit.com

Ana Ikhwan/ Abdel Monem Mahmoud: http://ana-ikhwan.blogspot.com

Manal and Alaa: www.manalaa.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.mideasti.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
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.mideasti.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.huji.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:
http://www.mcc.gov/selection/indicators/index.php
Brookings Iraq Index: http://www.brookings.edu/saban/iraq-index.aspx
Public Opinion:
Palestinian Center for Policy and Survey Research: http://www.pcpsr.org/
Pew Global Attitudes Project: http://www.pewglobal.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:
World Bank World Development Indicators: http://ddp-ext.worldbank.org/ext/DDPQQ/member.do?method=getMembers&userid=1&queryId=6
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: http://web.worldbank.org/WBSITE/EXTERNAL/WBI/EXTWBIGOVANTCOR/0,,menuPK:1740542~pagePK:64168427~piPK:64168435~theSitePK:1740530,00.html
Word Bank Country Policy and Institutional Assessment: http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/IDA/0,,contentMDK:20948754~menuPK:2607525~pagePK:51236175~piPK:437394~theSitePK:73154~isCURL:Y ,00.html

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.

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GRADUATE STUDIES

RECEIVED
NOV 05 2015
EASA

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)*: 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. Addresss nonlineare vibrations in the join time-frequency domain; theories on incorporating nonlinear 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
   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 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. 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://vpr.tamu.edu/resources/export-controls/export-controls-basics-for-distance-education).
13.

Prefix	Course #	Title (excluding punctuation)
MEEN	604	TIME FREQ NONLINEAR VIB CNTRL

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					Level
3.00			3.00	1419010006	1920	16	-	17	0	0	3	6	3	2	6

Approval recommended by:

Dr. Daniel McAdams DAM
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 11/17/2015 Date

Dean of College 11/17/2015 Date

Chair, GC or UCC 12-15-15 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

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

Textbook: "Control of Cutting Vibration and Machining Instability – A Time-Frequency Approach for Precision, Micro and Nano Machining" by C. S. Suh and M. K. Liu, John Wiley and Sons, 2013.

References: 1. "Machine Tool Vibrations and Cutting Dynamics" by Gegg, Suh and Luo, Springer, 2010.
2. "Fundamental of Wavelets, Theory, Algorithms and Applications" by Goswami and Chan, John Wiley and Sons, 2011.

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

59-0.... F

Topics No. of Hours

1. Analog signals, Basis, Vectors, Projection, Vector Spaces	4
2. Integral Transform: Fourier Analysis	3
3. Sampling, Sampling Theorem, Discrete-Time Signals	3
4. Nonlinear Dynamics	4
5. Nonlinear Non-Stationary Signals	3
6. Discrete Fourier Transform, Short-Time Fourier Transform, Gabor Transform	4
7. Time-Frequency Analysis: Wavelets, Filters and Filterbanks	3
8. Time-Frequency Analysis: Instantaneous Frequency	3
9. Time-Frequency Control Theory	6
10. High Speed Time-Frequency Cutting Control	6
11. Synchronization of Chaos	6
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).

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. 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

RECEIVED
NOV 17 2015
GRADUATE STUDIES

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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 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
   Cross-listed with: MEMA 613 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 Materials Science and 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)
MSEN	610	PRINC OF COMPOSITE MTL

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			HEGIS Code						Level
3.00	0.00	0.00	3.00	1418010006	1864	16	-	17	0	0	3	6	3	2	6

Approval recommended by:

Miladin Radovic - MSEN — 11/05/2015
Department Head or Program Chair *(Type Name & Sign)* Date

Vikram K. Kinra - AERO — 11/06/2015
Department Head or Program Chair *(Type Name & Sign)* Date
(if cross-listed course)

Prasad Enjeti — 11/17/2015
Chair, College Review Committee Date

Prasad Enjeti — 11/17/2015
Dean of College Date

Karen Butler-Purry — 12-15-15
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

