COURSE TITLE: Atmospheric Dynamics Spring, 2024
COURSE NUMBER: PHYS731
INSTRUCTOR: Dr. Henrique Barbosa (hbarbosa@umbc.edu)
OFFICE HOURS: Monday and Friday, 2-4pm

TEXTS:
Holton, J. R. Introduction to Dynamic Meteorology, 5th ed., Acad. Press, 2013 (required).

Other reference texts:

- Pedlosky, J. - Geophysical Fluid Dynamics, John Wiley & Sons, 1979.
- Martin, J. E. - Mid-Latitude Atmospheric Dynamics: a first course, 2006
- Salby, M. L. - Fundamentals of Atmospheric Physics, 1996
- Vallis, G. K. - Atmospheric and Oceanic Fluid Dyn.: Fund. and Large-scale Circ., 2006
- Dutton, J. A. - The Ceaseless wind: An intro. to the theory of atmospheric motion, 1986
- Saltzman, B. - Dynamical Paleoclim.: generalized theory of global climate change, 2001
- Wallace & Hobbs - Atmospheric Sciences an introductory survey, 2006

Other course material:

- Papers
- Lecture notes

OBJECTIVES:
Apply fluid dynamics concepts to atmospheric systems, understanding the scales of atmospheric movements, and being able to justify approximations to equations involved. By the end of the course, the student should understand the dynamic evolution of the atmosphere, and have a basic understanding of how numerical weather and climatic predictions work.

CONTENT:
Fundamental equations (review of 621-level dynamics/thermo). Scale analysis and usual approximations: traditional, hydrostatic, inelastic, Boussinesq and their conditions. Derivation and use of pressure, isentropic and sigma coordinates. Simplified analytical solutions of the equations of motion and applications. Trajectories and streamlines. Geostrophic and cyclostrophic balance, thermal wind, gradient wind, adiabatic motion. Shallow water equations. Vorticity and circulation. Ertel's potential vorticity (PV). Rossby waves.

PRE-REQUISITES:
PHYS621 is highly recommended. Alternatively, either grad/undergrad course work in meteorology, or a strong mathematical background may be sufficient.

GRADING:
One mid-term exam (1/3), one final exam (1/3) and homework assignments (1/3).

Homework assignments will vary, depending on topic. They will include problems involving mathematical derivations, data analysis, text-book problems, analysis of meteorological maps, researching the literature. Work that is sloppy/unreadable or without clear mathematical development and discussion of results will be returned, with an option to resubmit. Where appropriate, results on problems should be checked using dimensional analysis or taking limiting values of parameters.

FORMAT FOR CLASS MEETINGS:
The standard lecture will be used for this course, but my style of teaching requires continuous student participation. We will make constant use of weather maps on the Windy.com website to illustrate what we are discussing in class with real world examples.

ACADEMIC INTEGRITY:
I feel obligated to ensure that students know the repercussions of cheating. If you are found cheating, you will receive a zero for that work, and you will be reported to the Academic Conduct Committee. The University has a website that addresses the concepts of academic integrity: https://academicconduct.umbc.edu/

Here is a statement from the Provost's Office:

UMBC Statement of Values for Academic Integrity

"By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult UMBC policies".

ACCESSIBILITY AND DISABILITY ACCOMMODATIONS, GUIDANCE AND RESOURCES:
Accommodations for students with disabilities are provided for all students with a qualified disability under the Americans with Disabilities Act (ADA & ADAAA) and Section 504 of the Rehabilitation Act who request and are eligible for accommodations. The Office of Student Disability Services (SDS) is the UMBC department designated to coordinate accommodations that would create equal access for students when barriers to participation exist in University courses, programs, or activities.

If you have a documented disability and need to request academic accommodations in your courses, please refer to the SDS website at sds.umbc.edu for registration information and office procedures.

SDS email: disAbility@umbc.edu
SDS phone: (410) 455-2459

If you will be using SDS approved accommodations in this class, please contact me (instructor) to discuss implementation of the accommodations. During remote instruction requirements due to COVID, communication and flexibility will be essential for success.

