RECEIVED 10/25/10

LONG SIGNATURE SHEET

UNC CHARLOTTE

Proposal Number: ESCI- 10-21-2009

Proposal Title Establishment of a graduate course in Boundary Layer Meteorology and Minor changes to existing course descriptions

Originating Department Geography and Earth Sciences

TYPE OF PROPOSAL: UNDERGRADUATE_____ GRADUATE_X_ UNDERGRADUATE & GRADUATE____

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
April 2 2010	April 19, 2010	Oct. 25, 2010	Approved Dept. Approved D.C.C.	DEPARTMENT CHAIR
10/25/2010	11/19/2010	11/23/2010	Approved	COLLEGE CURRICULUM COMMITTEE CHAIR
				TEACHER EDUCATION COMMITTEE CHAIR (Teacher Education Program proposals only)
11/23/10	12/3/10	12/3/10	Approved	COLLEGE FACULTY CHAIR
	12/3/10	12/3/10	Approved	COLLEGE DEAN
				UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR (for undergraduate courses)
1-26-10	2-1-11	2-4-11	Approved	GRADUATE COUNCIL CHAIR (for graduate courses) Rob Roy McGregor
				FACULTY GOVERNANCE SECRETARY (noting Faculty Council approval on Consent Calendar)
				FACULTY EXECUTIVE COMMITTEE (if decision is appealed)

Revised 4/08/03
OAA/jdp

UNCCHARLOTTE

To: **College Curriculum Committee**

From: **Matthew Eastin, Manda Adams, Walter Martin, and Terry Shirley**
Department of Geography and Earth Sciences

Date: **October 21, 2009**

Re: **Establishment of a graduate course in Boundary Layer Meteorology and minor changes to existing course descriptions**

SUMMARY:

The Department of Geography and Earth Sciences proposes to add the following graduate course to the M.S. Earth Science curriculum: ESCI 5240 Boundary Layer Meteorology. At present, there are only six courses offered at the graduate level at UNCC with a focus on either meteorology or climatology – the proposed course would provide graduates students with such interests a broader selection of coursework than is presently offered. Additionally, we are proposing changes to the descriptions and pre-requisites of five existing graduate courses in order to be consistent with their undergraduate counterparts.

University of North Carolina Charlotte **ESCI 10-21-2009**
New Graduate Course Proposal
Course and Curriculum Proposal from the Department of Geography and Earth Sciences

TITLE: *Establishment of a graduate course in Boundary Layer Meteorology and minor changes to existing course descriptions*

A. PROPOSAL SUMMARY AND CATALOG COPY.

1. SUMMARY:

The Department of Geography and Earth Sciences proposes to add the following graduate course to the M.S. Earth Science curriculum: ESCI 5240 Boundary Layer Meteorology. At present, there are only six courses offered at the graduate level at UNCC with a focus on either meteorology or climatology – the proposed course would provide graduates students with such interests a broader selection of coursework than is presently offered. Additionally, we are proposing changes to the descriptions and pre-requisites of five existing graduate courses in order to be consistent with their undergraduate counterparts.

2. PROPOSED CATALOG COPY:

ESCI 5150 Applied Climatology (3) Prerequisite: METR 3250, or permission of instructor. Methods of acquiring and analyzing climactic data in various types of applied problems. Emphasis on methods to assess and reduce the impact of weather and climate upon human activities. Three hours of combined lecture and lab per week. (Spring)

ESCI 5240 Boundary-Layer Meteorology (3) Prerequisite: METR 3210, or permission of instructor. Examines the flow of mass, energy, and moisture within the planetary boundary layer including their exchange at the earth's surface and theories of interaction. Principles of air pollution including sources, sinks, and controls. Interaction of the atmosphere with underlying surfaces (i.e. soils, vegetation, oceans, glaciers). Design and operation of instruments used to monitor the atmosphere with an emphasis on practical application. Three hours of combined lecture and lab per week. (On demand)

ESCI 5250 Advanced Dynamic Meteorology (3) Prerequisites: METR 3250 with a grade of C or better, MATH 2171, and MATH 2241, or permission of instructor. An in-depth examination of atmospheric dynamics, focusing on the structure and evolution of synoptic and mesoscale weather systems, wave dynamics (Rossby, topographic, inertia-gravity, etc.), scale-analysis, non-dimensional numbers, and atmospheric modeling. Three hours of combined lecture and lab per week. (Fall)

