2014-2015 LONG SIGNATURE SHEET

RECEIVED 5.11.15

REVISIONS RECEIVED 9.02.15

Proposal Number: GEES 03-15-2015 A

Proposal Title: Addition of 3 new courses 5000 Level to MS Earth Sciences Degree.

UNC CHARLOTTE

Originating Department: Geography and Earth Sciences

TYPE OF PROPOSAL: UNDERGRADUATE_____ GRADUATE X UNDERGRADUATE & GRADUATE____
(Separate proposals sent to UCCC and Grad. Council)

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
3/15/2015	4/29/15	5/6/15	Approved	**DEPARTMENT CHAIR** Craig Alla- [print name here:]
	8/28/15	9/2/15	Approved	**COLLEGE CURRICULUM COMMITTEE CHAIR** Janet E Levy Janet E. Levy [print name here:]
	9-4-15	9-4-15	Approved	**COLLEGE FACULTY CHAIR (if applicable)** Elizabeth Stearns [print name here:] Elizabeth Stearns
	9/4/15	9/4/15	Approved	**COLLEGE DEAN** [print name here:] Shawn Long
			Approved	**GENERAL EDUCATION** (if applicable; for General Education courses) [print name here:]
			Approved	**HONORS COLLEGE** (if applicable; for Honors courses & programs) [print name here:]
			Approved	**UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR** (for undergraduate content)
9-8-15	10-6-15	10-9-15	Approved	**GRADUATE COUNCIL CHAIR** (for graduate content) Dennis Livesay, Chair
				FACULTY GOVERNANCE ASSISTANT (Faculty Council approval on Consent Calendar)
				FACULTY EXECUTIVE COMMITTEE (if decision is appealed)

UNC CHARLOTTE

LONG FORM
COURSE AND CURRICULUM PROPOSAL

To: **Graduate Course and Curriculum Committees**

From: **Casey Davenport, Matthew Eastin, and Brian Magi**
Department of Geography and Earth Sciences

Date: **15 March 2015**

Re: **Addition of new elective courses for the M.S. Earth Sciences program**

SUMMARY:

The Department of Geography and Earth Sciences (GES) proposes to add three new courses for the M.S. Earth Sciences program: ESCI 5105 Meteorological Computer Applications, ESCI 5110 Atmospheric Instrumentation, and ESCI 5205 Climate Dynamics. These courses expand the elective course options available to our diverse cadre of students in both the M.S. Earth Sciences and M.A. Geography programs, and will help maintain relevance and currency to the applied components of our graduate programs.

TITLE: *Addition of new elective courses for the M.S. Earth Sciences program*

CONTENT OF PROPOSAL

A. PROPOSAL SUMMARY:

The Department of Geography and Earth Sciences proposes to add the following three courses to the M.S. Earth Sciences curriculum:

ESCI 5105 Meteorological Computer Applications (3)
ESCI 5110 Atmospheric Instrumentation (3)
ESCI 5205 Climate Dynamics (3)

These courses expand the elective course options available to our diverse cadre of students in both the M.S. Earth Sciences and M.A. Geography programs, and will help maintain relevance/currency to the applied components of our graduate programs.

B. JUSTIFICATION.

NEEDS ADDRESSED: Two recent events have encouraged the proposed course additions to the M.S. Earth Sciences program. ***First*** and foremost, the majority of atmospheric-focused graduates from the M.S. Earth Sciences program either pursue a doctoral degree or employment with the federal government, broadcast communication companies, or private firms. These organizations use the minimum curriculum requirements set forth by the American Meteorological Society (AMS) for employment and/or certification as a meteorologist or atmospheric scientist. The AMS recently updated these requirements to include instruction on climate dynamics and a holistic treatment of atmospheric instrumentation. The creation of two new courses (ESCI 5110 Atmospheric Instrumentation and ESCI 5205 Climate Dynamics) will address the need for those students who enter the M.S. program without an undergraduate degree in meteorology or atmospheric science to obtain the necessary coursework. These additions will allow our graduates to remain highly competitive for the full spectrum of career opportunities and doctoral programs.

