Course Change Request

New Course Proposal

Date Submitted: 05/01/18 12:38 pm

Viewing: **CLIM 511 : Atmospheric Dynaimcs**

Last edit: 05/01/18 12:38 pm

Changes proposed by: bklinger

Are you completing this form on someone else's behalf? No

Effective Term: Spring 2019

Subject Code: CLIM - Climate Dynamics **Course Number:** 511

Bundled Courses:

Equivalent Courses:

Catalog Title: Atmospheric Dynaimcs

Banner Title: Atmospheric Dynaimcs

Will section titles vary by semester? No

Credits: 3

Schedule Type: Lecture

Hours of Lecture or Seminar per week: 3

Repeatable: May only be taken once for credit (NR)

Default Grade Mode: Graduate Regular

Recommended Prerequisite(s): MATH 213 or equivalent.

Recommended Corequisite(s):

Required Prerequisite(s) / Corequisite(s) (Updates only):

Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

Registration Restrictions (Updates only):

Registrar's Office Use Only - Registration Restrictions:

Field(s) of Study:

Class(es):

Level(s):

Degree(s):

School(s):

Catalog Description: Observational bases and fundamentals of fluid dynamic principles for understanding atmospheric motions across multiple spatial and temporal scales; covers basic conservation laws of mass, momentum, and energy; concepts of circulation and vorticity; balanced atmospheric flows, e.g. geostrophic wind and shear, thermal wind; quasi-geostrophic and isentropic potential vorticity analysis for mid-latitude cyclones and fronts.

Justification:

In Workflow

1. **AOES Chair**
2. **SC Curriculum Committee**
3. SC Associate Dean
4. Assoc Provost-Graduate
5. Registrar-Courses
6. Banner

Approval Path

1. 05/07/18 1:51 pm Jim Kinter (ikinter): Approved for AOES Chair

Will fulfill atmospheric dynamics requirement for proposed MS Climate Science. Designed for MS students in Climate Science, MS students in Earth Systems Science, and other graduate programs who want to learn atmospheric dynamics but do not want the level of mathematical rigor used in CLIM 711 Introduction to Atmospheric Dynamics.

Does this course cover material which crosses into another department? No

Learning Outcomes:

Students will become familiar with the basic concepts of dynamic meteorology, develop an appreciation of meteorological phenomena across multiple spatio-temporal scales, and be able to apply these concepts to understanding weather and climate phenomena. The course will focus on the following topics:

- Important dynamical balances within atmospheric motion (e.g. geostrophic, hydrostatic, and thermal wind)
- Conservation laws such as energy, mass, momentum, vorticity, and entropy
- Approximations enabling solutions describing the behavior of specific atmospheric phenomenon e.g. the quasigeostrophic equations
- Key structure and development of the mid-latitude weather systems and the related dynamical interpretation.

Attach Syllabus (PDFs only) clim511syllabus1.pdf

Additional Attachments (PDFs only)

Staffing: All climate dynamics faculty in AOES (about 10 faculty members) are able to teach this course.

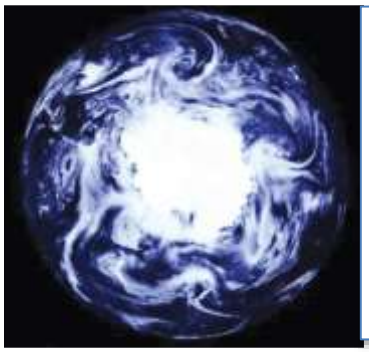
Relationship to Existing Programs: Elective credit for the Earth Systems Science MS.
Fulfills requirement for proposed MS Climate Science.

Relationship to Existing Courses: Cross-list of CLIM 411 Atmospheric Dynamics which is designed for seniors in the Atmospheric Science BS.
CLIM 511 will have additional, more advanced, questions on homework and exams.
CLIM 711 covers similar material at a more mathematically rigorous level.

Additional Comments:

Reviewer Comments

Key: 15910



CLIM 511
Atmospheric Dynamics

Syllabus

Catalog Description: Observational bases and fundamentals of fluid dynamic principles for understanding atmospheric motions across multiple spatial and temporal scales; covers basic conservation laws of mass, momentum, and energy; concepts of circulation and vorticity; balanced atmospheric flows, e.g. geostrophic wind and shear, thermal wind; quasi-geostrophic and isentropic potential vorticity analysis for mid-latitude cyclones and fronts. **Credits:** 3
Recommended Prerequisite: MATH 213 Analytic Geometry and Calculus III

Instructor: Natalie Burls
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Course Objectives: Students will become familiar with the basic concepts of dynamic meteorology, develop an appreciation of meteorological phenomena across multiple spatio-temporal scales, and be able to apply these concepts to understanding weather and climate phenomena. The course will focus on the following topics:

- Important dynamical balances within atmospheric motion (e.g. geostrophic, hydrostatic, and thermal wind)
- Conservation laws such as energy, mass, momentum, vorticity, and entropy
- Approximations enabling solutions describing the behavior of specific atmospheric phenomenon e.g. the quasigeostrophic equations
- Key structure and development of the mid-latitude weather systems and the related dynamical interpretation.