ESCI 5251 Advanced Synoptic Meteorology (3) Prerequisite: METR 3250 with a grade of C or better, or permission of instructor. An integrated view of synoptic and dynamic meteorology focusing on advanced conceptual models and analysis techniques for mid-latitude weather systems and regional precipitation events. Three hours of combined lecture and lab per week. (Fall)

ESCI 5320 Tropical Meteorology (3) Prerequisite: METR 3250, or permission of instructor. A comprehensive study of the tropical atmosphere, including climatology, mean structure and circulation, air-sea energy exchange, cumulus transport, synoptic waves, and tropical storms. Special attention is paid to the formation, evolution, motion, and societal impacts of hurricanes. Three hours of combined lecture and lab per week. (On demand)

ESCI 5350 Mesoscale Meteorology (3) Prerequisite or Corequisite: METR 3250, or permission of instructor. A comprehensive study of the structure, evolution, and dynamics of atmospheric phenomena having spatial scales between 2 and 2000 km. Topics include: fronts, convective initiation, mesoscale convective systems, severe thunderstorms, tornadoes, low-level jets, drylines, land-sea breezes, shallow convection, and terrain effects. Three hours of combined lecture and lab per week. (On demand)

B. JUSTIFICATION

1. NEED ADDRESSED: Many enrolled and prospective students inquire about graduate coursework in meteorology. At this time there are only six courses with an emphasis on atmospheric science or climatology. While most students are receptive to opportunities currently available, these students would be better served by expanding the curriculum to include more advanced atmospheric courses. The proposed course serves that need. Furthermore, given that the atmospheric boundary layer lies at the interface between the terrestrial and atmospheric domains, the proposed course will also benefit graduate students with interests in hydrology and the earth and environmental sciences.

2. PREREQUISITES AND COREQUISITES: A companion proposal revising the degree requirements for a Bachelors of Science in Meteorology changes the course descriptions and prerequisites for five courses that are listed at both the 4000 and 5000 levels. Here, we wish to change the 5000-level course descriptions and prerequisites to be consistent with their 4000-level counterparts. The above catalog copies incorporate these changes.

3. CONSISTENCY OF COURSE NUMBERING: No renumbering of courses will be required.

4. IMPROVEMENT: This proposal improves the department's offerings for meteorology, climatology, hydrology, and earth and environmental science graduate students, thereby strengthening their coursework in advance of their research projects.

C. IMPACT

1. GROUP(S) SERVED: This proposal would result in additional graduate-level meteorology coursework being offered, enhancing and diversifying the graduate curriculum for a Master's Degree in Earth Science. The inclusion of this new course into the curriculum would also help attract graduate students to UNC Charlotte (and the program) through an expansion of available coursework.

2. EFFECT ON EXISTING COURSES AND CURRICULA:

- **a.** Boundary Layer Meteorology (ESCI 5240) will be taught each fall, on demand.
- **b.** The content or offering frequency of existing graduate level courses will not be detrimentally affected. Rather, the development of this course will enhance our overall curricular offering for not only graduate students with an interest in meteorology and air quality, but also students interested in hydrology, ecology, geography, urban transportation issues, and the earth and environmental sciences.
- **c.** Expected enrollment in Boundary Layer Meteorology (ESCI 5240) will be 5-10 students per year (when offered). We anticipate graduate students from outside our department (e.g. engineering, biology, and chemistry) will also be attracted to this course.
- **d.** We do not anticipate any detrimental impacts on enrollments in other courses. With recent growth in faculty and graduate students, additional courses are needed to meet student demands. The proposed course will help maintain healthy enrollments in existing graduate courses, while offering an expanded curriculum. These projections were determined by informal discussions with current graduate students across the many programs within the department, as well as the goal of Dr. Manda Adams to develop a research project consisting of several graduate students.
- **e.** Boundary Layer Meteorology is being taught as a topics course [ESCI 5000 Boundary Layer Meteorology (3)] for the first time this semester (Fall 2010). Total enrollment at the graduate level is 4 earth science graduate students. Mid-course feedback suggests the proposed course structure is effective for all, and the students find it to be a valuable addition to the curriculum.
- **f.** A catalog copy congruent with the proposed changes is shown above.

D. RESOURCES REQUIRED TO SUPPORT PROPOSAL:

1. PERSONNEL: None. The needed faculty and staff are on hand to teach the proposed course (new faculty, Dr. Adams) without increases to existing teaching loads.