Second, many students entering the program lack sufficient computer skills to develop the customized software (using advanced computing or scripting languages such as FORTRAN, C++, Matlab, IDL, or Python) required to complete their master's thesis research projects. In the past, we have offered independent studies on a case-by-case basis to teach the necessary skills. However, the recent hiring of Dr. Casey Davenport, who is an expert with computer software and applications related to the atmospheric sciences, allows the program to develop a tailored course. This course addition will not only address a programmatic instructional need, but will also address the common desire by employers that their employees have the ability to develop new computer software that can help their organization address contemporary challenges in the geosciences.

PREREQUISITES AND COREQUISITES: The pre/corequisites rationale associated with each proposed course are ***based on their undergraduate counterparts (at the 4000-level) and their integration within the B.S. Meteorology program.*** Nevertheless, they are discussed here for completeness. First, many computer applications introduced in ESCI 5105 require understanding of fundamental meteorological concepts and the application of elementary calculus, and thus METR 3140 and MATH 1241 have been included as prerequisites. Second, the instrumentation concepts introduced in ESCI 5110 are extensions of classic thermodynamics, and thus METR 3210 is included as the prerequisite. Third, the climate dynamics concepts introduced in ESCI 5205 require understanding of fundamental meteorology and climatology, as well as sufficient computer skills to develop dynamic-based models of the climate system, and thus METR 3140, ESCI 3101, and METR 4105 are included as prerequisites with METR 3250 included as a prerequisite or corequisite. Finally, the proposed requirement of "a grade of C or better" on several prerequisites for ESCI 5105, 5110, and 5205 is consistent with other courses in the B.S. Meteorology program. All pre/corequisites are incorporated into the catalog course descriptions (further below).

CONSISTENCY OF COURSE NUMBERING: All selected course numbers are consistent with the course numbering guidelines listed in the current graduate catalog. Moreover, all course numbers were selected to ensure all course pre/corequisites courses were smaller than the current course (and thus implying a level of academic advancement from the pre/corequisite courses). Finally, all new courses were assigned numbers at the 5000-level since they address introductory graduate-level concepts, and so they could be cross-listed at the 4000-level.

IMPROVEMENT: This proposal will improve the department's offerings for graduate students with an atmospheric focus by bringing the elective curriculum in line with the new AMS guidelines for a meteorology or atmospheric science job position. Such additions will allow our graduates to remain highly competitive for the full spectrum of career opportunities and doctoral programs.

PREVIOUS OFFERINGS AS TOPICS COURSES: Not applicable – none of the proposed courses have been offered previously as topics courses. Rather the proposed courses and changes embody a pro-active strategy to address the aforementioned changes to the AMS guidelines in a manner consistent with current faculty resources and workloads.

C. IMPACT.

GROUP(S) SERVED: Graduate students with an atmospheric interest who are enrolled in the M.S. Earth Sciences and B.A. Geography programs will be served by this proposal.

EFFECT ON EXISTING COURSES AND CURRICULA: Each course will be taught once per year – ESCI 5110 will be taught each fall, while ESCI 5105 and ESCI 5205 will be taught each spring. Enrollments in each proposed course will average 4-5 graduate students (combined with up to 15-20 undergraduate students) per offering. As such, the addition of the proposed courses will not significantly impact the enrollment or offering frequency of other graduate-level ESCI, GEOL, or GEOG courses.

RESOURCES REQUIRED TO SUPPORT PROPOSAL

A. **PERSONNEL:** None – The needed faculty and staff are on-hand to offer the proposed courses without changes to teaching loads or contact hours – Casey Davenport will teach ESCI 5105 , Matthew Eastin will teach ESCI 5110, and Brian Magi will teach ESCI 5205.

B. **PHYSICAL FACILITY:** None – All required classrooms and computer labs to teach the existing and restructured courses already exist within the McEniry Building.

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

D. **COMPUTER:** None – The atmospheric computer lab (McEniry 203) has 19 Linux-based machines that can accommodate projected enrollments for each proposed course.