SEXUAL ASSAULT, SEXUAL HARASSMENT, AND GENDER BASED VIOLENCE AND DISCRIMINATION:
UMBC's Policy on Sexual Misconduct, Sexual Harassment and Gender Discrimination and Federal Title IX law prohibit discrimination and harassment on the basis of sex in University programs and activities. Any student who is impacted by sexual harassment, sexual assault, domestic violence, dating violence, stalking, sexual exploitation, gender discrimination, pregnancy discrimination, gender-based harassment or retaliation should contact the University's Title IX Coordinator to make a report and/or access support and resources:

Mikhel A. Kushner, Title IX Coordinator (she/her/hers)
410-455-1250 (direct line), kushner@umbc.edu

You can access support and resources even if you do not want to take any further action. You will not be forced to file a formal complaint or police report. Please be aware that the University may take action on its own if essential to protect the safety of the community.

If you are interested in or thinking about making a report, please see the Online Reporting Form. Please note that, while University options to respond may be limited, there is an anonymous reporting option via the online form and every effort will be made to address concerns reported anonymously.

NOTICE THAT FACULTY ARE RESPONSIBLE EMPLOYEES WITH MANDATORY REPORTING OBLIGATIONS:
All faculty members are considered Responsible Employees, per UMBC's Policy on Sexual Misconduct, Sexual Harassment, and Gender Discrimination. Faculty are therefore required to report possible violations of the Policy to the Title IX Coordinator, even if a student discloses something they experienced before attending UMBC.

While faculty members want you to be able to share information related to your life experiences through discussion and written work, students should understand that faculty are required to report Sexual Misconduct to the Title IX Coordinator so that the University can inform students of their rights, resources and support. If you need to speak with someone in confidence, who does not have an obligation to report to the Title IX Coordinator, UMBC has a number of Confidential Resources available to support you:

- The Counseling Center: 410-455-2742 / After-Hours 410-455-3230
- University Health Services:410-455-2542
- Pastoral Counseling via Interfaith Center: 410-455-3657; interfaith@umbc.edu

Other Resources:
• Women's Center (for students of all genders): 410-455-2714; womenscenter@umbc.edu.
• Shady Grove Student Resources, Maryland Resources, National Resources.

Child Abuse and Neglect:
Please note that Maryland law and UMBC policy require that I report all disclosures or suspicions of child abuse or neglect to the Department of Social Services and/or the police.

PREGNANCY
UMBC's Policy on Sexual Misconduct, Sexual Harassment and Gender Discrimination expressly prohibits all forms of Discrimination and Harassment on the basis of sex, including pregnancy. Resources for pregnant students are available through the University's Office of Equity and Inclusion. Pregnant and parenting students are encouraged to contact the Title IX Coordinator to discuss plans and assure ongoing access to their academic program with respect to a leave of absence or return following leave related to pregnancy, delivery, or the early months of parenting. In addition, students who are pregnant may be entitled to accommodations under the ADA through the Student Disability Service Office, and/or under Title IX through the Office of Equity and Inclusion.

RELIGIOUS OBSERVANCES & ACCOMMODATIONS
UMBC Policy provides that students should not be penalized because of observances of their religious

beliefs, students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the responsibility of the student to inform the instructor of any intended absences for religious observances in advance, and as early as possible. For questions or guidance or to request an accommodation, please contact the Office of Equity and Inclusion at oei@umbc.edu.

HATE, BIAS, DISCRIMINATION AND HARASSMENT

UMBC values safety, cultural and ethnic diversity, social responsibility, lifelong learning, equity, and civic engagement. Consistent with these principles, UMBC Policy prohibits discrimination and harassment in its educational programs and activities or with respect to employment terms and conditions based on race, creed, color, religion, sex, gender, pregnancy, ancestry, age, gender identity or expression, national origin, veterans status, marital status, sexual orientation, physical or mental disability, or genetic information.

Students (and faculty and staff) who experience discrimination, harassment, hate or bias or who have such matters reported to them should use the online reporting form to report discrimination, hate or bias incidents; reporting may be *anonymous*.