TEXAS A&M UNIVERSITY

Syllabus

Principles of Composite Materials
MEMA 613/MSEN 610 Spring 2017

Instructor	Dr. Ramesh Talreja, Professor, Department of Aerospace Engineering, and Department of Materials Science and Engineering
Instructor contact	(979) 458-3256; talreja@tamu.edu; 736A HRBB
Text	Book: Analysis and Performance of Fiber Composites, Third Edition, B.D. Agarwal, L. J. Broutman & K. Chandrashekhara, John Wiley, 2006. Selected papers and handout notes
Course Description	Introduction to fiber reinforced composite material systems with emphasis on the fundamental principles; introduction to processing and manufacturing of polymer-, metal- 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.
Prerequisite:	Basic courses in mechanics and materials science; graduate classification.
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	
Week 1	Types of fiber and matrix materials.
Week 2	Processing and manufacturing methods
Week 3	Micromechanics estimates of properties
Week 4	Unidirectional composites; orthotropic solids
Week 5	Laminate plate theory
Week 6	Laminate plate theory – contd.
Week 7	Short-fiber composites
Week 8	Experimental characterization
Week 9	Interlaminar stresses and free-edge effects
Week 10	Nonlinear/time-dependent constitutive relations (plasticity/viscoelasticity/viscoplasticity)
Week 11	Failure – static and fatigue
Week 12	Selected applications – emerging composite systems
Week 13	Selected applications, contd.
Week 14	*Project Term Paper Due*
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	"An Aggie does not lie, cheat or steal, or tolerate those who do." For additional information, please visit: http://aggiehonor.tamu.edu. 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/], 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 on-line at http://student-rules.tamu.edu/rule07 . Please come on time. Silence cell-phones and other electronic distractions.

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 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). 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/sponsauth/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 or 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.

	9. Mandatory participation as a student-athlete in NCAA-sanctioned competition. 10. In accordance with Title IX of the Educational Amendments of 1972, Texas A&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. 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.

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GRADUATE STUDIES

Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional

• Submit original form and attach a course syllabus.•

RECEIVED
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EASA

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 655, Materials Design Studio
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): MEEN 601, MSEN/ECEN 618, MSEN 601 or equivalent, Permission from 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 programs(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)*
       M.E., M.S., Ph.D. in Chemistry, Physics, Chemical Eng., Electrical & Computer Eng., Materials Science, and Mechanical Eng
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

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code	Level
2.00	3.00	0.00	3.00	4010010002	1864	16 - 17	003632	6

Approval recommended by:

Miladin Radovic — 11/01/2015
Department Head or Program Chair *(Type Name & Sign)* Date

Prasad Enjeti — 11/17/2015
Chair, College Review Committee Date

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

Prasad Enjeti — 11/17/2015
Dean of College Date

Submitted to Coordinating Board by:

Karen Butler-Purry — 12-15-15
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

TEXAS A&M UNIVERSITY

SYLLABUS

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

Textbook(s): **Integrated Design of Multiscale, Multifunctional Materials and Products,** *David L. McDowell, Jitesh H. Panchal, Hae-Jin Choi, Carolyn Conner Seepersad, Janet K. Allen and Farrokh Mistree*

Grading Policies

Projects: 80%
Project 1: 15%
Project 2: 20%
Project 3: 45%
Participation: 20%

Grade Basis: $A \geq 90$; $80 \leq B < 90$; $70 \leq C < 80$; $60 \leq D < 70$; $F < 60$.

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

Week	Topic
1	Materials as Hierarchical Systems
2	Materials Design as an Inverse Problem
3	Data-enabled Quantitative Structure Property Relationships
4	**Project 1 is due**
5	Decision Making in Materials Design
6	
7	Search and Optimization of Materials Design Spaces
8	
9	Design under Uncertainty **Project 2 is due**
10	Integrated Computational Materials Science and Engineering (ICME)
11	Computational Approaches to Materials Discovery
12	Experimental Methods for High-throughput Materials Synthesis and Characterization
13	Innovation and Entrepreneurship: Bring Materials Solutions to Markets • creation of a business model canvas • understanding and testing of hypotheses for new ventures • structuring and conducting customer interviews for maximum effect • role of financing for new ventures **Project 3 is due**
14	

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 (http://studentrules.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, in Cain Hall, Room B118, or call 845-1637. For additional information visit 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: http://aggiehonor.tamu.edu*

DWIGHT LOOK COLLEGE OF
ENGINEERING

Department of Materials Science & Engineering

December 1, 2015

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 .

