VISAYAS STATE UNIVERSITY

DEPARTMENT OF METEOROLOGY
College of Engineering and Technology
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OUTCOMES-BASED EDUCATION (OBE) COURSE SYLLABUS

Mete 133
Dynamic Meteorology 1

I. UNIVERSITY INFORMATION

1. Vision of the University

A globally competitive university for science, technology, and environmental conservation.

2. Mission of the University

Development of a highly competitive human resource, cutting-edge scientific knowledge and innovative technologies for sustainable communities and environment.

3. VSU Quality Policy Statement

The Visayas State University (VSU), a globally competitive university of science and technology and environmental conservation, is created by law to develop highly competitive human resource, cutting- edge scientific knowledge and innovative technologies for sustainable communities and environment.

Towards this end, we, at the Visayas State University, commit to:

- Produce highly competent, quality and world-class manpower in science and technology, especially for agriculture, environmental management and industry who are proficient in communication skills, critical thinking and analytical abilities;
- Generate and disseminate relevant knowledge and technologies that lead to improved productivity, profitability and sustainability in agriculture, environment and industry; and
- Satisfy the needs and applicable requirements of the industry, the community and government sectors who are in need of quality graduates and technology ready for commercialization through the establishment, operation, maintenance and continual improvement of a Quality Management System (QMS) which is aligned with the requirements of ISO 9001:2015.

It shall be the policy of the university that the quality policies and procedures are communicated to and understood by all faculty, staff, students and other stakeholders and that the system be continually improved for its relevance and effectiveness.

EDGARDO E. TULIN
President
v0 07-16-2019

4. Quality Goals of the College of Engineering and Technology

a) Produce globally competent engineering graduates by providing students with excellent instruction through updated curriculum; functional and state-of-the art facilities; and qualified, well-trained, and dedicated faculty and staff;
b) Generate new and advance knowledge and technology in engineering and allied sciences through the conduct of relevant researches that can contribute towards sustainable development, climate change mitigation, food security, and advance knowledge in engineering sciences; and
c) Engage in relevant need-based community/stakeholder-projects that can make the Philippines and even the world a better place to live in.

5. Quality Objectives of the Department of Meteorology

a. Produce highly competent and world-class professionals in meteorology;
b. Develop a strong and dynamic faculty and staff of the department;
c. Offer excellent and relevant undergraduate and graduate programs;
d. Generate appropriate knowledge and technologies relevant to the conservation, management, and utilization of available resources;
e. Establish and sustain dynamic linkages with private sector for the promotion of instruction, research, and extension programs of the department; and
f. Provide science and technology expertise to relevant sectors in the country and in other countries.

II. PROGRAM INFORMATION

1. Name of the Program	Bachelor of Science in Meteorology
2. CHED CMO Reference	*No CMO Issuance yet*
3. BOR Approval	BOR Resolution No. 17 s. 2012

4. Program Educational Objectives and Relationship to Institution Mission

Program Educational Objectives	Mission*		
	a	**b**	**c**
1. Create and provide weather forecasts to the general public through different multimedia weather broadcasting platforms;			
2. Manage business with weather sensitive operations (e.g., aviation, marine, navigation, power, oil exploration) and military;			
3. Lead local or international firms that are involved in natural hazards and disaster risk reduction;			
4. Conduct multi-disciplinary research studies that can be utilized by the industry and for the advancement of meteorology;	✓	✓	✓
5. Pursue advanced studies in meteorology and emerging related fields;	✓	✓	✓
6. Occupy responsible positions in meteorology education; and other PEOs unique to the institution.			

a - development of a highly competitive human resource, b - cutting-edge scientific knowledge, c - innovative technologies for sustainable communities and environment

III. COURSE INFORMATION

1. Course Code	Mete 133
2. Course Title	Dynamic Meteorology 1

3. Pre-requisite	Mete 111 – Introduction to Meteorology Math 114 – Differential Equations
4. Co-requisite	None
5. Credit	5 units
6. Semester Offered	1st Semester
7. Number of hours	5 hours lecture per week
8. Course Description	This course will discuss the equations that govern the flow of the atmosphere. Approximations to the Navier-Stokes equations of fluid flow appropriate to geophysical scale flows. Applying two key themes of rotation and stratification of the atmosphere. The spinning of the Earth, and the variation of radiation with latitude, create a playground for several waves and instabilities, driving both the weather over our heads and the undulations of the oceans.

9. Program Outcomes (POs) **in relation to the Program Educational Objectives** (PEOs)

Program Outcomes (POs)		**Program Educational Objectives**					
		1	2	3	4	5	6
a	Grasp knowledge of atmospheric physics, mathematics, chemistry, and statistics; climate science; and synoptic, dynamic and tropical meteorology to solve simple to complex meteorological problems;				✓	✓	
b	Design a system, component, or process; apply scientific reasoning, computational and experimental methods; and analyze and interpret data to meet desired needs within realistic constraints in accordance with standards;				✓	✓	
c	Communicate effectively meteorological knowledge, activities and forecasts using modern techniques, skills, and technology with the scientific community and with society at large;						
d	Recognize and adopt specialized fields and recent developments in Meteorology.						

