



# NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

## COURSE SYLLABUS

College Name: [CoST](#)

Department Name: [Applied Sci&Tech PhD Program](#)

Course Name: [Dynamic Mountain Meteorology](#)

---

## COURSE INFORMATION

- Course Number/Section: [AST 885-3](#)
- Term: [Fall 2020](#)
- Semester Credit Hours: [3](#)
- Times and Days: [11:00-1:30 T](#)
- Class Location: [Online](#)

## INSTRUCTOR CONTACT INFORMATION

- Instructor: [Dr. Yuh-Lang Lin](#)
- Office Location: [302H Gibbs](#)
- Office Phone: [336-285-2127 \(984-212-0989 – C\)](#)
- Email Address: [ylin@ncat.edu](mailto:ylin@ncat.edu)
- Teaching Assistant: [Shak Karim \(skarim@aggies.ncat.edu\)](mailto:skarim@aggies.ncat.edu)

## STUDENT HOURS

*These are times students may visit the professor without an appointment to request the assistance they need.*

*NOTE: Students are responsible for reading, understanding and following the syllabus.*

[Just email me anytime; Make appointment for Skyping or Zooming discussions](#)

## COURSE PREREQUISITES

[Dynamic Meteorology; Atmospheric Dynamics I & II or equivalent](#)

## COURSE DESCRIPTION

*Many well-known weather phenomena are directly related to flow over orography, such as mountain waves, lee waves and clouds, rotors and rotor clouds, severe downslope windstorms, lee vortices, lee cyclogenesis, frontal distortion across mountains, cold-air damming, track deflection of midlatitude and*

tropical cyclones, coastally trapped disturbances, orographically induced precipitation and flash flooding, and orographically influenced storm tracks. This course can be roughly divided into four parts, namely (I) basic dynamics of stratified fluid flow, (II) orographically forced flows, (III) thermally forced flow over orography, and (IV) orographic precipitation. In Part I, governing equations and linearization of them for basic dynamics of stratified fluid flow will be discussed. In Part II, linear and nonlinear dynamics associated with two-dimensional and three-dimensional stratified fluid flow over sinusoidal and/or isolated mountains will be studied. Applications of the mountain-wave theories included trapped lee waves, severe downslope winds, lee vortices, lee cyclogenesis, track deflection of cyclones and fronts by mountains, coastally trapped disturbances, cold-air damming, and gap flow. In part III, combined thermally and orographically forced flows will be discussed. Applications included heat island circulations, sea and land breezes, mountain-plain solenoidal circulations, density current generation and propagation, formation of thunderstorm cloud tops, as well as circulations and gravity waves that are generated by diabatic heating associated with coastal frontogenesis, moist convection, and orographic precipitation systems. In part IV, the dynamics of moist fluid flow over mountains will be studied. Topics in this part include orographic influence on climatological distribution of precipitation, orographic modification of pre-existing disturbances (e.g., troughs, midlatitude cyclones and fronts, tropical cyclones), common ingredients of orographic precipitation, formation and enhancement mechanisms, and control parameters for moist flow over mountains and their associated flow regimes. In addition to the problems, several short projects, which involve idealized and real-case modeling, will be assigned to enhance the understanding of dry and moist flow theories and dynamics.

## **STUDENT LEARNING OBJECTIVES/OUTCOMES (SLO)**

*Learning outcomes should be specific, measurable and focused on the content knowledge the students are expected to master and not what the faculty will teach.*

*If the course is a General Education Course, the SLO should be listed and labeled as "General Education."*

- Objective:** Use analytical thinking skills to evaluate information critically
- Outcome:** Students will demonstrate the ability to answer conceptual questions on examination questions.
- Objective:** Effectively relate basic ideas and concepts to more sophisticated atmospheric systems in tropics.
- Outcome:** Students will demonstrate the ability to employ critical thinking in answering short questions as well as solving problems on examinations.
- Objective:** Use a wide range of disparate information and knowledge to draw references and summarize various concepts, theories and observational evidence in the literature.
- Outcome:** Student will demonstrate the ability to absorb various concepts, theories and observations in assigned references and summarize and present them to the class.

## **REQUIRED TEXTBOOKS AND MATERIALS**

*Any course-level subscriptions and tools linked in Blackboard Learn learning management system (LMS) should be listed here. The Blackboard LMS must have links to their student data privacy statement.*

### **REQUIRED TEXTS:**

Mesoscale Dynamics by Yuh-Lang Lin, Cambridge University Press, 2007

### **REQUIRED MATERIALS:**

None

## SUGGESTED COURSE MATERIALS

### SUGGESTED READINGS/TEXTS:

- (1) Mesoscale Dynamics (Ch. 1-7 and 11) by Y.-L. Lin, Cambridge Univ. Press, 2007
- (2) Mountain Meteorology, by C. David Whiteman, Oxford University Press, 2000
- (3) Mountain Weather Distance Learning Course, UCAR, MetEd (online)

