2014-2015 LONG SIGNATURE SHEET

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UNC CHARLOTTE

Proposal Number: GEES 03-15-2015B

Proposal Title: Revision of the Degree Requirements for BS in Meteorology

Originating Department: Geography and Earth Sciences

TYPE OF PROPOSAL: UNDERGRADUATE ✓ **GRADUATE** _____ **UNDERGRADUATE & GRADUATE** ___

(Separate proposals sent to UCCC and Grad. Council)

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
4/16/15	4/29/15	5/4/15	*Approved*	**DEPARTMENT CHAIR** Craig Allan [print name here:]
			Approved 9/3/15	**COLLEGE CURRICULUM COMMITTEE CHAIR** Carol Leeman [print name here:]
	9-4-15	9-4-15	*Approved*	**COLLEGE FACULTY CHAIR (if applicable)** Elizabeth Stearns [print name here:]
	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)
			Approved	**GRADUATE COUNCIL CHAIR** (for graduate content)
				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: **Undergraduate Course and Curriculum Committees**

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

Date: **15 March 2015**

Re: **Revision of the degree requirements for a B.S. in Meteorology.**

SUMMARY:

The Department of Geography and Earth Sciences (GES) proposes to revise the degree requirements for a B.S. in Meteorology in the following manner: (1) creation of three new courses (METR 4105, METR 4110, and METR 4205); (2) significant revisions to two existing courses (METR 3250 and METR 3330); (3) removal of four courses (GEOL 1200, GEOL 1200L, ITCS 1212, and ITCS 1212L) from the degree requirement list and addition of two new courses (METR 4105 and METR 4205) and one existing course (ESCI 3101) to the degree requirement list – which collectively results in a 1-credit increase in the total required hours for the degree program; (4) several revisions to the list of approved elective courses; and (5) change one existing course name to better reflect its current content.

GES wishes to maintain currency and relevance with its undergraduate programs. Due to pending changes in the American Meteorological Society's (AMS's) requirements for an undergraduate meteorology curriculum (will take effect in Fall 2015), the department feels the proposed changes will effectively fulfill all new expectations without a significant increase in total credit hours or an immediate need for new faculty resources.

TITLE: ***Revision of the degree requirements for a B.S. in Meteorology***

CONTENT OF PROPOSAL

A. PROPOSAL SUMMARY:

The Department of Geography and Earth Sciences proposes to revise the degree requirements for a B.S. in Meteorology in the following specific manner:

1. Add the following new courses to the undergraduate curriculum:

   METR 4105 Meteorological Computer Applications (3)
   METR 4110 Atmospheric Instrumentation (3)
   METR 4205 Climate Dynamics (3)

2. Change METR 3250 Dynamic Meteorology (currently a 4-credit course with both lecture and laboratory components) to a 3-credit course without the laboratory component.

3. Add the "W" designation to METR 3330 Forecasting

4. Remove the following courses from the required course list:

   GEOL 1200 Physical Geology (3)
   GEOL 1200L Physical Geology Laboratory (1)
   ITCS 1212 Introduction to Computer Science (3)
   ITCS 1212L Introduction to Computer Science Lab (0)

5. Add the following courses to the required course list:

   ESCI 3101 Global Environmental Change (3)
   METR 4105 Meteorological Computer Applications (3)
   METR 4205 Climate Dynamics (3)

6. Remove the following courses from the elective course list:

   GEOG 2103 Elements of GIScience and Technologies (4)
   GEOG 4120 Fundamentals of GIS (4)

7. Add the following courses to the elective course list:

   ESCI 3205 Water Resources (3)
   GEOG 4110 GIS for Non-Majors (3)
   METR 4110 Atmospheric Instrumentation (3)
   METR 4220 Atmospheric Chemistry (3)

8. Change the course name of METR 3140 Introduction to Meteorology and Climatology to METR 3140 Fundamentals of Meteorology

B. JUSTIFICATION.

NEEDS ADDRESSED: Several recent events have encouraged the proposed revisions to the Bachelor of Science in Meteorology Program. ***First*** and foremost, the majority of graduates from the B.S. in Meteorology program either pursue an advanced degree in atmospheric science 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. 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 (METR 4110 Atmospheric Instrumentation and METR 4205 Climate Dynamics) will address this need, and we propose adding METR 4205 to the programs list of required courses and METR 4110 to the programs list of elective courses. Such changes will allow our graduates to remain highly competitive for the full spectrum of career opportunities and graduate programs.

Second, the meteorology program currently requires one 3-credit computer science course (ITCS 1212 Introduction to Computer Science). While students have been very receptive to this course, their instructional needs related to meteorology extend beyond this course. In the past, we have partially compensated for this deficiency by using the laboratory component of METR 3250 Dynamic Meteorology to provide tailored computer science instruction, but this method remains insufficient. The proposed revisions create a new, 3-credit, atmospheric-focused computer science course (METR 4105 Metrological Computer Applications) that will (a) fulfill our instructional needs of both basic software coding and its meteorological application, and (b) address the new AMS guidelines which stipulate that students "need the ability to apply numerical and statistical methods to atmospheric science problems". This change will also make the laboratory component of METR 3250 superfluous, and thus we propose its removal.

Third, the recent creation of the Earth and Environmental Sciences degree led to the development of a new climate-focused course (ESCI 3101 Global Environmental Change), which effectively supplants and expands upon the climate material previously covered in METR 3140 Introduction to Meteorology and Climatology. As such, the climate material covered in METR 3140 has been significantly reduced, and thus we propose a name change for METR 3140 to more accurately reflects its meteorology-focused content. We also propose adding ESCI 3101 to the list of required courses to provide fundamental instruction on climate, in line with the new AMS requirements.

Fourth, the meteorology program currently comprises 70 total credit hours – the revisions proposed above would significantly increase that total. Thus, we propose to remove GEOL 1200 Physical Geology, GEOL 1200L Physical Geology Lab, ITCS 1212 Introduction to Computer Science, and ITCS 1212L Introduction to Computer Science Lab from the list of required courses. The new METR 4105 would replace ITCS 1212 and ITCS 1212L, and the AMS course requirements do not include physical geology. Such collective changes result in a new total of 71 credit hours (a minimal increase), but also eliminates repetition within the program, provides greater focus on relevant atmospheric processes, and retains sufficient flexibility (by not reducing the 9 hours of elective credits) for students to tailor their degree program.