2. PHYSICAL FACILITY: None. All required classrooms and computer labs to teach the proposed course already exist within the McEniry Building.

3. EQUIPMENT AND SUPPLIES: None. All required equipment and supplies are either on hand or can easily be purchased with the Department's annual operating or lab fee budget.

4. COMPUTER: None. The meteorology computer laboratory (McEniry 203) was recently upgraded from 14 to 19 Linux machines. This upgrade can accommodate the proposed course at projected enrollment numbers.

5. AUDIO-VISUAL: None. The existing computer labs and "smart" classrooms in the McEniry Building are adequate.

6. OTHER RESOURCES: None. No additional resources for travel, communication, or publishing are required to support the proposed curricular changes.

7. SOURCE(S) OF FUNDING: None. No additional funding is required to support this proposal.

E. CONSULTATION WITH THE LIBRARY AND OTHER DEPARTMENTS OR UNITS:

1. LIBRARY: Consultation with Atkins Library was initiated by email on 2 October 2009, and the library reference staff confirmed that the holdings are sufficient to support this proposal (see attachment).

2. OTHER DEPARTMENTS: None required.

F. INITIATION AND CONSIDERATION OF THE PROPOSAL:

1. ORIGINATING UNIT: This proposal was initiated in August 2009 soon after Dr. Manda Adams was hired and arrived on campus. The proposal was passed unanimously by the Geography and Earth Science faculty on 20 November 2009. The department planned to submit the proposal to the CLAS Curriculum Committee in February 2010, but internal communication challenges resulted in an October 2010 submission.

2. OTHER CONSIDERING UNITS: None.

G. ATTACHMENTS:

Course Syllabus for ESCI 5240 Boundary Layer Meteorology
Course Syllabus for METR 4240 Boundary Laayer Meteorology
Letter of support from the Library

ESCI 5240
BOUNDARY LAYER METEOROLOGY
FALL 2011

Place and Times: McEniry 203, Monday / Wednesday at 2:00 - 3:15 pm

Prerequisite: METR 3210 or permission of the instructor

Instructor: Dr. Manda Adams
McEniry 232
704-687-5984
manda.adams@uncc.edu

Office Hours: Tuesday / Thursday 10:00 – 11:00 pm or by appointment

Required Texts: An Introduction to Boundary Layer Meteorology
Roland S. Stull
Kluwer Academic Publishers

Air Pollution Meteorology and Dispersion
S. Pal Arya
Oxford University Press

Course Description: This course examines the flow of mass, energy, and moisture within the planetary boundary layer including their exchange at the earth's surface and theories of interaction. Principles of air pollution, including sources, sinks, and controls, will also be explored, as will the interaction of the atmosphere with underlying surfaces (such as soils, vegetation, oceans, and glaciers). Finally, the course will examine the design and operation of instruments used to monitor the atmosphere with an emphasis on practical application.

Course Objectives:

1. Gain a basic understanding of the structure and evolution of the planetary boundary layer including interactions and exchanges between the atmosphere and a variety of underlying surfaces.
2. Gain a basic understanding of air pollution including its societal impacts.
3. Develop sufficient knowledge to effectively analyze and interpret observations collected by standard boundary layer instrumentation.
4. Learn to think critically about scientific research presented in professional journals as well as the continuum of modern media.

Course Policies:

Attendance, Participation and Due Dates: Regular class attendance and active participation is expected. You are responsible for all information presented in class; if you are absent, you will need to consult the online course management system (Moodle) or contact a classmate to obtain the material.

Assignment Deadlines and Exam Dates: I expect you to turn in assignments and take exams as scheduled - except due to extraordinary circumstances or participation in a university sanctioned event. I will not accept late assignments. If you know you will not be in class on the due date, turn the assignment in early. Exams will occur as scheduled and there are no make-up exams. If you miss an exam for what you believe to be a valid reason, you must provide written documentation in order for me to consider allowing a make-up exam. There will be no extra credit.