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

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

G. **SOURCE OF FUNDING:** None – No additional funding is required to support this proposal.

CONSULTATION WITH THE LIBRARY AND OTHER DEPARTMENTS OR UNITS

A. **LIBRARY CONSULTATION:** Atkins Library staff was consulted by email on 5 March 2015 regarding the adequacy of its holdings for each course. Library staff responded on 6 March 2015 that its holdings were adequate – consultation forms are attached.

B. **CONSULTATION WITH OTHER DEPARTMENTS OR UNITS:** No need for consultation with other departments. All proposed courses and curriculum changes only impact the M.S. Earth Sciences program.

C. **HONORS COUNCIL CONSULTATION:** Not Applicable.

INITIATION, ATTACHMENTS AND CONSIDERATION OF THE PROPOSAL

A. **ORIGINATING UNIT**: The department wishes to maintain currency and relevance in its graduate programs. Given pending changes to the AMS expectations for employment as a meteorologist or atmospheric scientist, the department feels the proposed changes will most effectively fulfill the new expectations without a significant increase in total credit hours or an immediate need for new instructional resources. The proposal was evaluated by the department's graduate curriculum committee and was circulated to all GES faculty. No objections were raised by the departmental faculty, and the proposal passed by a unanimous vote.

B. CREDIT HOUR. (Mandatory if new and/or revised course in proposal): Review statement and check box once completed:

☑ The GES Graduate Advisory Committee (responsible for graduate curriculum) has reviewed the respective course syllabi and determined the proposed assignments are sufficient and meet the university definition for the respective number of credit hours.

C. ATTACHMENTS:

CONSULTATION: Atkins Library consultations for each course are provided below.

COURSE OUTLINE/SYLLABUS: Syllabi are attached below for each course.

PROPOSED CATALOG COPY: Only those sections of the M.S. Earth Sciences catalog copy to which text is to be added or changed are included below (using the red-strike and blue-underline format). All other portions of the catalog remain unchanged. A *combined* checklist is provided for all new courses.

☑ New/revised courses will be cross listed with other courses.
☑ There are pre-requisites for the new/revised courses.
☑ There are co-requisites for the new/revised courses.
☐ The new/revised courses are repeatable for credit.
☐ This course will increase/decrease the number of credits hours currently offered (required) by its program
☐ This proposal results in the deletion of an existing course(s) from the degree program and/or catalog.

COURSES IN EARTH SCIENCES AND GEOLOGY

Earth Sciences (ESCI)

ESCI 5105. Meteorological Computer Applications. (3) Prerequisites: METR 3140 and MATH 1241 with a grade of C or above, or permission of instructor. Principles of computer programming applied to the analysis of meteorological data. Students will become familiar with the Unix environment, learn programming basics, and create programs to analyze various meteorological datasets. Topics include program composition, compiling, data types, mathematical operators, selective execution, repetitive execution, arrays, functions, and subroutines. Three hours of combined lecture and lab per week. (*Spring*)

ESCI 5110. Atmospheric Instrumentation. (3) Prerequisite: METR 3210 with a grade of C or above, or permission of the instructor. An overview of common atmospheric measurements systems and their applications. Particular attention is paid to surface, sounding, radar, and satellite systems. Three hours of combined lecture and lab per week. (*Fall, On demand*)

ESCI 5205. Climate Dynamics. (3) Prerequisites: ESCI 3101 and METR 4105 with a grade of C or above; Pre- or corequisite: METR 3250; or permission of instructor. Topics include global climate, climate variability, and dynamics within the climate system, with a focus on the role of the atmosphere in the climate system. The El Niño phenomenon provides the main example of how climate variability can affect weather, and seasonal weather forecasting. Three hours of combined lecture and lab per week. (*Spring*)

ACADEMIC PLAN OF STUDY **(UNDERGRADUATE ONLY)**: Does the proposed change impact an existing Academic Plan of Study?

- ☐ Yes
- ☐ No
- ☑ N/A

STUDENT LEARNING OUTCOMES (**UNDERGRADUATE & GRADUATE**): Does this course or curricular change require a change in Student Learning Outcomes (SLOs) or assessment for the degree program?