Fifth, the meteorology program currently has one upper-level, elective, writing-intensive (W) course (METR 4150 Applied Climatology) currently taught by Dr. Brian Magi. In order for Dr. Magi to teach the new required METR 4205 Climate Dynamics course without a change in his total teaching expectations, he will no longer be able to teach METR 4150. Thus, we propose adding the "W" designation to the upper-level, elective METR 3330 Weather Forecasting course, which has been taught for several years with an extensive writing component but without the formal "W" designation (see attachments).

Sixth, many employers in the private and non-traditional sectors of meteorology desire their employees to have basic familiarity with (1) computer software that can easily integrate meteorological data with geographical databases within the GIS framework, (2) relevant hydrologic processes after precipitation has fallen, and (3) air quality. Also, a recent restructuring of the introductory GIS course sequence has removed current elective options from the course catalog. Thus, the addition of ESCI 3205 Water Resources, METR 4220 Atmospheric Chemistry, and GEOG 4110 GIS for Non-Majors to the meteorology program elective list (along with the removal of the now defunct GEOG 2103 Elements of GIScience and Technologies and GEOG 4120 Fundamentals of GIS) fulfills these collective needs.

Finally, our list of elective courses includes only those courses for which ***all*** prerequisites can be satisfied by completing the required and/or elective coursework in the program. However, as we have always done, other relevant earth science, geography, geology, hydrology, mathematics, statistics, chemistry, physics, and engineering courses at the 3000-level or above can be approved as electives on a case-by-case basis through the standard academic petition and degree audit processes. Hence, the proposed elective list does ***not*** include any courses with "hidden prerequisites" – a practice that is frowned upon by many college and university curriculum committees, parents, current students, and prospective students.

PREREQUISITES AND COREQUISITES: No changes to any pre/corequisites are proposed for any existing or restructured courses. Rationale for the pre/corequisites associated with each proposed new course is outlined below, and these pre/corequisites are incorporated into the catalog course descriptions (further below). First, many computer applications introduced in METR 4105 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 METR 4110 are extensions of classic thermodynamics, and thus METR 3210 is included as the prerequisite. Third, the climate dynamics concepts introduced in METR 4205 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 METR 4105, 4110, and 4205 is consistent with other courses in the meteorology program. This strategy was adopted during our last major curriculum revision (in 2009) as a means to increase academic rigor.

CONSISTENCY OF COURSE NUMBERING: All selected course numbers are consistent with the course numbering guidelines listed in the current undergraduate course 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 4000-level since there address advanced concepts in meteorology, and so they could be cross-listed at the 5000-level and open to first-year graduate students.

IMPROVEMENT: This proposal will improve the department's offerings for undergraduate meteorology students by bringing the curriculum in line with the new AMS guidelines for an undergraduate meteorology program while maintaining a streamlined program that offers sufficient opportunities for students to tailor their degree through elective courses. Such changes will allow our graduates to remain highly competitive for the full spectrum of career opportunities and graduate 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 for an undergraduate meteorology curriculum in a manner consistent with current faculty resources and workloads.

C. IMPACT.

GROUP(S) SERVED: Undergraduate majors in the B.S. Meteorology program will be served by this proposal. All proposed changes relate either to advanced coursework confined within the meteorology program or to the addition of core courses within the B.S. Earth and Environmental Sciences and/or B.S. Geography programs on the elective course list for the meteorology program.

EFFECT ON EXISTING COURSES AND CURRICULA:

a. All new and restructured courses will be taught once per year. The new METR 4110 will be taught each fall, while the restructured METR 3250, restructured METR 3330, new METR 4105, and new METR 4205 will be taught each spring.

b. Apart from no longer offering METR 4150 in the near future (discussed above), the proposed changes will not impact the frequency of any METR, ESCI, or GEOG course offerings. Likewise, the impacted GEOL and ITCS courses are large lecture sections (100+ students) where enrollment decreases of 15-20 students per year should not impact their offering frequency. No content changes to other existing courses are expected.

c. Enrollments in the new required courses (METR 4105 and METR 4205) will average 15-20 students per offering. Enrollment in the new elective course (METR 4110) is also expected to be 15-20 students per offering since students frequently request such an instrumentation course. Enrollments in ESCI 3205, GEOG 4110, and METR 4220 are expected to increase slightly (less than 5 students per year) since many meteorology majors already elect to take these courses. No enrollment changes are expected in the restructure courses (METR 3250 and METR 3330).

d. Enrollments in the courses removed from the requirement lists (GEOL 1200, GEOL 1200L, ITCS 1212, and ITCS 1212L will decrease by 15-20 students, but (as noted above) these course are large lecture sections (100+ students) where enrollment decreases of 15-20 students per year should not impact their content or offering frequency.

RESOURCES REQUIRED TO SUPPORT PROPOSAL

A. PERSONNEL: None. The needed faculty and staff are on-hand to teach the new and restructured courses without increases to teaching loads and/or contact hours.

Casey Davenport teaches METR 3250 (with 6 contact hours) each spring – the removal of the lab component from METR 3250 (–3 contact hours) coupled with teaching the new METR 4105 (+3 contracts hours) will keep her spring teaching commitment at 6 contact hours. Matthew Eastin recently stepped down from serving as the Earth Sciences Graduate Coordinator (which comes with a course release) – teaching the new METR 4110 will maintain his annual teaching load. Brian Magi currently teaches METR 4150 each spring – teaching the new METR 4205 in its place will keep his annual teaching load the same. Finally, Terry Shirley teaches METR 3330 each spring – adding the "W" designation will compensate for Brian Magi no longer offering METR 4150.

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 meteorology computer lab (McEniry 203) has 19 Linux-based machines that can accommodate all proposed curricular changes and new/restructured courses at existing and projected enrollment numbers.

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 was consulted by email on 5 March 2015 regarding the adequacy of its holdings for each new (METR 4105 Meteorological Computer Applications, METR 4110 Atmospheric Instrumentation, and METR 4205 Climate Dynamics) and revised (METR 3250 Dynamic Meteorology and METR 3330 Weather Forecasting) course. Library staff responded on 6 March 2015 that its holdings were adequate – consultation forms are attached.