Academic Integrity: Students are responsible for knowing and following **The UNCC Code of Student Academic Integrity** http://www.legal.uncc.edu/policies/ps-105.html and **The UNCC Code of Student Responsibility** http://www.legal.uncc.edu/policies/ps-104.html in all aspects of their work in this course. This code forbids cheating, fabrication or falsification of information, multiple submissions of academic work, plagiarism, abuse of academic materials, and complicity of academic dishonesty. Standards of academic integrity will be enforced in this course. Any special requirements or permission regarding academic integrity in this course will be stated by the instructor, and are binding on the students. Questions regarding the policies and enforcement of the policies may be addressed to me during class or during office hours. Students are expected to report cases of academic dishonesty to the course instructor.

Accommodations: UNCC abides by interpretations of the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973 that stipulates no student shall be denied the benefits of an education "solely by reason of a handicap." Disabilities covered by law include, but are not limited to, learning disabilities, hearing, sight or mobility impairments, and other health related impairments. This course will gladly provide accommodations for students with documented needs. If you feel you need an accommodation, please contact the Office of Disability Services, Fretwell Room 230, phone 704-687-4355 for the necessary evaluation and documentation.

Course Requirements:

Homework: A total of 5 homework assignments will be given. Each homework will consist of several in-depth exercises related to the current topic(s), and will involve the examination of data from a variety of observing platforms, numerical models, cases studies, and/or multi-media instructional modules. You are required to show and/or explain your work on all homework assignments. You are encouraged to work together on homework, but each should submit one's individual work.

Paper Presentation: Each student will read, critique, and orally present a professional journal article on a boundary layer phenomenon. Oral presentations (13-15 minutes in length) should include a summary of the article's methodology and results, as well as a critique of the data used, methods, and/or results. The article may be chosen from a provided list or selected independently. All articles must be approved by the instructor. *The list of potential articles and the evaluation rubric will be forthcoming.*

Research Project: Each student will conduct an independent research project on a boundary layer process or phenomenon of their choice. The project should consist of the observational analysis and/or modeling of the event using operational or research data networks. Each student will present their results in a paper (6-10 pages not including tables and figures) and an oral presentation (18-20 minutes in length). The format of the paper must follow the American Meteorological Society publication guidelines.

Exams: There will be two exams during the semester (in class on September 29 and November 03) and a cumulative final exam (December 15 at 3:30 – 6:30 pm). The final exam day and time **may not** be rescheduled; plan your semester break departure to accommodate this time.

Evaluation:

The grading scale will be a standard percentile scale. Your final grade will be calculated using the following formula:

Homework (5 @ 20 pts. each)	100
Paper Presentation	100
Research Paper	100
Research Presentation	100
Exams (2 @ 50 pts. each)	100
Cumulative Final Exam	100
Total Points	600

Percent	Grade
90-100	A
80-89	B
70-79	C
0-69	U

Tentative Class Schedule:

Week	Date		Subject
1	Mon	8/23	Introduction to the Course and the Planetary Boundary Layer
	Wed	8/25	Mean Boundary Layer Characteristics
2	Mon	8/30	Mean Boundary Layer Characteristics
	Wed	9/01	Turbulent Flow
3	Mon	9/06	**No Class – Labor Day**
	Wed	9/08	Turbulent Flow
4	Mon	9/13	Turbulence Closure Techniques
	Wed	9/15	Turbulence Closure Techniques
5	Mon	9/20	Boundary Conditions and Surface Exchange
	Wed	9/22	Boundary Conditions and Surface Exchange
6	Mon	9/27	Boundary Conditions and Surface Exchange
	Wed	9/29	**Exam 1**
7	Mon	10/04	Convective Boundary Layer
	Wed	10/06	Convective Boundary Layer
8	Mon	10/11	**No Class – Fall Break**
	Wed	10/13	Stable Boundary Layer
9	Mon	10/18	Stable Boundary Layer
	Wed	10/20	Boundary Layer Instrumentation and Measurement Techniques
10	Mon	10/25	Boundary Layer Instrumentation and Measurement Techniques
	Wed	10/27	Boundary Layer Instrumentation and Measurement Techniques
11	Mon	11/01	Boundary Layer Instrumentation and Measurement Techniques
	Wed	11/03	**Exam 2**
12	Mon	11/08	Fundamentals of Air Pollution
	Wed	11/10	Sources and Sinks of Air Pollution
13	Mon	11/15	Sources and Sinks of Air Pollution
	Wed	11/17	Controls on Air Pollution
14	Mon	11/22	Controls on Air Pollution
	Wed	11/24	**No Class – Thanksgiving Break**
15	Mon	12/29	Paper Presentations
	Wed	12/01	Paper Presentations
16	Mon	12/06	Paper Presentations
	Wed	12/08	Graduate Research Presentations
17	Wed	12/15	**Cumulative Final Exam 3:30 – 6:30 pm**