10. Course Outcomes (COs) and Relationship to Program Outcomes (POs)

	Program Outcomes Code			
After completing this course, the student must be able to perform the following COs:	a	b	c	d
CO 1: **Derive** the fundamental equations and relate it to the observed dynamic flow of the atmosphere.	*D*			
CO 2: **Visualize and model** the rotating spherical coordinates and its effect to fluid flow and wave propagation in the atmosphere.	*D*	*E*		
CO 3: **Describe** the planetary boundary layer using underlying physical characteristics and its role in the formation of the different atmospheric phenomena.	*D*	*E*		
CO 4: **Discuss** the different synoptic scale motions using quantitative measures.	*D*	*E*		

11. Course Content and Plan

Week	Topics	Learning Outcomes	Teaching and Learning Activities		Assessment Tasks
			Teaching Activities	Learning Activities	
1	OBE Course Syllabus (including VSU Vision Mission, and Quality Policy Statement) Class Policies Requirements Grading System and Activities Learning Guide Submission of requirements	Explain the the Vision, Mission and Quality Policy Statement of the University; Use the knowledge in the future concerns related to the class policies ; Use the gained information in the future concerns related to requirements, grading system and activities; Access the VSUEE	Q & A for clarification Setting of expectations Getting-to-know-each other Sharing of Ideas	Presentation of Course Syllabus & Checking of Class Roster Getting organized for the semester Getting Oriented to course outcomes	
	Emergency Plan -Fire -Earthquake	Discuss and explain what to do during the emergencies for fire and earthquake	Demonstration of the emergency plan by the OUDRRM	Fire Drill Earthquake Drill	
CO 1: Derive the fundamental equations and relate it to the observed dynamic flow of the atmosphere.					
1	**Module 1. Introduction** Lesson 1.1 The Atmosphere Lesson 1.2 Fundamental Forces Lesson 1.3 Frames of Reference and "Apparent" Forces Lesson 1.4 Structure of the Static Atmosphere	Review fundamentals of the atmosphere Derive and discuss the fundamental forces Discuss frames of reference and apparent forces Discuss the structure of the static atmosphere	Learning Instructions through the Student Learning Guides Consultation and follow-up meetings with students either through SMS, Messenger, Facebook, Email, Courier	Solving sample exercises Solving Assessment exercise Solving supplement exercises	Quiz 1
2-3	**Module 2. Basic Conservation Laws** Lesson 2.1 Review of Mathematical		Learning Instructions through the Student Learning Guides	Solving sample exercises Solving Assessm	Quiz 2

	background Lesson 2.2 Scale Analysis of the Equations of Motion Lesson 2.3 The Continuity Equation Lesson 2.4 The Thermodynamic Energy Equation Lesson 2.5 Thermodynamics of the Dry Atmosphere	Discuss mathematical backgrounds that lead to the derivation of important dynamical equations Identify the scales of motion of the different atmospheric phenomena Derive the continuity equation Derive the thermodynamic energy equation Discuss the thermodynamics of Dry Atmosphere	Consultation and follow-up meetings with students either through SMS, Messenger, Facebook, Email, Courier	ent exercise Solving supplement exercises	
4-5	**Module 3.** **Elementary Applications of the Basic Equations** Lesson 3.1 Basic Equations in Isobaric Coordinates Lesson 3.2 Balanced Flow Lesson 3.3 Trajectories and Streamlines Lesson 3.4 The Thermal Wind Lesson 3.5 Vertical Motion Lesson 3.6 Surface Pressure Tendency	Derive the basic equations in isobaric coordinates Discuss balanced flow in the atmosphere Derive equations representing the trajectories and streamlines. Derive the thermal wind equation Discuss the vertical motion and its influences Discuss surface pressure tendency	Learning Instructions through the Student Learning Guides Consultation and follow-up meetings with students either through SMS, Messenger, Facebook, Email, Courier	Solving sample exercises Solving Assessment exercise Solving supplement exercises	Quiz 3 Long Exam 1
CO 2: Visualize and model the rotating spherical coordinates and its effect to fluid flow and wave propagation in the atmosphere.					
6-7	**Module 4.** **Circulation and Vorticity** Lesson 4.1 The Circulation Theorem Lesson 4.2 Vorticity	Discuss the circulation theorem Discuss the concept of vorticity and its existence in the atmosphere	Learning Instructions through the Student Learning Guides Consultation and follow-up meetings with students either through SMS,	Solving sample exercises Solving Assessment exercise Solving supplement exercises	Quiz 4