B. CONSULTATION WITH OTHER DEPARTMENTS OR UNITS: Due to the proposed removal of ITCS 1212 Introduction to Computer Science and ITCS 1212L Introduction to Computer Science Lab, the Chair of the Department of Computer Science was consulted by email on 5 March 2015 regarding such changes. The Chair responded on 5 March 2015 that such proposed changes were agreeable – letter of support is attached.

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 undergraduate programs. Given pending changes to the AMS expectations for an undergraduate meteorology curriculum, 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 undergraduate 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 Undergraduate Curriculum Committee 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: Consultations from Atkins Library for each new and revised course are provided below, along with a letter of support from the Department of Computer Science regarding the removal of ITCS 1212 and 1212L from the program requirements.

COURSE OUTLINE/SYLLABUS: Syllabi are attached below for all new and revised courses.

PROPOSED CATALOG COPY: The current B.S. Meteorology catalog copy is provided below with the proposed revisions. Text to be added, changed, or removed is noted below (using the red-strike and blue-underline format). A *combined* checklist is provided for all new and/or revised courses. Cross-listings at the graduate level are proposed for all new 4000-level courses. Details regarding pre-requisites, co-requisites, changes to total credit hours, and deletion of required courses from the degree program are provided in the justification and all relevant changes to the catalog copy are included below.

☑ 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.

BACHELOR OF SCIENCE IN METEOROLOGY

The primary goal of the Bachelor of Science in Meteorology is to advance our understanding of the atmospheric processes that influence weather and climate. This pursuit inherently involves an interdisciplinary approach through the combination of advanced coursework in mathematics, chemistry, physics, statistics, computer science, geology, earth science, and meteorology with emphasis on recent basic and applied research. The program is designed to provide the next generation of meteorologists with sufficient knowledge and skills to: (1) effectively monitor and analyze the atmospheric state across a spectrum of temporal and geospatial scales; (2) provide accurate and timely forecasts of ordinary and severe weather; and (3) address relevant contemporary challenges such as global and region climate change, human interactions with the natural environment, and the development of resilient and sustainable communities. To this end, the core meteorological curriculum is composed of courses that collectively provide a broad treatment of multi-scale atmospheric processes, including atmospheric thermodynamics and physics as well as synoptic, dynamic, and mesoscale meteorology. The major comprises a minimum of ~~70~~ 71 total hours with ~~31~~ 35 hours of required departmental courses, 9 hours of elective departmental courses, and ~~30~~ 27 hours of required extra-departmental courses. An outline of the program appears below. Students are also encouraged to take additional coursework in related disciplines. Students enrolled in the program must complete a total of 120 hours, and fulfill the general education requirements applicable to all baccalaureate degrees at UNC Charlotte.

Degree Requirements:

Required Courses (~~31~~ 35 hours)

ESCI	1101	Earth Sciences – Geography (3)
ESCI	1101L	Earth Sciences – Geography Lab (1)
ESCI	3101	Global Environmental Change (3)
~~GEOL~~	~~1200~~	~~Physical Geology (3)~~
~~GEOL~~	~~1200L~~	~~Physical Geology Lab (1)~~
~~METR~~	~~3140~~	~~Introduction to Meteorology and Climatology (3)~~
METR	3140	Fundamentals of Meteorology (3)
METR	3210	Atmospheric Thermodynamics (3)
METR	3220	Physical Meteorology (3)
METR	3245	Synoptic Meteorology (4)
METR	3250	Dynamic Meteorology ~~(4)~~ (3)
METR	4105	Meteorological Computer Applications (3)
METR	4205	Climate Dynamics (3)
METR	4245	Advanced Synoptic Meteorology (3)
METR	4250	Advanced Dynamic Meteorology (3)

Elective Courses (Select 9 hours)

ESCI	3105	Oceanography (3)
ESCI	3205	Water Resources (3)
ESCI	4140	Hydrological Processes (4)
ESCI	4155	Fluvial Processes (4)

ESCI 4170 Fundamentals of Remote Sensing (4)
~~ESCI 4180 Advanced Remote Sensing (4)~~
ESCI 4180 Digital Image Processing in Remote Sensing (4)
ESCI 4222 Watershed Science (3)
~~GEOG 2103 Elements of GIScience & Technologies (4)~~
GEOG 3165 Environmental Planning (W) (3)
GEOG 4110 GIS for Non-Majors (4)
~~GEOG 4120 Fundamentals of GIS (4)~~
~~GEOG 4131 Environmental Modeling with GIS (4)~~
METR 3252 Weather Analysis Laboratory (1)
METR 3330 Weather Forecasting (W) (3)
METR 3340 Weather Communications (3)
METR 4110 Atmospheric Instrumentation (3)
METR 4150 Applied Climatology (W) (3)
METR 4220 Atmospheric Chemistry (3)
METR 4240 Boundary Layer Meteorology (3)
METR 4320 Tropical Meteorology (3)
METR 4350 Mesoscale Meteorology (3)

Required Extra-Departmental Courses (~~30~~ 27 hours)
CHEM 1251 General Chemistry I (3)
CHEM 1251L General Chemistry I Lab (1)
~~ITCS 1212 Introduction to Computer Science (3)~~
~~ITCS 1212L Introduction to Computer Science Lab (0)~~
MATH 1241 Calculus I (3)
MATH 1242 Calculus II (3)
MATH 2171 Differential Equations (3)
MATH 2241 Calculus III (3)
PHYS 2101 Physics for Science I (3)
PHYS 2101L Physics for Science I Lab (1)
PHYS 2102 Physics for Science II (3)
PHYS 2102L Physics for Science II Lab (1)
STAT 2122 Introduction to Probability and Statistics (3)

COURSE DESCRIPTIONS:

METR 3140. ~~Introduction to~~ Fundamentals of Meteorology. ~~& Climatology~~ (3) Prerequisite: ESCI 1101-1101L, or permission of instructor. Fundamental physical principles of meteorology: analysis of atmospheric behavior, the governing forces and map contouring are all introduced. Specific topics include solar radiation, temperature, moisture, wind and pressure, synoptic systems, jet streams, local weather, thunderstorms, and tropical systems. ~~weather and climate. Analysis of short and long term atmospheric behavior are introduced. Topics include solar radiation, temperature, moisture, wind and pressure, synoptic systems, regional climates, paleoclimates, climatic change, and applied climatology.~~ (*Fall*)

