

New Course

Proposal Reference : 9183
 Number
 PRN Alias : 14-15#406
 Version No : 6
 Submitted By : Dr Daniel Kirshbaum
 Edited By : Ms Josie D'Amico

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New Data					
Program Affected?	Y				
Program Change Form Submitted?	N (Simple Change) - This course would be added to the list of approved U0 science courses				
Subject/Course/Term	ATOC 100 <ul style="list-style-type: none"> one term 				
Credit Weight or CEU's	3 credits				
Course Activities	<table border="1"> <thead> <tr> <th>Schedule Type</th> <th>Hours per week</th> </tr> </thead> <tbody> <tr> <td>A - Lecture</td> <td>3</td> </tr> </tbody> </table>	Schedule Type	Hours per week	A - Lecture	3
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	A - Lecture	3			
Total Hours per Week : 3 Total Number of Weeks : 13					
Course Title	<table border="1"> <tbody> <tr> <td>Official Course Title :</td> <td>Extr.-Weath. & Clim.-Chg Phys.</td> </tr> <tr> <td>Course Title in Calendar :</td> <td>Extreme-weather and climate-change physics</td> </tr> </tbody> </table>	Official Course Title :	Extr.-Weath. & Clim.-Chg Phys.	Course Title in Calendar :	Extreme-weather and climate-change physics
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Course Title in Calendar :	Extreme-weather and climate-change physics				
Rationale	ATOC 100 provides U0 students with the opportunity to apply their knowledge of math and physics to understand the fundamental science of weather and climate. As one of the approved U0 courses, ATOC 100 represents a helpful recruiting tool that would attract outstanding science students to the AOS B. Sc. programs.				
Responsible Instructor					
Course Description	This course will provide an overview of extreme weather and climate phenomena, using calculus-based mathematical and physical principles. It will examine the physics and dynamics associated with extreme weather and climate phenomena, including blizzards, heat waves, cold waves, ice storms, tornadoes, and hurricanes. The atmospheric and oceanic observing system will be used to quantify the structure and mechanisms of extreme weather and climate events. The physics of climate change will be interpreted through the natural and anthropogenic changes to Earth's radiation and energy balances. An introduction to climate models (both simple and complex) will illustrate the concepts of forcing, feedbacks, and				

	climate sensitivity, and provide the foundation for understanding future changes in extreme weather.
Teaching Dept.	0291 : Atmospheric & Oceanic Sciences
Administering Faculty/Unit	SC : Faculty of Science
Prerequisites	PHYS 101 Web Registration Blocked? : N
Corequisites	MATH 141 Web Registration Blocked? : N
Restrictions	
Supplementary Calendar Info	
Additional Course Charges	
Campus	Downtown
Projected Enrollment	25
Requires Resources Not Currently Available	N
Explanation for Required Resources	
Required Text/Resources Sent To Library?	N
Library Consulted About Availability of Resources?	N
Consultation Reports Attached?	N
Effective Term of Implementation	201601
File Attachments	<ul style="list-style-type: none"> • ATOC100_course_outline5_11_Oct_2014_djk_jrg-1.pdf View
To be completed by the Faculty	
For Continuing Studies Use	

Approvals Summary

Show all comments

Version No.	Departmental Curriculum Committee	Departmental Meeting	Departmental Chair	Other Faculty	Curric/Academic Committee	Faculty	SCTP	Version Status
6								Submitted to Curriculum/Academic Committee for approval Edited by: Josie D'Amico on: Oct 22 2014
5								Submitted to Curriculum/Academic Committee for approval Edited by: Daniel Kirshbaum on: Oct 20 2014
4								Submitted to Curriculum/Academic Committee for approval Edited by: Daniel Kirshbaum on: Oct 20 2014
3								Submitted to Curriculum/Academic Committee for approval Edited by: Daniel Kirshbaum on: Oct 20 2014
2								Submitted to Curriculum/Academic Committee for approval Edited by: Daniel Kirshbaum on: Oct 20 2014
1								Submitted to Curriculum/Academic Committee for approval Created on: Oct 20 2014

ATOC 100: Extreme-weather and climate-change physics
Winter 2016

1. Motivation and scope of the course

This course will provide an overview of extreme weather and climate phenomena, using calculus-based mathematical and physical principles.

Society is increasingly vulnerable to the effects of extreme weather, and to the longer-term impacts of human-induced climate change. The combination of the development of an increasingly complex infrastructure, and the net migration of the world's population into low-lying coastal regions explains such vulnerability.

The purpose of this course is to examine the physics and dynamics associated with extreme weather and climate phenomena. The physics of such extreme events as blizzards, heat waves, cold waves, ice storms, tornadoes, and hurricanes are discussed. A key to the fundamental understanding of extreme weather and climate is an analysis of the atmospheric and oceanic observing system. Measurements of this system are used to quantify the structure and processes of extreme weather and climate events. The physics of climate change will be presented by focusing on natural and anthropogenic changes to Earth's radiation and energy balances. An introduction to climate models (both simple and complex) will illustrate the concepts of forcing, feedbacks, and climate sensitivity, and provide the foundation for understanding future changes in extreme weather.

2. Prerequisites

- a. Math 141, or equivalent (co-requisite)
- b. Phys 101, or equivalent (prerequisite)

3. Meetings

13 weeks
2 1 ½-hr. lectures per week.

4. Means of evaluation

Assignments:	30%
Mid-term exam:	35%
Exam (non-cumulative, scheduled during the Final Examination period)	35%

Each examination will consist of short-answer questions only. There will be a choice of questions to be answered.

There will be a supplemental examination, counting for 100% of the supplemental mark.