3003 TAMU
College Station, TX 77843-3033

Tel. 979.845.0750 Fax. 979.862.6835
engineering.tamu.edu/materials

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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 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.
   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 programs(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)*
       M.E., M.S., Ph.D. in Chemistry, Physics, Chemical Eng., Electrical & Computer Eng., Materials Science, and Mechanical Eng
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	657	SUMMER SCH COMP MATLS SCI

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code	Level
2.00	3.00	0.00	3.00	4010010002	1864	16 - 17	006432	6

Approval recommended by:

Miladin Radovic — Department Head or Program Chair *(Type Name & Sign)* — 11/05/2015 Date

Prasad Enjeti — Chair, College Review Committee — 11/17/2015 Date

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

Prasad Enjeti — Dean of College — 11/17/2015 Date

Submitted to Coordinating Board by:

Karen Butler-Purry — Chair, GC or UCC — 12-15-15 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

TEXAS A&M UNIVERSITY

SYLLABUS

Course Title and Number	**MSEN 657**
Course Name	**Multiscale Modeling in Materials**
Term	Summer 2016
Meeting Times and Location	TBD
Credit Hours:	3

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

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

Textbook(s): **Introduction to Computational Materials Science: Fundamentals to Applications 1st Edition, R. Lesar**

Grading Policies

Projects: 80%
- Project 1: 20%
- Project 2: 20%
- Project 3: 20%
- Project 4: 20%

Participation: 20%

Grade Basis: $A \geq 90$; $80 \leq B < 90$; $70 \leq C < 80$; $60 \leq D < 70$; $F < 60$.

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

Day	Topic
1	Introduction to Computational Materials Science
2	Electronic Structure Methods - **(Project 1 is due)**
3	Classical Molecular Dynamics
4	Computational Thermodynamics and the CALPHAD Approach **(Project 2 is due)**
5	Phase Field Models of Microstructure Evolution
6	Dislocation Dynamics and Mesoscale Phenomena **(Project 3 is due)**
7	Coarse-graining Approaches
8	Microstructure-sensitive Mechanics of Materials **(Project 4 is due)**
9	Homogenization Methods
10	Challenges in Multi-scale Materials Modeling

Note: Each day will consist of 4 hrs. Lecture and 3 hrs. Lab

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 (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 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: http://aggiehonor.tamu.edu*

RECEIVED
NOV 17 2015
GRADUATE STUDIES

RECEIVED
NOV 09 2015
EASA

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 690 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.
   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 programs(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)*
       M.E., M.S., Ph.D. in Chemistry, Physics, Chemical Eng., Electrical & Computer Eng., Materials Science, and Mechanical En
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	618	DATA-DRIVEN DISCOVERY MTLS

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
3.00	0.00	0.00	3.00	1418010006	1864	16	-	17	0	0	3	6	3	2

Level: 6

Approval recommended by:

Miladin Radovic 11/05/2015
Department Head or Program Chair *(Type Name & Sign)* Date

Prasad Enjeti 11/17/2015
Chair, College Review Committee Date

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

Prasad Enjeti 11/17/2015
Dean of College Date

Submitted to Coordinating Board by:

Karen Butler-Purry 12-15-15
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

TEXAS A&M UNIVERSITY

SYLLABUS

Course Title and Number	**MSEN 660**
Course Name	**Data-Driven Discovery of Materials**
Term	Fall 2016
Meeting Times and Location	TBD
Credit Hours:	3

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

Name	Ulisses Braga-Neto
Telephone number	979-862-6441
Email address	ulisses@ece.tamu.edu
Office hours	TBD
Office location	TBD