METR 3210. Atmospheric Thermodynamics. (3) Prerequisites: METR 3140 with a grade of C or above and MATH 1241; or permission of instructor. The study of the physical processes associated with atmospheric thermodynamics and stability. Topics include: atmospheric composition, equation of state, hydrostatics, first and second laws of thermodynamics for dry, moist, and saturated air, atmospheric stability, parcel buoyancy, and thermodynamic diagrams. Three hours of combined lecture and lab per week. (*Spring*)

METR 3220. Physical Meteorology. (3) Prerequisites: CHEM 1251 and METR 3210 with grades of C or above; or permission of instructor. Fundamentals of cloud and precipitation physics, atmospheric electricity, atmospheric chemistry and physics, atmospheric radiation, and radiative transfer. Three hours of combined lecture and lab per week. (*Fall*)

METR 3245. Synoptic Meteorology. (4) Prerequisite: METR 3210 with a grade of C or above, or permission of instructor. Principles of meteorological analysis; fundamental concepts of meteorology, thermodynamics, and kinematics are integrated to understand the structure and evolution of mid-latitude cyclones and fronts. Three hours of lecture and one three-hour lab per week. (*Fall*)

METR 3250. Dynamic Meteorology. ~~(4)~~ **(3)** Prerequisites: METR 3245 with a grade of C or above, MATH 1242, and PHYS 2101; or permission of instructor. Principles of atmospheric dynamics including the equations of motion, circulation, vorticity, divergence, balanced and unbalanced flows, and the general circulation. Three hours of combined lecture and ~~one three-hour~~ lab per week. (*Spring*)

METR 3252. Weather Analysis Laboratory. (1) Pre- or corequisite: METR 3245 and permission of instructor. Topics related to atmospheric observation, data collection, analysis, and techniques of weather forecasting. May be repeated for credit. (*On demand*)

METR 3330. Weather Forecasting. (3) (W) Prerequisite: METR 3245 or permission of instructor. Focuses on weather forecasting: real-time, short-term, and long-term. Verification techniques will be studied. Three hours of combined lecture and lab per week. (*Spring, On demand*)

METR 3340. Weather Communications. (3) Pre- or corequisite: METR 3245 or permission of instructor. A survey of the field of weather communications covering weather forecasting principles, television and radio broadcasting, science writing, forensic meteorology, and forecasting for business applications. Three hours of combined lecture and lab per week. (*Fall, On demand*)

METR 4000. Selected Topics in Meteorology. (1-4) Prerequisite: METR 3140 or permission of the instructor. In-depth treatment of specific topics selected from meteorology. May be repeated for credit with change of topic. (*On demand*)

METR 4105. 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*)

METR 4110. 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*)

METR 4150. Applied Climatology. (3) (W) 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*~~ *On demand*)

METR 4205. 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. El Niño 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*)

METR 4220. Atmospheric Chemistry. (3) Prerequisites: CHEM 1251 and MATH 1242 with grade of C or above; or permission of instructor. Basic physical chemistry and a survey of major topics in atmospheric chemistry including fundamental properties of the atmosphere, tropospheric chemistry, air pollution, acid rain, stratospheric chemistry and the ozone hole, and the role of chemistry in the Earth's climate. Three hours of combined lecture and lab per week. (*Spring, On demand*)

METR 4240. 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. (~~*Fall,*~~ *On demand*)

METR 4245. Advanced Synoptic Meteorology. (3) Prerequisite: METR 3250 with a grade of C or above, 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*)

METR 4250. Advanced Dynamic Meteorology. (3) Prerequisites: METR 3250 with a grade of C or above, 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*)

METR 4320. 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. (*Fall, On demand*)

METR 4350. Mesoscale Meteorology. (3) Pre- 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. (*Spring, On demand*)

METR 4400 Internship in Meteorology (3-6) Prerequisite: Permission of the department. Research and/or work experience designed to be a logical extension of a student's academic program. The student must apply to department for an internship by submitting a proposal which specifies the type of work/research experience preferred and how the internship will complement his or her academic program. The department will attempt to place the selected students in cooperating community organizations to complete specified research or work-related tasks which are based on a contractual arrangement between the student and community organization. The student can receive three to six hours credit, depending on the nature and extent of the internship assignment. (*On demand*)

METR 4800. Individual Study in Meteorology. (1-4) Prerequisites: Permission from the department and credit hours established in advance; and, when taken for honors credit, approval of a proposal through the Honors College Application to Candidacy process the semester prior to taking the course. Tutorial study or special research problems. Students must request permission for independent study from an individual faculty member. May be repeated for credit with change of topic. (*On demand*)

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

- ☑ Yes – updated Academic Plan of Study in template format is attached.
- ☐ 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

The program uses an exit exam/survey that administered to all students at the end of the term when they complete their final required course and plan to graduate. Exam/Survey content is based on material presented in the required departmental courses. Since such course list will change, a number of questions will be altered to reflect material addressed in the new courses. In particular, material from GEOL 1200-1200L will be removed, and material from ESCI 3101, METR 4105, and METR 4205 will be added. These changes will not change our SLOs, but will change which exam questions are used to assess respective SLOs. In order to ensure that all new exam questions are consistent with material presented, the new questions will be developed after the initial offerings of METR 4105 and METR 4205 during the spring 2016 term.

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.

UNCCHARLOTTE

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:

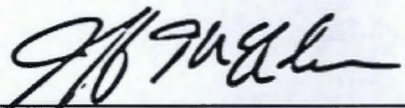
Evaluator: **Jeff McAdams** **Date: 3/6/15**

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

UNC CHARLOTTE

J. Murrey Atkins Library

Consultation on Library Holdings

To: **Matthew Eastin**

From: **Jeff McAdams**

Date: **3/6/15**

Subject: **METR 3250 – Dynamic Meteorology**

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
Atmospheric Physics	150	14
Dynamic Meteorology	36	2
Boundary layer (Meteorology)	47	1

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 3330 – Weather Forecasting**

Summary of Librarian's Evaluation of Holdings:

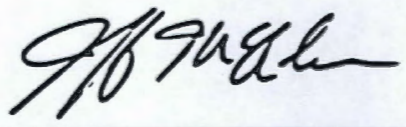
Evaluator: **Jeff McAdams** **Date: 3/6/15**

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
Weather Forecasting	300	11
Meteorology	1440	211
Atmospheric Physics	150	14



Evaluator's Signature

3/6/15

Date

Hi Matt,

I do not have a problem excluding ITCS 1212 from your requirements. This class is very large (150+ students in each section) and it is very difficult to achieve curricular outcomes for our own majors and others as well. Labs help, but only to a point. We are also likely to introduce significant changes within the next year.