	Lesson 4.3 Potential Vorticity Lesson 4.4 The Vorticity Equation Lesson 4.5 Vorticity in Barotropic Fluids Lesson 4.6 The Barcolinic (Ertel) Potential Vorticity Equation	Discuss the concept of potential vorticity Derive the Vorticity Equation Discuss the behavior of vorticity in a barotropic fluid Derive the Baroclinic Potential Vorticity Equation	Messenger, Facebook, Email, Courier		
8	**INTEGRATION PERIOD**				
9	**MIDTERM EXAMINATION**				
CO 3: Describe the planetary boundary layer using underlying physical characteristics and its role in the formation of the different atmospheric phenomena.					
10-11	**Module 5.** **The Planetary Boundary Layer** Lesson 5.1 Atmospheric Turbulence Lesson 5.2 Turbulent Kinetic Energy Lesson 5.3 Planetary Boundary Layer Momentum Equations Lesson 5.4 Secondary Circulations and Spindown	Discuss atmospheric turbulence and its effects Describe turbulent kinetic energy Derive planetary boundary layer momentum equation Discuss secondary circulations and spindown	Learning Instructions through the Student Learning Guides Consultation and follow-up meetings with students either through SMS, Messenger, Facebook, Email, Courier	Solving sample exercises Solving Assessment exercise Solving supplement exercises	Quiz 5
12-14	**Module 6.** **Synoptic-Scale Motions: Quasi-geostrophic Analysis** Lesson 6.1 The Observed structure of extratropical circulations Lesson 6.2 The Quasi-geostrophic approximation Lesson 6.3 Quasi-geostrophic prediction Lesson 6.4 Diagnosis of vertical motion Lesson 6.5 Idealized Model of a baroclinic disturbance	Discuss the observed structure of extratropical circulations and how they differ from their tropical counterparts Discuss the quasi-geostrophic approximation Analyze quasi-geostrophic prediction Perform diagnosis of vertical motion Analyze the idealized model of a baroclinic disturbance	Learning Instructions through the Student Learning Guides Consultation and follow-up meetings with students either through SMS, Messenger, Facebook, Email, Courier	Solving sample exercises Solving Assessment exercise Solving supplement exercises	Quiz 6 Long Exam 2

15-16	**Module 7.** **Atmospheric Oscillations: Linear Perturbation Theory** Lesson 7.1 The Perturbation Method Lesson 7.2 Properties of Waves Lesson 7.3 Simple Wave Types Lesson 7.4 Internal Gravity (Buoyancy) Waves Lesson 7.5 Gravity waves modified by rotation Lesson 7.6 Adjustment to geostrophic balance Lesson 7.7 Rossby Waves	Discuss the perturbation method in analyzing atmospheric waves Enumerate and discuss the properties of waves Identify simple wave types Discuss the internal (buoyancy) waves Discuss gravity waves as modified by rotation Analyze adjustments to geostrophic balance Discuss Rossby waves	Learning Instructions through the Student Learning Guides Consultation and follow-up meetings with students either through SMS, Messenger, Facebook, Email, Courier	Solving sample exercises Solving Assessment exercise Solving supplement exercises	Quiz 7 Quiz 8
17	**INTEGRATION PERIOD**				
18	**FINALS WEEK**				

** VSUEE/VC – VSU E-Learning Environment/ Virtual Classroom*

12. Life-long Learning Opportunities

In this course, the students will demonstrate proficiency in deriving dynamical equations that are employed in the analysis of fluid motion in the atmosphere. The same equations are integrated in Numerical Weather Prediction Models. Students will develop appreciation on the practical use of these equations and how they aid forecasters in better understanding the machinations of the atmosphere.

13. Contribution of Course to Meeting the Professional Component

General Education:	0 %
Basic Science:	10 %
Professional Meteorology:	90 %

14. References and Other Learning Resources

A. Textbook(s)/ E-Books

Walker, Gabrielle, 2007: An Ocean of Air, Houghton Mifflin Harcourt, 288 pp.

Geoffrey K. Vallis, 2006, Atmospheric and Oceanic Fluid Dynamics: Fundamentals and Large-Scale Circulation, 2/E, Cambridge University Press, 745 pp.

Holton, J.R., Hakim, G.J., 2013. An Introduction to Dynamic Meteorology. 5/E, Academic Press.