- ☐ Yes
- ☑ No
- ☐ N/A

TEXTBOOK COSTS: It is the policy of the Board of Governors to reduce textbook costs for students whenever possible. Have electronic textbooks, textbook rentals, or the buyback program been considered and adopted?

- ☑ Yes – Several texts already have electronic editions available, and the students will be encouraged to purchase and/or rent the electronic editions. For other texts, every effort will be made to adopt electronic editions as they become available.
- ☐ No
- ☐ N/A

IMPORTANT NOTE: A Microsoft Word version of the final course and curriculum proposal should be sent to facultygovernance@uncc.edu upon approval by the Undergraduate Course and Curriculum Committee and/or Graduate Council chair.

UNC CHARLOTTE

J. Murrey Atkins Library

Consultation on Library Holdings

To: **Matthew Eastin**

From: **Jeff McAdams**

Date: **3/6/15**

Subject: **METR 4105/ESCI 5105 – Meteorological Computer Applications**

Summary of Librarian's Evaluation of Holdings:

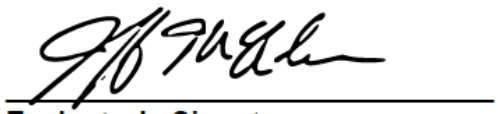
Evaluator: **Jeff McAdams** **Date: 3/6/15**

Check One:

1. Holdings are superior _____
2. Holdings are adequate __x__
3. Holdings are adequate only if Dept. purchases additional items. _____
4. Holdings are inadequate _____

Comments:
Library holdings should be adequate to support student research for this course (see list of items held by subject heading below). Students will have access to relevant databases including GeoRef, Geo Science World, Compendex, Inspec, Web of Science, Science Direct, Academic Search Premier, Wiley Online Library, SpringerLink, and many others.

LC Subject Heading	Books	Journals
Fortran	221	2
Unix	100	3



Evaluator's Signature

3/6/15

Date

UNC CHARLOTTE

J. Murrey Atkins Library

Consultation on Library Holdings

To: **Matthew Eastin**

From: **Jeff McAdams**

Date: **3/6/15**

Subject: **METR 4110/ESCI 5110 – Atmospheric Instrumentation**

Summary of Librarian's Evaluation of Holdings:

Evaluator: **Jeff McAdams** **Date: 3/6/15**

Check One:

1. Holdings are superior _____
2. Holdings are adequate __x__
3. Holdings are adequate only if Dept. purchases additional items. _____
4. Holdings are inadequate _____

Comments:
Library holdings should be adequate to support student research for this course (see list of items held by subject heading below). Students will have access to relevant databases including GeoRef, Geo Science World, Compendex, Inspec, Web of Science, Science Direct, Academic Search Premier, Wiley Online Library, SpringerLink, and many others.

LC Subject Heading	Books	Journals
Meteorological Satellites	145	2
Radar Meteorology	98	2
Doppler Radar	79	2
Remote Sensing/Photogrammetry	51	10

Evaluator's Signature

3/6/15

Date

UNCCHARLOTTE

J. Murrey Atkins Library

Consultation on Library Holdings

To: **Matthew Eastin**

From: **Jeff McAdams**

Date: **3/6/15**

Subject: **METR 4205/ESCI 5205 – Climate Dynamics**

Summary of Librarian's Evaluation of Holdings:

Evaluator: **Jeff McAdams** **Date: 3/6/15**

Check One:

1. Holdings are superior _____
2. Holdings are adequate __x__
3. Holdings are adequate only if Dept. purchases additional items. _____
4. Holdings are inadequate _____

Comments:
Library holdings should be adequate to support student research for this course (see list of items held by subject heading below). Students will have access to relevant databases including GeoRef, Geo Science World, Compendex, Inspec, Web of Science, Science Direct, Academic Search Premier, Wiley Online Library, SpringerLink, and many others.