Best regards,

Bojan

—

Bojan Cukic
Professor and Chair
Department of Computer Science
College of Computing and Informatics
University of North Carolina at Charlotte

From: <Eastin>, Matthew <mdeastin@uncc.edu>
Date: Thursday, March 5, 2015 at 12:56 PM
To: Bojan Cukic <bcukic@uncc.edu>
Subject: Curriculum Consultation - Revisions to BS Meterology program

Hi Bojan,

For a number of years now, the Bachelors of Science in Meteorology program has required our students to ITCS 1212 Introduction to Computer Science (including its lab component). While the students have found the course very helpful, the faculty recognize that the students would benefit from additional and more-focused instruction in computer science. After exploring the existing ITCS courses and informal discussions with several faculty in your department, we have two realistic options: (1) require two additional ITCS courses, or (2) develop an teach a content-specific computer science course with the Department of Geography and Earth Sciences. Option #1 is difficult since we already require 70 total credit hours to complete the degree, and adding 6+ additional credits will make the degree, arguably, too large. Thus, we have decided to pursue Option #2 and develop METR 4105 Meteorological Computer Applications (syllabus is attached). This course would replace ITCS 1212 and 1212L as the required computer science course for the B.S. Meteorology degree.

Hence, this proposed curriculum change would decrease the course enrollments in ITCS 1212 and 1212L by ~20 students per year. Would the Department of Computer Science be agreeable to such an enrollment reduction in those courses?

Best regards,

Matt Eastin

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%

Grading Scale:

Percentage	Letter Grade
90-100	A
80-89	B
70-79	C
60-69	D
59 & below	F

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
60 – 69	D
0 – 59	F

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.

METR 3250
Dynamic Meteorology
Spring 2016

Place and Time: McEniry 401, Monday and Wednesday, 2:00-3:15pm

Prerequisites: PHYS 2101 and MATH 1242

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

Office Hours: Wednesdays 10 am - 12 pm, or by appointment

Teaching Assistant: TBD

Textbook: *Mid-Latitude Atmospheric Dynamics: A First Course,* by J. Martin, 2006

Grades:

Assignment	Percentage
Quizzes	15%
Homework	20%
Exam 1	15%
Exam 2	15%
Final Exam	25%
Class Participation	10%

Grading Scale:

Percentage	Letter Grade
90-100	A
80-89	B
70-79	C
60-69	D
59 & below	F

Course Objectives:

- Develop an understanding of the basic equations that govern atmospheric motion
- Develop / use fundamental analytical skills for understanding geophysical flows
- Strengthen problem solving skills
- Develop the ability to support your meteorological opinions not only with concepts but with equations and mathematics

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.

Legibility: To be able to give you appropriate scores, I will need to be able to read your handwriting on quizzes, tests, and other assignments. If I can't decipher your handwriting, I can't give you credit. Please take the time to write legibly!

Missed Quizzes and Exams: There are NO make-ups for missed quizzes. There will be 6 quizzes, with the 2 lowest scores dropped, so unless you miss more than 2 quizzes a missed quiz will not impact your grade. 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.

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*:** You are expected to be engaged while in class. This includes writing notes, asking questions, and working on small activities I assign in class. Additionally, I will be asking you to process what you've learned on a regular basis. This will manifest itself in a couple of different ways: one will be an approximately weekly "Learning Audit" where I will ask you to reflect on what you've learned; second, you and a partner can develop a quiz question related to concepts discussed in class and present it to your fellow students. The questions should not be very involved, but they should clearly demonstrate key concepts. Your classmates will be given an opportunity to solve your question in class, but you will also be expected to be "experts" and explain the solution.

***Quizzes*:** Quizzes will be given as indicated on the class schedule. Quizzes are meant to be short, but may consist of a variety of types of questions (true/false, multiple choice, short derivations, conceptual explanations, etc.). Quizzes will be administered at the *beginning* of class on the days scheduled, and will have a finite time allowance. If you arrive late to class on a quiz day, you will receive no extra time to complete the quiz.

***Homework*:** There will be 8 homework assignments over the course of the semester (approximately once a week, except near exams). I encourage you to work with your classmates; however, you must each submit your own work. The use of outside resources such as solution manuals, assignments from previous semesters, or other online resources, is strictly prohibited. The main skill I want you to learn is problem solving. Thus, most of the credit given will come from showing clear steps leading to a *symbolic* solution, followed by a numeric answer as needed.

***Exams*:** There will be two mid-semester exams and a final exam. The exams will occur on Monday February 9th (Exam 1), Wednesday March 18th (Exam 2), and 2:00pm-4:30pm on Monday May 4th (Final Exam). Please note that the final exam will be *cumulative*.

METR 3330 Weather Forecasting (W)
Spring 2016

Place and Times:	McEniry 203, Monday / Wednesday at 12:30 – 1:45 pm
Prerequisites:	METR 3245, or permission of the instructor
Instructor:	Terry Shirley McEniry 210 704-687-5925 trshirle@uncc.edu
Office Hours:	Monday / Wednesday 2–5 pm, or by appointment
Required Text:	*Weather Forecasting Red Book*, by Tim Vasquez, 2006
Website:	http://clas-pages.uncc.edu/terryshirley/

Course Philosophy and Objectives: This course is a forecasting practicum that provides an opportunity for students to obtain real-time real-world experience forecasting conventional weather parameters at selected cities in the U.S. To become a good forecaster, you must possess several attributes:

1. Knowledge of the behavior of the atmosphere
2. Knowledge of forecasting principles and techniques
3. Sufficient experience to know which principles apply to a given situation
4. Ability to interpret statistical and numerical model guidance
5. Knowledge of how a general forecast must be modified to account for local effects.

Accordingly, this course will be a blend of instruction and forecasting. Forecasts will be made for regions with instructive meteorological situations. After each forecast is completed, the meteorological situation and the forecast will be discussed and evaluated. However, the range of meteorological situations in a 15-week period is not sufficient to provide good real-time examples of every principle and technique that a forecaster must learn. Therefore, some techniques may be illustrated using past cases.