Required Textbook: Martin, Jonathan E., *Mid-Latitude Atmospheric Dynamics*, John Wiley and Sons, 324pp.

Crosslist: The CLIM 511 syllabus will follow the same textbook, lecture format and number of homework assignments as the undergraduate, senior-level CLIM 411 class. CLIM 511 students will receive additional, more advanced, questions on each homework assignment, as well as the mid-term and final examinations.

Grading: Homework 30%, Mid-term 30%, Final 40%

Homework: There are six homework problem sets. Each set carries 5% of the total grade. Homework problem sets are due the week after they are assigned. You will also be assigned an in-class rotating tank demonstration (see applicable blackboard assignment for grading rubric) which will form part of your homework grade.

Grade Disputes

Any dispute regarding a grade on any assignment must be made in writing via email within 1-week of receipt of the grade on that assignment.

Topic Schedule

wk	Lecture	Topic	Textbook Chapter	Home work	Rotating Tank Demos
1	Mon 22 Jan	Nature of fluids; useful mathematical tools	1.1-1.5		Dye Stirring
	Wed 24 Jan	Nature of fluids; useful mathematical tools	1.1-1.5	HW1	
2	Mon 29 Jan	Nature of fluids; useful mathematical tools	1.1-1.5		
	Wed 29 Jan	Nature of fluids; useful mathematical tools	1.1-1.5		
3	Mon 5 Feb	Fundamental forces and apparent forces	2.1-2.2		
	Wed 7 Feb	Fundamental forces and apparent forces	2.1-2.2	HW2	Solid body rotation
4	Mon 12 Feb	Fundamental forces and apparent forces	2.1-2.2		
	Wed 14 Feb	Fundamental forces and apparent forces	2.1-2.2		
5	Mon 19 Feb	Fundamental forces and apparent forces	2.1-2.2		
	Wed 21 Feb	Conservation of momentum, mass, & energy	3.1-3.3	HW3	
6	Mon 26 Feb	Conservation of momentum, mass, & energy	3.1-3.3		
	Wed 28 Feb	Conservation of momentum, mass, & energy	3.1-3.3		
7	Mon 5 Mar	Conservation of momentum, mass, & energy	3.1-3.3		
	Wed 7 Mar	**Midterm**			
8	Mon 12 Mar	*Spring Break*			
	Wed 14 Mar	*Spring Break*			
9	Mon 19 Mar	Conservation of momentum, mass, & energy	3.1-3.3		
	Wed 21 Mar	Conservation of momentum, mass, & energy	3.1-3.3	HW4	
10	Mon 26 Mar	Equations of motion and applications	4.1-4.5	Student lectures	
	Wed 28 Mar	Equations of motion and applications	4.1-4.5	Student lectures	
11	Mon 2 Apr	Equations of motion and applications	4.1-4.5		Hadley circulation & thermal wind balance I
	Wed 4 Apr	Equations of motion and applications	4.1-4.5	HW5	Hadley circulation & thermal wind balnce II
12	Mon 9 Apr	Equations of motion and applications	4.1-4.5		
	Wed 11 Apr	Equations of motion and applications	4.1-4.5		Balanced Vortex
13	Mon 16 Apr	Equations of motion and applications	4.1-4.5		
	Wed 18 Apr	Circulation; Vorticity; Potential Vorticity	5.1-5.3	HW6	
14	Mon 23 Apr	Circulation; Vorticity; Potential Vorticity	5.1-5.3		
	Wed 25 Apr	Circulation; Vorticity; Potential Vorticity	5.1-5.3		
15	Mon 30 Apr	Circulation; Vorticity; Potential Vorticity	5.1-5.3		
	Wed 2 May	Quasi-Geostrophic System	5.4		
	Mon 15 May	**Final Exam** (7:30 am – 10:15 am)			

Some Important Mason Policies

Updated Spring 2016

Electronic Communications

Students must use their MasonLive email account to receive important University information, including communications related to this class.

Disability Accommodations

If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with **Office of Disability Services** to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Office of Disability Services: http://ods.gmu.edu

Academic Integrity

The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity.

Three fundamental and rather simple principles to follow at all times are that:

1. all work submitted be your own;
2. when using the work or ideas of others, including fellow students, give full credit through accurate citations; and
3. if you are uncertain about the ground rules on a particular assignment, ask for clarification.

No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

Office of Academic Integrity: http://oai.gmu.edu/
Honor Code: http://oai.gmu.edu/the-mason-honor-code-2/

Mason Diversity Statement

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach.

Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes, and that the larger societal setting has an evolving socio-cultural understanding of diversity and inclusion, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group and organization, and to make improvements as needed.