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

Week	Topic
1	Introduction to Materials Informatics
2	Quantitative-Structure Property Relationships (QSPRs) in Materials Science and Engineering
3	Review of Probability
4	Optimal Prediction: Least-Squares Estimation
5	Optimal Prediction: MMSE Estimation
6	Supervised Learning: Basics of Classification
7	Supervised Learning: Linear and Nonlinear Classification Rules
8	Supervised Learning: Regression
9	Supervised Learning: Case Study in Classification and Regression for Materials Informatics Problems
10	Unsupervised Learning: Dimensional Reduction
11	Unsupervised Learning: Clustering
12	Unsupervised Learning: Case Study: Dimensional Reduction and Clustering in Materials Informatics Problems
13	Project Presentations
14	Project Presentations

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 (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 http://disability.tamu.edu.
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+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: 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 *(DDS, MD, JD, PharmD, DVM)*
2. Request submitted by *(Department or Program Name)*: Department of Oceanography
3. Course prefix, number and complete title of course: OCNG 634 - Fundamentals of High Performance Computing for the Geosciences
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 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)
OCNG	634	FUND HPC GEOSCIENCES

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year	FICE Code	Level
03	02	00	04	4006990202	2140	16 - 17	003632	6

Approval recommended by:

Deborah Thomas DT/L 11/10/15
Department Head or Program Chair *(Type Name & Sign)* Date

Chair, College Review Committee 11/11/15 Date

Michael C. Pope Michael C. Pope 11/09/15
Department Head or Program Chair *(Type Name & Sign)* Date
(if cross-listed course)

Dean of College 11/11/15 Date

Submitted to Coordinating Board by:

Chair, GC or UCC 12-15-15 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

TEXAS A&M UNIVERSITY

SYLLABUS

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:

1. Chivers, I., Sleightholme, J., Introduction to Programming with Fortran, 2nd Ed., Springer, 2012, ISBN 978-0-85729-232-2.
2. Akin, E., Object Oriented Programming via Fortran 90/95, 1st Ed., Cambridge University Press, 2003, ISBN 0-521-52408-3.
3. Chapman, S.J., Fortran 95/2003 for Scientists and Engineers, 3rd Ed., McGraw-Hill, 2007, ISBN 978-0-07-319157-7.
4. Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flannery, B.P., Numerical Recipes: The Art of Scientific Computing, Third Edition, Cambridge University Press, 2007, ISBN 978-0-521-88068-8. See also, by the same authors: Fortran Numerical Recipes, 2nd Edition, Vol. 1 and 2, Cambridge University Press, 1992, 1997, available on line at: http://apps.nrbook.com/fortran/index.html.
5. McCool, M., Robinson, A., Reinders, J., Structured Parallel Programming: Patterns for Efficient Computation, Morgan Kaufmann, 2012, ISBN: 978-0-12-415993-8. See also: http://parallelbook.com
6. Foster, I., Designing and Building Parallel Programs: Concepts and Tools for Parallel Software Engineering, Addison-Wesley, 1995, ISBN: 978-0-20-157594-1.
7. Mattson, T.G., Sanders, B.A., Massingill, B.L., Patterns for Parallel Programming, Addison-Wesley Professional, 2013, ISBN 978-0-32-194078-0.
8. Hager, G., Wellein, G., Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4398-1192-4.
9. Levesque, J., Wagenbreth, G., High Performance Computing: Programming and Applications, Chapman & Hall/CRC Press, 2011, ISBN: 978-1-4200-7705-6.
10. Zhao, C., Hobbs, B.E., Ord, A., Fundamentals of Computational Geoscience, Numerical Methods and Algorithms, Lecture Notes in Earth Sciences, Vol. 122, Springer-Verlag Berlin Heidelberg, 2009, ISBN 978-3-540-89742-2.

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

Week	Topic	Assignment
Week 1	Introduction to the architecture and design of state-of-the-art High Performance Computing systems	
Week 2	Description of the UNIX operating system, including the shell environment.	
Week 3	Algorithm design and basic principles of computer programming.	
Week 4-5	Fundamentals of Fortran programming language.	
Week 6	Advanced Fortran features for computational Geosciences. Introduction to structured programming. Pattern-based serial programming.	**Assignment #1 due:** Serial codes for one-dimensional physical models

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
Week 8		**Midterm Exam**
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
Week 12-13	Distributed-memory parallelism with the Message Passing Interface (MPI)	**Assignment #4 due:** Use OpenMP to create a shared-memory parallel code. Evaluate parallel efficiency.
Week 14	Concepts and tools for empirical performance analysis of parallel codes.	**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 the 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.