Course Policies:

Attendance: Absolutely mandatory. Forecasts cannot be made up. If you miss more than 2 classes during the semester, you will receive a failing grade in the course. Attendance is also graded by the submission of your weekly weather discussion – skipped discussions or discussions submitted after midnight of the due date will be considered absences.

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:

Weather Forecasting Contests: Each student will be expected to participate in two forecasting contests modelled after the national contest (*Wx-Challenge*). Details will follow when they are released by the *Wx-Challenge* personnel for this semester.

Post-mortems of Previous Forecasts: Post mortems consist of students providing a two page post analysis of the forecast situation as well as a 5-10 minute power-point presentation outlining the main threat of the forecast, what actually happened and what we could do in the future to prevent those types of errors. Teams composed of two class members will be constructed at the start of the semester. A schedule when each team performs a "post-mortem will be posted and sent out via email at the beginning of the semester. The post-mortems will always be done in the beginning of each class (at which time the forecasts made on the previous class day will be reviewed). The following factors should be discussed in the post-mortems: (a) primary weather threat; (b) synoptic/mesoscale situation; (c) available model guidance; (d) team member forecasts, and (e) verification.

Weather Discussions: In meteorology, an essential skill is to be able to create technical and non-technical weather discussions that are sent out to other meteorologists and the public. These discussions take the conceptual scientific topics gained in the prerequisite courses and organize them into a clear, detailed chronological sequence of future weather phenomena. It is expected that the students will be able to apply knowledge gained in the prerequisite courses along with output from real-time computer models to create, edit, and submit polished, technical and non-technical discussions throughout the course. There will be 22 weather discussion assignments during the semester (8 in-class; 14 out-of-class). After submission to a Moodle 2 forum, students may comment on the discussion as the weather unfolds. After the event ends, the instructor will print the discussions, edit them, and then the student will resubmit a 'final discussion' after edits and suggestions have been taken into account. Students will have one week after the discussions are returned to resubmit for final grading. Your total grade will be a combination of your initial submission (50%) and your eventual corrections (50%) to the final discussion.

Expectations for the Weather Discussions: One goal of this course is to prepare students to write effective area forecast discussions (AFDs) consistent with the discussions disseminated by the National Weather Service. Below is a set of guidelines that will be used to edit and grade weather discussions as well as some tips and suggestions:

1. Write the discussion last or towards the end of the forecast process. This way you will have a better understanding of the story.
2. Always try to begin your discussion with a sentence that summarizes your main points in the forecast. This should smoothly introduce the reader to what you're going to discuss. A good introductory sentence might sounds like, "Colder and drier conditions will dominate the next few days and then a major storm system may affect us." This sentence sets the stage for coming story.
3. Your discussion should then tell the story chronologically, starting with a brief description of the current weather, including the major weather features affecting the forecast area.
4. Keep it clear and concise. Avoid getting lost in the details of what's going on; keep the specific details to the forecast text. Try to make the text interesting and engaging.
5. Length – aim for at 1-2 pages but try to keep it under three.
6. Keep the voice fresh and active. Try to make the interactions of the weather features sound dynamic and active; avoid using a passive voice.
7. Remember that our audience is the general public or other meteorologists depending on the assignment...avoid technical jargon without brief explanations when writing toward the public. Avoid lengthy explanations of weather phenomena when writing toward other meteorologists.
8. Proofread your forecasts! Please check your spelling and grammar before submitting.
9. Avoid using the first person (I); rather, write in the third person.
10. Try hard to express your confidence, or lack thereof, in the forecast, especially over the first two days. Avoid ambiguous, vague, and wishy-washy words/phrases that express uncertainty without understanding. Be frank and to the point with your forecast uncertainty.

Grades:

This is a writing intensive (W) course. As such 45% of your grade will be derived from written discussions, post mortem analysis, and verifications.

Assignment	Percentage of Total Grade	Percentage	Grade
Forecast contest 1:	15%	90 – 100	A
Forecast contest 2:	15% (begins after spring break)	80 – 89	B
Post mortems/Verifications:	25% (written – 5 total)	70 – 79	C
Weather Discussions	25% (written – 22 total)	60 – 69	D
Final Exam:	20%	0 – 59	F

UNC CHARLOTTE

General Education Program:

Writing Intensive and Oral Communication Requirements

Approvals

	Signature	Date
Department		
College		
University College		

"W" and/or "O" Designation Form

Name of Person Submitting Proposal:	**Terry Shirley**						
Department:	**Geography and Earth Sciences**						
Designation Requested:	NEW Course ____			or EXISITING Course __X__			
	W ___	O ___	W & O ___	Add __X__ / Remove ___	W _X_	O ___	W & O ___
Course # and title:	**METR 3330 Weather Forecasting**						
Effective beginning (Sem/Yr):	**Spring 2016**						
Curriculum Proposal Initiated: (Mo/Yr):	**March 2015**						

Instructions:

NOTE: This form concerns the "W" and/or "O" designations only; it ***supplements*** the Course and Curriculum Short Form used for all new/revised courses. Submit this coversheet, a syllabus of the proposed new/revised course, your description of how the course meets the guidelines below, and the Course and Curriculum Short Form to your college Course and Curriculum Committee. **NOTE: if the request is to remove designation(s) please attach an explanation for the request and an analysis of the curricular implications.** Following collegiate approval of the new/revised course, it should be forwarded to University College for "W" or "O" designation review and then routed to the Undergraduate Course and Curriculum Committee. Allow time for processing. For more information contact the Dean of University College 704-687-5628, or *jsmail@uncc.edu*.

Request for Writing Intensive ("W") Designation

Describe how your course will satisfy each of the guidelines for writing intensive courses below. Provide cross references to the course syllabus to illustrate how the guidelines are built into the course requirements. Faculty should also review the "W-O Best Practices" for information on minimum requirements and best practices for W and O courses.

1. Describe how the writing skills taught are specific to the discipline, and describe the nature of writing assigned in terms of those disciplinary expectations.