5. Instructor

John Gyakum

Atmospheric and Oceanic Sciences

Burnside Hall, Room 944

Tel.: 398-3760

Fax: 398-6115

Email: john.gyakum@mcgill.ca

6. Textbooks: A course packet of required readings will be drawn from three reference textbooks.

Atmospheric Science, Second Edition: An Introductory Survey

John M. Wallace and Peter V. Hobbs

Academic Press

ISBN 9780127329512

Introduction to Modern Climate Change

Andrew Dessler

Cambridge University Press

ISBN 9780521173155

Severe and Hazardous Weather: An introduction to high impact meteorology; Fourth Edition

Robert M. Rauber, John E. Walsh, and Donna J. Charlevoix

Kendall/Hunt Publishing Company

ISBN 9781465250704

7. Topics to be covered

Lecture 1:

Introduction and overview of weather and climate science

Lecture 2:

Properties of the Atmosphere (Temperature, pressure, potential temperature, moisture, and wind); the ideal gas law, hydrostatic balance, the hypsometric equation

Lecture 3:

Meteorological measurements and observing systems (Surface measurements, rawinsondes, radar, and satellites)

Lectures 4 and 5:

Geostrophic balance, thermal wind balance, the jet stream, and extratropical cyclones

Lectures 6 and 7:

The tropical atmosphere, tropical cyclones, and gradient-wind balance

Lectures 8 and 9:

Air masses, basics of frontal dynamics, arctic air mass formation; cold air outbreaks in North America

Lectures 10 and 11:

Basics of baroclinic instability, Nor'easters and Blizzards

Lectures 12 and 13:

Ice storms; supercooled water; dynamics associated with the production of an ice storm's meteorological environment

Lectures 14 and 15:

Dry and moist instability, thunderstorms, tornadoes, and hailstorms

Lectures 16 and 17:

Role of energy balance and radiation in climate

Lectures 18 and 19:

Climate change, natural and anthropogenic

Lectures 20 and 21:

Climate models (simple and not-so-simple)

Lectures 22, 23, and 24:

Climate forcings, feedbacks, and sensitivity; Taylor-series expansion of black body radiation

Lectures 25 and 26:

Future climate and future climate extremes (rainfall and hurricanes)

8. Academic integrity

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/integrity for more information).

From: Daniel Kirshbaum, Prof.
Sent: October-27-14 4:45 PM
To: Josie D'Amico
Subject: Fwd: Re: new course proposal

Hi josie,

Here's a positive response from Guy Moore on ATOC 100.

Best,
Dan

----- Original Message -----

Subject:Re: new course proposal
Date:Mon, 20 Oct 2014 17:59:03 -0400
From:Guy Moore <guymoore@hep.physics.mcgill.ca>
To:Daniel Kirshbaum <daniel.kirshbaum@mcgill.ca>

Hi Dan,

I polled the Curriculum Committee here, and there were no objections.

guy

On Mon, Oct 20, 2014 at 11:21:24AM -0400, Daniel Kirshbaum wrote:

> Dear Guy,
>
> AOS is proposing a new course entitled "Extreme-weather and
> climate-change physics" (ATOC 100) at next Tuesday's (October 28) AC
> meeting. The course would serve as ATOC's only approved U0
> elective. It differs from current 100-level ATOC courses in that it
> uses basic calculus (ideal gas law, hydrostatic balance, geostrophic
> balance, etc.) and is thus more quantitative. To reflect that key
> difference, we use the word "physics" in the title.
>
> As part of the consultation for this course, we wish to ask you if
> Physics would be content with our use of the word "physics" in the
> title? Please let us know if you approve.
>
> best regards,
> Dan
>
> --
> Daniel J. Kirshbaum
> Assistant Professor, McGill University
> Dept. of Atmospheric and Oceanic Sciences
> Room 839 Burnside Hall
> 805 Sherbrooke St West
> Montréal, QC H3A 0B9 (Canada)
> Tel: 1-514-398-3347

Guy D. Moore

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3600 rue University

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e-mail guymoore@physics.mcgill.ca

Montreal QC H3A 2T8 Canada

From: Vojkan Jaksic [mailto:jaksic.mcgill@gmail.com] On Behalf Of Vojkan Jaksic
Sent: October-22-14 12:04 PM
To: Daniel Kirshbaum, Prof.
Cc: Josie D'Amico

Subject: Re: ATOC 100

This course is fine with the Department of Mathematics and Statistics.

Best regards,

Vojkan

On Oct 22, 2014, at 11:11 AM, Daniel Kirshbaum <daniel.kirshbaum@mcgill.ca> wrote:

> Dear Vojkan,

>

> I am writing to consult you about a new course proposal in the Atmospheric and Oceanic Sciences Department that tangentially affects Math and Stats.

>

> The course is named ATOC 100 and we are proposing to add it to the list of approved freshman (U0) science courses at next Tuesday's (October 28) AC meeting. ATOC 100 is an introduction to the physics of weather and climate change, and it differs from other 100-level ATOC courses in that it uses a bit of calculus. Because MATH 141 is a corequisite for ATOC 100, we are seeking approval from Math & Stats. So, please let me know if you approve of MATH 141 serving as a corequisite for ATOC 100.

>

> If you're interested in the details of ATOC 100, please see attached for course outline. We anticipate that the registration in ATOC 100 will be around 25 students.

>

> Best regards,

> Dan

>

> --

> Daniel J. Kirshbaum

> Assistant Professor, McGill University Dept. of Atmospheric and

> Oceanic Sciences Room 839 Burnside Hall

> 805 Sherbrooke St West

> Montréal, QC H3A OB9 (Canada)

> Tel: 1-514-398-3347

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