RECEIVED
OCT 29 2015
GRADUATE STUDIES

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 Oceanography
3. Course prefix, number and complete title of course: OCNG 656 MATLAB Programming for Ocean Sciences
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

   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. OCNG, MOST, PhD OCNG
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	656	MATLAB Prog for Ocean Sciences

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year		HEGIS Code					
2.00	2.00	0.00	3.00	4006070002	2140	16	17	0	0	3	6	3	2

Level: 6

Approval recommended by:

Debbie Thomas — Department Head or Program Chair *(Type Name & Sign)* — Date: 10/8/15

Eric Riggs — Chair, College Review Committee — Date: 10/15/2015

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

Kate Miller — Dean of College — Date: 10/15/2015

Submitted to Coordinating Board by:

Chair, GC or UCC — Date: 12-15-15

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.

TEXAS A&M UNIVERSITY

SYLLABUS

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

Week	Topic
1	The art of Scientific computing, logging on
2	Introduction MATLAB programming: basics of programing
3	Introduction MATLAB programming: m-scripts, functions (Assignment 1 due)
4	Introduction to MATLAB programming II: debugging, loading various data formats, loops (Assignment 2 due)
5	Introduction to MATLAB programming III: Manipulating CTD and bottle data (Assignment 3 due)
6	Basics of MATLAB programming: working with vectors: times series plotting (Assignment 4 due)
7	Basics of MATLAB programming: matrices, scripting and command line statistics (Assignment 5 due)
8	Accessing data from NODC (The National Ocean Data Center) and CCHDO (CLIVAR and Carbon Hydrographic Data Office
9	Introduction to Oceanographic toolboxes: seawater toolbox; calculating oceanographic variables (Assignment 6 due)
10	Graphical representations of oceanographic data (Assignment 7 due)
11	Mapping techniques (Assignment 8 due)
12	Gridding and contouring (Assignment 9 due)
13	Vertical sections (Assignment 10 due)
14	Semester wrap up (Assignment 11 due) Graduates: final project due.

Americans with Disabilities Act (ADA)

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

Academic Integrity

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

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

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 is 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."

RECEIVED
NOV 17 2015
GRADUATE STUDIES

RECEIVED
AUG 07 2015
CC ESSAP

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)*: 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: _____
   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)*
       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-controls-basics-for-distance-education).
13.

Prefix	Course #	Title (excluding punctuation)
PETE	614	MS Grad Student Paper Contest

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
0.00	0.00	0.00	0.00	1425010006	2210	16	-	17	0	0	3	6	3	2

Level 6

Approval recommended by:

I. Yucel Akkutlu — 8/5/2015
Department Head or Program Chair *(Type Name & Sign)* Date

T E Taylor 11/17/2015
Chair, College Review Committee Date

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

T E Taylor 11/17/2015
Dean of College Date

12-15-15
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

TEXAS A&M UNIVERSITY

SYLLABUS

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)

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RECEIVED
NOV 17 2015
GRADUATE STUDIES

RECEIVED
AUG 07 2015
ESSAP

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)*: Harold Vance Department of Petroleum Engineering
3. Course prefix, number and complete title of course: PETE 615-~~PHD Grad Student Paper Contest~~ Doctoral 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
   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 programs(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

Lect.	Lab	Other	SCH	CIP and Fund Code	Admin. Unit	Acad. Year			FICE Code					
0.00	0.00	0.00	0.00	1425010006	2210	16	-	17	0	0	3	6	3	2

Level 6

Approval recommended by:

I. Yucel Akkutlu — 8/5/2015
Department Head or Program Chair *(Type Name & Sign)* Date

Chair, College Review Committee — 11/17/2015 Date

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

Dean of College — 11/17/2015 Date

Submitted to Coordinating Board by:

Chair, GC or UCC — 12-15-15 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

TEXAS A&M UNIVERSITY

SYLLABUS

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 doctorial 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 satisfactory/unsatisfactory and for zero credit hours.

Americans with Disabilities Act (ADA)

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