   In meteorology, an essential skill is to be able to create technical and non-technical weather discussions that are sent out to other meteorologists or to the public. These discussions take the conceptual scientific topics gained in the prerequisite courses and organize them into a very clear, detailed chronological sequence of future weather phenomena. It is expected that the students will be able to use the knowledge from the prerequisite courses and apply that to the computer models that are used in this course to create, edit, and submit polished technical and non-technical discussions throughout the course. There will be approximately 14 of these assignments throughout the semester. This description can be found in the **Weather Discussion** section of the syllabus.

2. Describe how writing is an integral, on-going part of the course (frequent and regular during the semester) rather than isolated in a specific assignment.

   Each week, for the entire semester, students will be assigned one day of the week to submit a written weather discussion, totaling 14 submissions. The in-class assignments consist of creating forecasting spreadsheets, area maps and weather discussions. One third of the work done in-class will be written. Finally, after a forecast period ends, students are assigned the task of doing a post-mortem analysis of the situation, submitting a written description of the unfolding events as well as a power point presentation that they give to the class. These descriptions can be found in the **Post-mortem** and **Weather Discussion** sections of the syllabus.

3. Describe how much writing students will do and how much of the writing is in the form of finished, formal, prose. (The minimum is 9-10 pages of formal prose; for best practice it should be close to twice that.)

   Each weather discussion is required to be a minimum of two pages and, with 14 assigned throughout the semester, the students will submitted around 30 pages of formal writing. In addition to this, there are approximately eight in-class written assignments as well as five written post-analysis reviews. In total there are approximately 27 written assignments totaling around 50 pages by the end of the semester. This breakdown can be found in the **Grades** section of the syllabus.

4. Describe what percentage of the final grade is based on writing? (The minimum is 30%; for best practice it should be 50% or more.*)

   Combination of the written post-mortem analysis, weather discussions, and in-class writing assignments, gives 50% of the course grade dedicated to written assignments. These numbers can be found in the **Grades** section of the syllabus.

5. Indicate how you will incorporate revision into the course's writing projects. It should be clear that students have multiple opportunities to revise writing assignments.

   Revisions occur after each week of weather discussion submissions. I will edit each discussion, giving feedback and comments, and return them to the students. The students must then resubmit these discussions with the comments and any corrections taken into account. They have one week to resubmit each written assignment – their total grade is a combination of the initial submission (50%) and the final edited paper (50%). This description can be found at the end of the **Weather Discussion** section of the syllabus.

6. Provide criteria for evaluating student writing and how those criteria will be used.

   I use a combination of my own criteria and the National Weather Service's criteria for area weather discussions AWDs) when evaluating student writing. Both of these criteria are provided to the students:

   1. Write the discussion last or towards the end of the forecast process. This way you will have a better understanding of the story.
   2. Always try to begin your discussion with a sentence that summarizes your main points in the forecast. This should smoothly introduce the reader to what you're going to discuss. A good introductory sentence might sounds like, "Colder and drier conditions will dominate the next few days and then a major storm system may affect us." This sentence sets the stage for coming story.
   3. Your discussion should then tell the story chronologically, starting with a brief description of the current weather, including the major weather features affecting the forecast area.
   4. Keep it clear and concise. Avoid getting lost in the details of what's going on; keep the specific details to the forecast text. Try to make the text interesting and engaging.
   5. Length – aim for at 1-2 pages but try to keep it under three.
   6. Keep the voice fresh and active. Try to make the interactions of the weather features sound dynamic and active; avoid using a passive voice.
   7. Remember that our audience is the general public or other meteorologists depending on the assignment...avoid technical jargon without brief explanations when writing toward the public. Avoid lengthy explanations of weather phenomena when writing toward other meteorologists.
   8. Proofread your forecasts! Please check your spelling and grammar before submitting.

9. Avoid using the first person (I); rather, write in the third person.
10. Try hard to express your confidence, or lack thereof, in the forecast, especially over the first two days. Avoid ambiguous, vague, and wishy-washy words/phrases that express uncertainty without understanding. Be frank and to the point with your forecast uncertainty.

The Area Forecast Discussion (AFD) is an important product for our customers and partners in the media and emergency management. The primary purpose of the AFD product is to provide the meteorological/scientific reasoning behind the forecast. Additionally, the AFD gives us an opportunity to express how confident we are, what could go wrong, alternate scenarios, etc. The AFD is a highly visible product used to convey forecast insight beyond any other NWS products. Given the wide variety of severe weather that can occur in central North Carolina throughout the year, the AFD is a *very* important product for our area, particularly during the winter months when relatively small amounts of wintry precipitation can result in significant impacts to life, property, and the local economy/infrastructure. The AFD consists of two sections. The first is the narrative description of forecast reasoning. This section has 5 components: synopsis, near term, short term, long term, and aviation. The other section of the AFD is a summary of watch/warning/advisory issuances. The AFD is issued whenever adjustments/changes are made to the grids or after analysis of the upper air data and near term model analysis. The narrative discussion should be professional in tone, focused on the meteorology, and contain a concise, plain language explanation of forecast reasoning. It should not contain editorial, political, or casual comments or judgmental opinions of a personal nature. Use of contractions should be limited, and should conform to the Federal Aviation Administration (FAA) Handbook 7340.1U. Acronyms that are well-known within the scientific community for numerical models and meteorological phenomenon are also allowed. Due to the nature of the AFD (to reflect current thinking/analysis of the forecaster), time stamps are placed at the beginning of each section so that the users of the product know when the entry was submitted. Other discussion sections that can be added to the AFD, but remain optional include: climate, fire weather, hydrology, and marine (for AKQ backup). Public and fire weather Watch/Warning/Advisory information shall be included in a separate section after the narrative discussion. This does not include short duration warnings (of a few hours or less) for convective events and flash floods, severe thunderstorm and tornado watches, and flood warnings. Formal coding schemes should be utilized in the watch/warning/advisory section of the AFD.

7. Confirm that course enrollment will be limited to 25 students and that responsibility for instruction, supervision, and evaluation remains with the instructor rather than being delegated.

This course will be capped at 12 students. It has been capped at 12 students for each of the last five semesters it has been taught and there are no plans to change this in the future.