Ahrens, D.C. (2013). Meteorology Today: an introduction to weather, climate and the environment, 10/E, Brooks/Cole, CENGAGE Learning

Lutgens, F.K., Tarbuck, E.J., Tasa, D.G. (2016). The atmosphere: an introduction to meteorology. 13/E, Pearson Education, Inc., 1900 E. Lake Ave, Glenview, IL 60025

B. Other Learning Resources

- YouTube lecture videos

15. Course Assessment and Evaluation

The performance of students will be assessed and evaluated based on the following:

Item No,	Assessment Tasks	Percentage Contribution (1)	No. of Times in the Semester (2)	Individual Task % Contribution (1/2)
1	Quiz (Q)	40	8	5
2	Long Exam (LE)	30	2	15
3	Term Exam (TE)	30	2	15
		100	12	

COs	Assessment Tasks	Weight in Percent	Minimum Average for Satisfactory Rating	Target and Standards
CO 1	Q 1 Q 2 LE 1	5 5 15	60%	At least 70% of the students have at least 60% score
CO 2	Q 3 Q 4 TE 1	5 5 15	60%	
CO 3	Q 5 Q 6 LE 2	5 5 15	60%	At least 70% of the students have at least 60% score
CO 5	Q 7 Q 8 TE 2	5 5 15	60%	
TOTAL		**100%**		
Passing Percentage			**60%**	

Grading System (% Passing: 60%)

Range	Grade	Range	Grade
95.56-100.00	1.00	52.50-59.99	3.25
91.11-95.55	1.25	45.00-52.49	3.50
86.67-91.10	1.50	37.50-44.99	3.75
82.22-86.66	1.75	30.00-37.49	4.00
77.78-82.21	2.00	22.50-29.99	4.25
73.33-77.77	2.25	15.00-22.49	4.50
68.89-73.32	2.50	07.50-14.99	4.75
64.44-68.88	2.75	00.00-07.49	5.00

60.00-64.43	3.00

16. Course Policies

A. Conduct of Classes

1. The classes for this course are to be **conducted during the schedule** as reflected in the official schedule or as agreed during the class.
2. Students may communicate with the instructor through **preferred communication channels** of the instructor.

B. Student Conduct During Classes

1. Students are to **attend all classes** as agreed during the class orientation. Attendance to classes shall be checked and recorded. Failure to attend must be duly informed to the instructor.
2. Students are encouraged to **participate during classes** while upholding the attitude expected of a professional including being respectful, attentive, punctual, honest, and hardworking.
3. Students are expected to **dress appropriately** during the class.
4. **Minimum health protocols** shall be properly observed.
5. Students shall observe **cleanliness and orderliness** of the classroom at all times.

C. Course Activities

1. All course activities shall be **performed by the student**s, either individually or by group, as required, and shall be performed while following the instructions, rules, and regulation of the activity.
2. **Missed activities** shall be communicated to the instructor, within a limited time frame, for compliance purposes.
3. Students are expected to **perform all activities in full honesty**.

D. Final Provisions

1. **Specific and details** for the previously stated policies shall be provided by the instructor during the Course Orientation.
2. All policies set forth, including addition and amendments during the Course Orientation, shall be **strictly implemented**. Non-compliance to the policies shall have their **respective consequences** depending on the degree of violation.
3. All policies set forth, including addition and amendments during the Course Orientation, shall be **applicable for the whole semester and are applicable to this course only.**

17. Course Materials and Facilities Available

- Lecture Notes
- VSU Elearning Environment
- Google Meet
- Pre-recorded Lecture videos
- Lectures from Youtube

18. Revision History			
Revision number	**Date of Revision**	**Date of implementation**	**Highlights of Revision**
00	Aug 2021	First Semester, SY 2021-2022	• New course offering
01	08 Sept 2022	12 Sept 2022 1st Sem. A.Y. 2022-2023	Use of **TP-IMD-08** *V1 11-19-2021* CET OBE Syllabus Harmonization Charlindo S. Torrion

19. Preparation			
	Name	Signature	Date Signed
Prepared by	Charlindo S. Torrion		

III. INSTRUCTOR/PROFESSOR INFORMATION

1. Name of Instructor/Professor	Charlindo S. Torrion
2. Office and Department	Instructor, Department of Meteorology
3. Telephone/Mobile Numbers	09190068626
4. Email Address	charlindo.torrion@vsu.edu.ph
5. Consultation Time	Refer to Instructor's Program

20. Department Instructional Materials Review Committee:

Committee	Name	Signature	Date Signed
Member:	Charlie S. Andan		
Member:	Engr. Rotsen B. Labisores		
Chairperson/ Department Head:	Daniel C. Lor		

	Name	Signature	Date Signed
Verified by:	DR. JANNET C. BENCURE College Dean		
Validated by:	DR. NANCY D. ABUNDA Head, IMD		

Note:

1) The number of POs will depend on each degree program offered
2) COs and Relationship to POs
    a. (I) - **Introductory** – an Introductory Course to an outcome
    b. (E) - **Enabling** – an Enabling Course or a course that strengthens the outcome
    c. (D) - **Demonstrated** – a Demonstrative Course or a course demonstrating an outcome.

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Distribution of copies: OIMD, College, Department, Faculty and ODQA