METR 4240
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FALL 2011

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The grading scale will be a standard percentile scale. Your final grade will be calculated using the following formula:

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Paper Presentation	100
Exams (2 @ 50 pts. each)	100
Cumulative Final Exam	100
Total Points	400

Percent	Grade
90-100	A
80-89	B
70-79	C
60-69	D
0-59	F

Tentative Class Schedule:

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2	Mon	8/30	Mean Boundary Layer Characteristics
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	Wed	12/08	Graduate Research Presentations
17	Wed	12/15	**Cumulative Final Exam 3:30 – 6:30 pm**

J. Murrey Atkins Library

Memorandum

TO: Dr. Matthew D. Eastin

FROM: Barbara G. Tierney
Liaison Librarian to Earth Sciences

DATE: September 8, 2009

RE: **Consultation with Library for new Course and Curriculum Proposal**

Date of initiation of consultation with Library Reference personnel: Request received October 2, 2009

Courses/Program: METR 4240 / ESCI 5240 Boundary Layer Meteorology

The Dept. of Geography and Earth Sciences proposes to add these courses to the M.S. and undergraduate Earth Science curriculum. At present, there are only six courses offered at the graduate level at UNCC with a focus on either meteorology or climatology. This proposed course would provide graduate students with such interests a broader selection of coursework than is presently offered.

Boundary-Layer Meteorology examines the flow of mass, energy, and moisture within the planetary boundary layer including their exchange at the earth's surface and theories of interaction. It also examines: principles of air pollution (including sources, sinks, and controls); interaction of the atmosphere with underlying surfaces (i.e. soils, vegetation, oceans, glaciers); design and operation of instruments used to monitor the atmosphere, with an emphasis on practical application.

Summary of Librarian's Evaluation of Holdings:

Evaluator: Barbara Tierney_____ Date: October 8, 2009

Please Check One:

Holdings are superior	____
Holdings are adequate	**_x___**
Holdings are adequate only if Dept. purchases additional items.	_____
Holdings are inadequate	____

Comments: After a careful review of relevant library collections, I find current library holdings to be adequate to support the proposed new undergraduate/graduate course "METR 4240 and ESCI 5240 Boundary Layer Meteorology. Specifically I find that the J. Murrey Atkins Library has adequate print and electronic indexes, databases, journals and books to support these new courses. Please see below for details regarding existing relevant library holdings:

Available Reference Indexes and Databases include (electronic and print)
Earth and Environmental Sciences
GEOBASE
GeoScience World
GeoRef
Pollution Abstracts
Science Direct
Springer Verlag
Web of Science
Wiley Interscience
Academic Search Premier

Books:

Required Texts:

An introduction to boundary layer meteorology, by Roland S. Stull. Kluwer, 2003.
Atkins Library currently does not have this title.

Air pollution, meteorology and dispersion, by S. Pal Arya. Oxford Univ. Press, 1999.
Atkins Library currently has the 1999 edition of this title (QC 882 A856 1999)

Atkins General Collections books:

Below is a table of the number of holdings under relevant Library of Congress Subject Headings. In addition, the field is supported by a large collection of federal documents received through the federal depository library program.

LC Subject Heading or Keyword	Monographs in General Collection	
	Total number	Published 2000+
Climatology	98	15
Meteorology	59	5
Boundary Layer (Meteorology)	21	0
Air- Pollution - Meteorological Aspects	6	0
Pollution - Social Aspects	2	0
Ocean - Atmosphere Interaction	34	6
Ocean - Atmosphere Interaction - Mathematical Models	3	0
Atmospheric Turbulence	28	5
Turbulent Boundary Layer	29	0

SUMMARY:

I believe that the J. Murrey Atkins Library has sufficient relevant databases, indexes, journals, and books to support the new undergraduate/graduate courses – METR 4240/ESCI 5240 Boundary Layer Meteorology. It is recommended, however, that the Earth Science Department continue to purchase additional current monographic materials in the above subject areas to update relevant collections.

Barbara Tierney *Barbara Tierney, Liaison Librarian to Earth Sciences*, Oct. 8, 2009

_____

Evaluator's Signature **Date**