LC Subject Heading	Books	Journals
Climatology	651	167
Climate Change	431	9
Climate Science	325	1
Atmospheric Science	92	1

Evaluator's Signature

3/6/15

Date

METR 4105/ESCI 5105
Meteorological Computer Applications
Spring 2016

Place and Time: McEniry 203, Monday and Wednesday, 3:30-4:45pm

Prerequisites: METR 3140 with grade of C or above and MATH 1241

Instructor: Dr. Casey Davenport
Casey.Davenport@uncc.edu
McEniry 239
704-687-5984

Textbook: *FORTRAN 95/2003 for Scientists and Engineers,* S. Chapman, 2007

Grades:

Assignment	Undergraduate	Graduate
Programs/Homework	40%	25%
Exam 1	15%	10%
Exam 2	15%	10%
Final Project	30%	35%
Final Paper	--	20%

Graduate Grading Scale:

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

Course Objectives:

- Gain basic programming skills through an understanding and proficiency in the Fortran programming language
- To learn and use the Unix operation environment for Fortran processing
- Strengthen problem solving skills through debugging code
- Apply programming skills to meteorological applications

Course Policies:

***Attendance*:** Regular class attendance and active participation is expected of each student. You are responsible for all information presented in class; if you are absent, you will need to contact a classmate and/or visit the website to obtain the material. If you choose to miss class, do not expect me or the TA to provide private tutoring on what was missed. However, if you miss class for circumstances beyond your control, please ask for help!

***Announcements*:** Course announcements not made in class will be posted on Moodle and/or sent via e-mail. It is your responsibility to regularly check Moodle and your e-mail.

***Cell phones*:** Please turn off your cell phone before class starts. Emailing, texting, playing Candy Crush, etc. are all strictly prohibited during class. If I catch you doing any of those things in class, I will confiscate your phone until the end of class. If I need to do this more than once, I will start deducting 5% off of your next exam grade for each infraction.

***Late Assignments*:** Late assignments will be accepted only until the assignment is handed back or the answer key is distributed to the class. For each *calendar day* beyond the due date, late assignments will receive 10% off.

***Missed Exams*:** 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.

***Computer Etiquette*:** Class time will be split between lectures/demonstrations and time to work on programming assignments. You will be expected to give your full attention to the task at hand, and not distract yourself by checking Facebook or your fantasy sports league. If I catch you working on anything that is not class-related, the infraction will be the same as using your cell phone: I will deduct 5% off of your next exam grade for each infraction.

***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 230, Phone: 704-687-4355 for the necessary evaluation and documentation.

***Diversity*:** The University of North Carolina at Charlotte is committed to equality of educational opportunity and does not discriminate against students or employees based on race, color, national origin, religion, sex, sexual orientation, age or disability.

Course Requirements:

***Class participation (all students)*:** You are expected to be engaged while in class. This includes taking notes, asking questions, and working on programming assignments in class.

***Homework (all students)*:** There will be 8 homework assignments over the course of the semester (approximately once a week, except near exams). These assignments will ask you to apply a programming concept discussed in class and create your own program to complete some meteorological analysis. I encourage you to work with your classmates and help each other debug code; however, you must each submit your own work. You may not simply copy and paste someone else's code. The idea is for you to flex your problem solving skills in putting a workable coded program together.

***Exams (all students)*:** There will be two mid-semester exams (occurring as scheduled) and a final project.

***Final project (all students)*:** Each student will complete a final project that applies all concepts learned over the course into one program that analyzes a dataset of your choice (more details given later in the semester).

***Final paper (graduate students only)*:** In addition to the final project, graduate students will be expected to write a 5—7 page paper summarizing the findings from your analysis completed via the final project.

Course Topics:

- Introduction to Computing and Computers (Chapter 1 of text)
  - Introduction to the Unix Environment
  - Editing in the Unix Environment
  - Compiling and Execution
- Basic Fortran (Chapter 2 of text)
  - Program composition
  - Data types / Operations
  - Assignment
  - Input/output basics
- Selective Execution (Chapter 3 of text)
  - Logical expressions
  - Logical data types
- Repetitive Execution (Chapter 4 of text)
  - Do loops
  - Do While loops
- Input / Output (Chapter 5 of text)
  - Formatted output and formatted input
  - Write/read/file processing
- Arrays (Chapter 6 of text)
  - One-dimensional
  - Multi-dimensional
- Programming with Functions (Chapter 7 of text)
  - Library functions
  - External and intrinsic statements
- Programming with Subroutines (Chapter 8 of text)
  - Sub-programs
  - Common statements