### SUGGESTED MATERIALS:

None

## GRADING POLICY

### ASSIGNMENTS AND GRADING POLICY

94% and above	A		76% - 74%	C
93% - 90%	A-		73% - 70%	C-
89% - 87%	B+		69% - 67%	D+
86% - 84%	B		66% - 64%	D
83% - 80%	B-		63% - 60%	F
79% - 77%	C+			

For **GRADUATE COURSES**: See 2019-2020 Graduate Catalog p.38 for graduate grading scale and Non-Graded Courses

### GRADING ALLOCATION

Course grades are based on a weighted grading scale of 100%. The breakdown for the course is as follows: *[Faculty, please adjust according to your course.]*

- |                             |     |
|-----------------------------|-----|
| (1) Homework                | 20% |
| (2) Midterm and Final Exams | 50% |
| (3) Projects                | 30% |

## COURSE POLICIES

### USE OF BLACKBOARD AS THE LEARNING MANAGEMENT SYSTEM

MesoLab website and Blackboard are the primary online instructional and course communications platforms. Students can access the course syllabus, assignments, grades, and learner support resources. Students are encouraged to protect their login credentials, complete a Blackboard orientation and log in daily to course.

### MAKE-UP EXAMS: NA

For **GRADUATE STUDENTS**: See 2019-20 Graduate Catalog p. 54

### EXTRA CREDIT: NA

**LATE WORK:** [With Penalty](#)

**SPECIAL ASSIGNMENTS:** [NA](#)

**For GRADUATE STUDENTS:** [FAILING TO MEET COURSE REQUIREMENTS \(Graduate Catalog p.40\)](#)

**For GRADUATE STUDENTS:** [CLASS ATTENDANCE \(see 2019-20 Graduate Catalog p. 53-54\)](#)

Students are expected to attend class and participate on a regular basis in order to successfully achieve course learning outcomes and meet federal financial aid requirements ([34 CFR 668.22](#)). Class attendance in online courses is defined as active participation in academically-related course activities. Active participation may consist of course interactions with the content, classmates, and/or the instructor. Examples of academically-related course activities include, but are not limited to:

- Completing and submitting assignments, quizzes, exams, and other activities within Blackboard or through Blackboard (3rd-party products).
- Participating in course-related synchronous online chats, discussions, or meeting platforms such as Blackboard Collaborate in which participation is tracked.

## **CLASSROOM CITIZENSHIP**

Courtesy, civility and respect must be the hallmark of your interactions.

## **COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT**

North Carolina A&T State University is committed to following the requirements of the Americans with Disabilities Act Amendments Act (ADAAA) and Section 504 of the Rehabilitation Act. If you need an academic accommodation based on the impact of a disability, you must initiate the request with the Office of Accessibility Resources (OARS) and provide documentation in accordance with the Documentation Guidelines at N.C. A&T. Once documentation is received, it will be reviewed. Once approved, you must attend a comprehensive meeting to receive appropriate and reasonable accommodations. If you are a student registered with OARS, you must complete the Accommodation Request Form to have accommodations sent to faculty.

OARS is located in Murphy Hall, Suite 01. We can be reached at 336-334-7765, or by email at [accessibilityresources@ncat.edu](mailto:accessibilityresources@ncat.edu). Additional information and forms can be found on the web at <https://www.ncat.edu/provost/academic-affairs/accessibility-resources/index.php>.

**Please note:** Accommodations are not retroactive and begin once the Disability Verification Form is provided to faculty.

## **TITLE IX**

North Carolina A&T State University is committed to providing a safe learning environment for all students—free of all forms of discrimination and harassment. Sexual misconduct and relationship violence in any form are inconsistent with the university’s mission and core values, violate university policies, and may also violate federal and state law. Faculty members are considered “Responsible Employees” and are required to report incidents of sexual misconduct and relationship violence to the Title IX Coordinator. If you or someone you know has been impacted by sexual harassment, sexual assault, dating or domestic violence, or stalking, please visit the Title IX website to access information about university support and resources. If you would like to speak

with someone confidentially, please contact the Counseling Services 336-334-7727 or the Student Health Center 336-334-7880.

## **TECHNICAL SUPPORT**

If you experience any problems with your A&T account, you may call Client Technology Services (formerly Aggie Tech Support and Help Desk) at 336-334-7195, or visit <https://hub.ncat.edu/administration/its/dept/ats/index.php>.

## **FIELD TRIP POLICIES / OFF-CAMPUS INSTRUCTION AND COURSE ACTIVITIES**

*If applicable:*

Off-campus, out-of-state and foreign instruction and activities are subject to state law and university policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at <https://www.ncat.edu/campus-life/student-affairs/index.php>.