UNC CHARLOTTE

B.S. in Meteorology
Academic Plan of Study

College of Liberal Arts & Sciences
Department of Geography & Earth Sciences
geoearth.uncc.edu

PROGRAM SUMMARY

- ***Credit Hours:*** 120 hours
- ***Concentrations:*** No
- ***Declaring the Major:*** GPA requirements, pre-requisite courses, application deadlines, pre-enrollment advising etc. Students may declare the major at any time before graduation.
- ***Advising (For the Major):*** Each major is assigned an advisor from within the department. Majors will meet with this advisor before each subsequent semester to define the most advantageous course schedule for the student. An advising hold will be in place until the student completes their advising meeting, at which time it will be removed for registration.
- ***Advising (For General Education):*** General Education course advising can be done within the department by your major advisor.
- ***Minimum Grades/GPA:*** minimum GPA is 2.0
- ***Teacher Licensure:*** No. Only in B.A. in Earth Sciences. Students preparing to teach high school earth science may become licensed by earning the B.A. degree including the Secondary Teaching Option. Licensure applications are the responsibility of the student and the Office of Student Academic Services in the College of Education.
- ***Evening Classes Available:*** No
- ***Weekend Classes Available:*** No
- ***Other Information:*** GEO (Geology & Earth Science Organization); GTU (Gamma Theta Upsilon, which is an international honor society in geography); STORM (Student Organization of Meteorology).
- ***Contact(s):*** Mr. Jake Armour, undergraduate coordinator for ESCI/GEOL, jarmour@uncc.edu; Ms. Jamie Strickland, undergraduate coordinator for GEOG, jstrickl@uncc.edu; Mr. Terry Shirley, undergraduate coordinator for METR, thsirle@uncc.edu

PROGRAM REQUIREMENTS

Meteorology is a discipline in the sciences devoted to increasing our understanding of the atmosphere and the development of methods for applying that knowledge to practical problems. Although this field is usually associated with weather prediction and broadcasting, it also has significant ties to environmental, agricultural, oceanic, and hydrological sciences. For students wishing to pursue many of these areas, a degree in meteorology from UNC Charlotte is the path for you!

A degree in meteorology from UNC Charlotte will combine a foundation of courses in mathematics, chemistry, physics and earth science, with a core of meteorology courses in applied and theoretical topics and a choice of elective courses offering specialized training. Students graduate with the skills and experience they need for professional employment within industry, private consulting firms, television, government, and the armed forces or for further study toward graduate degrees.

Extracurricular experiences are important components of the meteorology program at UNC Charlotte. Our students hold internships at local TV stations and local NWS offices, are also involved in atmospheric research and field work in the subjects of air quality, computer weather modeling, and tropical storm forecasting. In addition, students at UNC Charlotte participate in the WxCHALLENGE national collegiate forecasting contest, biweekly forecasts for the Niner newspaper, forecasting for UNCC sports teams, and opportunities to go on field trips and to attend national conferences. Also available to students is participation in the **ST**udent **OR**ganization of **M**eteorology (**STORM**), an official student chapter of the American Meteorological Society (AMS), which is aimed to help students network with meteorology professionals in the surrounding area and around the country.

Areas	Credit Hours	Description
Pre-Major/ Prerequisites	-	
Major	71	31 hours of required departmental courses, 9 hours of elective departmental courses, and 30 hours of required extra-departmental courses
General Education *(not satisfied by other major requirements)*	28	Hours do not include those requirements which are satisfied within the major.
Related Work	0	May be satisfied by a second major, a minor, or a set of coordinated courses developed through consultation with an advisor. Specific requirements for the concentration in METR.
Foreign Language	8	Foreign language: Proficiency at the introductory level (1202) by coursework, placement test, or high school coursework.
Electives	13	As needed to complete 120 hours total.
Total Credit Hours	120	

SUGGESTED PLAN OF STUDY – B.S. IN METEOROLOGY

Freshman Year					
Course Number	**Course Title**	**Credit Hours**	**General Education**	**W/O Course**	**Notes**
Fall Semester					
MATH 1241	Calculus I	3			
CHEM 1251	Chemistry I	3			
CHEM 1251L	Chemistry I lab	1			
UWRT 1101	English	3			
ESCI 1101 + L	Earth Science + Lab	4			
Spring Semester					
MATH 1242	Calculus II	3			
PHYS 2101 + L	Physics I + Lab	4			
UWRT 1102	English	3			
LBST 11xx	Arts and Society Elective	3			
LBST 2101	Western Culture and History	3			
					30 Credit Hours for Year

Sophomore Year					
Course Number	**Course Title**	**Credit Hours**	**General Education**	**W/O Course**	**Notes**
Fall Semester					
METR 3140	Weather and Climate	3			
MATH 2241	Calculus III	3			
PHYS 2102 + L	Physics II +Lab	4			
ESCI 3101	Global Environmental Change	3			
Spring Semester					
METR 3210	Atmospheric Thermodynamics	3			
MATH 2171	Differential Equations	3			
METR 4105	Meteorological Computer Apps	3			
Social Science	Elective	3			
LBST 2102	Global Connections	3			
					28 Credit Hours for Year

Junior Year					
Course Number	Course Title	Credit Hours	General Education	W/O Course	Notes
Fall Semester					
METR 3220	Physical Meteorology	3			
METR 3245	Synoptic Meteorology	4			
STAT 2122	Statistics	3			
FORL 1201	Foreign Language	4			
General Elective		2			
Spring Semester					
METR 3250	Dynamic Meteorology	3			
METR elective	Major Elective	3			
METR 4205	Climate Dynamics	3			
LBST 22xx	Liberal Studies Elective	3			
FORL 1202	Foreign Language	4			
					32 Credit Hours for Year

Senior Year					
Course Number	Course Title	Credit Hours	General Education	W/O Course	Notes
Fall Semester					
METR 4245	Advanced Synoptic Meteorology	3			
METR 4250	Advanced Dynamic Meteorology	3			
METR elective	Major Elective	3			
GEOG 3215 (W)	Writing elective	3			
General Elective		3			
Spring Semester					
METR elective	Major Elective	3			
Writing (W)	Writing Elective	3			
ESCI 4600 (O)	Communication Elective	1			
General Elective		4			
General Elective		4			
					30 Credit Hours for Year

ADVISING RESOURCES

- General Education Requirements for ALL Students: ucol.uncc.edu/general-education
- Undergraduate Catalog: catalog.uncc.edu
- Central Advising website: advising.uncc.edu
- College of Liberal Arts & Sciences advising website: clas.uncc.edu/students/Advising-News/
- University Advising Center website: advisingcenter.uncc.edu