METR 4110 / ESCI 5110
ATMOSPHERIC INSTRUMENTATION
FALL 2015

Place and Times:	McEniry 203, Monday / Wednesday at 11:00 am - 12:15 pm
Prerequisites:	METR 3210 with a grade of C or above, or permission of the instructor
Instructor:	Dr. Matthew Eastin McEniry 209 704-687-5914 mdeastin@uncc.edu
Office Hours:	Monday / Wednesday 1–2 pm, or by appointment
Required Text:	None – All presentations and reading material will be provided.
Supplemental Text:	*Meteorological Measurement Systems*, by Brock and Richardson, 2001 *Radar for Meteorologists*, by Reinhart, 2004 *Doppler Radar and Weather Observations*, by Doviak and Zrnic, 2006 *Satellite Meteorology – An Introduction*, by Kidder and VonderHaar, 1995
Website:	http://clas-pages.uncc.edu/matt-eastin/classes/atmos-instruments/

Course Description: An overview of common atmospheric measurements systems and their applications. Particular attention is paid to surface, sounding, radar, and satellite systems.

Course Objectives:

1. Gain a basic understanding of common atmospheric measurement systems and applications.
2. Develop the necessary knowledge to acquire, analyze, and interpret observations from a variety of common atmospheric measurements systems used forecast and research settings.

Course Policies:

Attendance and Participation: Regular class attendance and active participation (e.g., taking notes and asking questions) is expected. You are responsible for all information presented in class; if you are absent, you will need to contact a classmate and/or the website to obtain the material. Use of phones, email, texting, or music players during class is prohibited.

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 college-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 *individual* extra credit, but group extra credit may be offered during the semester.

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.

Diversity: The University of North Carolina at Charlotte is committed to equality of educational opportunity and does not discriminate against students or employees based on race, color, national origin, religion, sex, sexual orientation, age or disability.

Course Requirements:

Class Participation (all students): Each student is required to attend each class period and actively participate (i.e., take notes and ask questions) throughout the period. Use of cell phones, text messaging, email, personal music players, or similar communications during class is prohibited: any student engaging in such activity will immediately lose *all participation* points for the semester.

Homework (all students): A total of 8 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 case study data from observing platforms. 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.

Research Project (ESCI 5110 students only): Each graduate student will conduct an independent research project using observations from at least one observing platform of their choice. The project should consist of a literature review, analysis of observations, and an overview of your salient results. Each student will present their results in a written paper (10-12 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. Evaluation rubrics for the paper and presentation will be made available on the course website.

Exams (all students): There will be one mid-term exam and one cumulative final exam. The final exam day and time ***may not*** be rescheduled; plan your semester break departure to accommodate this exam time.

Evaluation:

The grading scale will be a standard percentile scale. Your final grade will be calculated based on the following total points:

	METR 4110	ESCI 5110
Class Participation	50	50
Homework (8 @ 20 pts. each)	200	200
Research Paper	---	100
Research Presentation	---	100
Exam #1 (mid-term)	50	50
Exam #2 (final)	100	100
Total Points	400	600

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

Topics Covered:

1. Surface Measurement Systems — *2 Homework assignments*
- **a.** Operational and research platforms
- **b.** Instrument design
- **c.** Standards – calibration / exposure
- **d.** Quality Assurance

2. Atmospheric Sounding Systems — *2 Homework assignments*
- **a.** Operational and research platforms
- **b.** Instrument design
- **c.** Standards
- **d.** Quality Assurance

3. Overview of Electromagnetic Theory — *1 Homework assignment*

4. Precipitation Radar Systems — *2 Homework assignments*
- **a.** Operational and research platforms
- **b.** Fundamentals of Radar
- **c.** Fundamentals of Doppler Radar
- **d.** Display / Application of Radar Observations
- **e.** Polarimetric Radars
- **f.** Airborne Radars