## **STUDENT HANDBOOK**

<https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php>

## **STUDENT TRAVEL PROCEDURES AND STUDENT TRAVEL ACTIVITY WAIVER**

[https://hub.ncat.edu/administration/student-affairs/staff-resources/studen\\_activity\\_travel\\_waiver.pdf](https://hub.ncat.edu/administration/student-affairs/staff-resources/studen_activity_travel_waiver.pdf)

## **OTHER POLICIES** (e.g., *Copyright Guidelines, Confidentiality, etc.*)

### **STUDENT HANDBOOK**

<https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php>

[Graduate Catalog](#)

### **SEXUAL MISCONDUCT POLICY**

<https://www.ncat.edu/legal/title-ix/sexual-harassment-and-misconduct-policies/index.php>

### **FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)**

<https://www.ncat.edu/registrar/ferpa.php>

### **STUDENT COMPLAINT PROCEDURES**

<https://www.ncat.edu/current-students/student-complaint-form.php>

### **STUDENT CONDUCT AND DISCIPLINE**

North Carolina A&T State University has rules and regulations that govern student conduct and discipline meant to ensure the orderly and efficient conduct of the educational enterprise. It is the responsibility of each student to be knowledgeable about these rules and regulations.

Please consult the following about specific policies such as academic dishonesty, cell phones, change of grade, disability services, disruptive behavior, general class attendance, grade appeal, incomplete grades, make up work, student grievance procedures, withdrawal, etc.:

- Undergraduate Bulletin  
<https://www.ncat.edu/provost/academic-affairs/bulletins/index.php>
- Graduate Catalog  
<https://www.ncat.edu/tgc/graduate-catalog/index.php>
- Student Handbook  
<https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php>

## ACADEMIC DISHONESTY POLICY

Academic dishonesty includes but is not limited to the following:

1. Cheating or knowingly assisting another student in committing an act of cheating or other academic dishonesty;
2. Plagiarism (unauthorized use of another's words or ideas as one's own), which includes but is not limited to submitting exams, theses, reports, drawings, laboratory notes or other materials as one's own work when such work has been prepared by or copied from another person;
3. Unauthorized possession of exams or reserved library materials; destroying or hiding source, library or laboratory materials or experiments or any other similar actions;
4. Unauthorized changing of grades, or marking on an exam or in an instructor's grade book or such change of any grade record;
5. Aiding or abetting in the infraction of any of the provisions anticipated under the general standards of student conduct;
6. Hacking into a computer and gaining access to a test or answer key prior to the test being given. A&T reserves the right to search the emails and computers of any student suspected of such computer hacking if a police report of the suspected hacking was submitted prior to the search; and
7. Assisting another student in violating any of the above rules.

A student who has committed an act of academic dishonesty has failed to meet a basic requirement of satisfactory academic performance. Thus, academic dishonesty is not only a basis for disciplinary action but may also affect the evaluation of a student's level of performance. Any student who commits an act of academic dishonesty is subject to disciplinary action.

In instances where a student has clearly been identified as having committed an act of academic dishonesty, an instructor may take appropriate disciplinary action, including a loss of credit for an assignment, exam or project; or awarding a grade of "F" for the course, **subject to review and endorsement by the chairperson and dean.**

**For GRADUATE STUDENTS:** Reference for academic dishonesty – 2010-2020 Graduate Catalog, p.58-59

**For GRADUATE STUDENTS: STUDENT RELIGIOUS OBSEDRVANCE (see Graduate Catalog, p.55)**

## ASSIGNMENTS AND ACADEMIC CALENDAR

Include topics, reading assignments, due dates, exam dates, withdrawal dates, pre-registration and registration dates, all holidays and convocations.\*

DATE	Lec #	SUBJECT	REMARKS
8/20	1	Introduction Governing Equations and Approximations	Ch. 1 Sec. 2.1
8/27	2	Governing Equations and Approximations Basic Wave Dynamics	Sec. 2.2-2.3 Sec. 3.4
9/3	3	Pure Gravity Waves	Sec. 3.5
9/10	4	Inertia-Gravity Waves	Sec. 3.6
9/17	5	Reflection Levels and Critical Levels Wave Generation Mechanisms	Sec. 3.7-3.8 Sec. 4.1-4.2
9/24	6	Wave Maintenance Mechanisms Wave Propagation Mechanisms and Momentum Flux	Sec. 4.3 Sec. 4.4
10/1	7	Flow over 2D Sinusoidal Mountains Flow over 2D Isolated Mountains	Sec. 5.1 Sec. 5.2
10/8	8	Nonlinear Flow over 2D Mountains (nonlinear flow regimes; severe downslope wind generation mechanisms)	Sec. 5.3
10/15	9	Flow over 3D Mountains (linear theories; nonlinear theory of lee vortex generation)	Sec. 5.4 [Midterm?]
10/22	10	Flow over Large-Scale Mountains (rotational effect, lee cyclogenesis, cyclones over 3D mountains)	Sec. 5.5
10/29	11	Other Orographic Effects (frontal passage, coastal trapped disturbances, cold-air damming, gap flow, etc.)	Sec. 5.6
11/5	12	Thermally Forced Flow Theories	Sec. 6.1-6.2
11/12	13	Applications of Thermally Forced Flow Theories (shear & rotational effects, sea-land breezes, mountain-solenoidal circulations)	Sec. 6.3-6.6
11/19	14	Orographic Precipitation	Ch. 11
12/7-11		Final Exam	

\* These descriptions and timelines are subject to change at the discretion of the instructor.