5. Satellite Systems — *1 Homework assignment*
- **a.** Operational Platforms
- **b.** Orbits and Navigation
- **c.** Retrieval Methods
- **d.** Fundamentals of Image Interpretation

METR 4205 / ESCI 5205 Climate Dynamics

Place and Times:	TBD (2 lectures per week, 3 credits)
Final Exam:	TBD
Prerequisites:	METR 3250 (Dynamic Meteorology) (or co-requsite) METR 4105 (Meteorological Computer Applications) with grade C or above ESCI 3101 (Global Environmental Change)
Instructor:	Dr. Brian Magi McEniry 232 704-687-5917 **brian.magi@uncc.edu**
Office Hours:	TBD
Required Textbook:	*Climate Change and Climate Modeling*, Neelin, 2011
Supplemental Textbooks:	*Atmospheric Sciences: An Introductory Survey*, Wallace and Hobbs, 2006 *Global Physical Climatology*, Hartmann, 1994 *Climate Studies: Introduction to Climate Science*, Moran, 2010
Teaching Assistant:	TBD
Website:	moodle2 https://clas-pages.uncc.edu/mesas/teaching/climate-dynamics/

Description

Climate dynamics deals with the climate system and the natural variability that causes global climate change but also affects seasonal weather patterns in different ways around the world. El Nino Southern Oscillation is perhaps to most well-known phenomenon that is classified as a source of natural variability in the climate system. Part of the course is learning about how to talk about this natural variability, but another part of the course will explicitly cover computational methods to diagnose the natural variability via analytical diagnostics. Finally, the course will address questions about how the present-day climate change, which is driven largely by increases in human activities over the last two centuries, will affect the strength and frequency of natural climate variability.

Objectives

1. Develop an understanding of the diagnostics used to evaluate natural processes affecting global climate
2. Determine how natural climate variability affects global weather
3. Determine how natural climate variability is affected by anthropogenically-driven climate change

Course Components

Participation: Class participation can completely alter your classroom and university experience. Some lectures may include a short 'concept' quiz or short group work to re-visit previous material.

Project and Presentation: Students will be responsible for a class project and a 15 minute presentation of their project near the end of the semester. Details will be provided within the first weeks of the course.

Problem Sets: Problem sets are based on the class material and designed to help you successfully synthesize lecture materials with analytical thinking. This synthesis is a key component of your success on the exams.

Exams There will be 2 mid-term exams and a cumulative final exam. The dates for the mid-term exams will be set early in the semester. The final exam is set by UNC Charlotte.

Grades

Letter grades will be assigned according to the percentage of points earned for the course components listed below. Percentage categories for 4205 students are 90-100, 80-89, 70-79, 60-69, 0-59 and earn A, B, C, D, and F respectively. For 5205 students, 90-100, 80-89, 70-79, 0-69 earn A, B, C, and U, respectively. Assignments must be turned in on time and exams must be taken as scheduled. I will accept assignments turned in early, but not late except under unusual circumstances.

Description	*4205 Grade Fraction*	*5205 Grade Fraction*
Participation	5%	-
Project/Presentation	40%	60%
Problem Sets	15%	10%
Mid-term Exams	20%	20%
Final exam	20%	10%

Course Outline

This schedule is subject to change and is intended to provide a general framework for the course. Time spent on specific topics will depend on the backgrounds and interests of the students.

Weeks	*Topics*
1-3	Global climate and climate variability
4-12	Dynamics in the climate system
13-14	Modern climate change
15-16	Class project presentations

Class Policies

No mobile devices of any sort may be used during class.

University Policies

Academic Integrity: Students are responsible for knowing and following The Code of Student Academic Integrity and The Code of Student Responsibility found at http://www.legal.uncc.edu/policies/ps-105.html and http://www.legal.uncc.edu/policies/ps-104.html respectively. Standards of academic integrity will be enforced in this course.

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 230, Phone 704-687-4355 for the necessary evaluation and documentation.

Diversity: The University of North Carolina at Charlotte is committed to equality of educational opportunity and does not discriminate against students or employees based on race, color, national origin, religion, sex, sexual orientation, age or disability.