SMR 301: DYNAMIC METEROLOGY
STUDY GUIDE

1. Course Unit Summary

Dynamic Meteorology is a third level unit and is meant for students who have covered selected mathematics and physics courses. The Mathematics courses include calculus, vector analysis, linear algebra, classical mechanics and ODEs. The physics units include Mechanics, Wave Theory and Optics.

2. General Course Unit Objectives

The aim of Dynamic Meteorology course is to enable students apply the laws of fluid dynamics and thermodynamics to acquire knowledge on the mechanisms of air motions in the earth's atmosphere. Students will learn how to identify forces causing the motions, and determine the force balances that interplay to give rise to atmospheric motion systems that are important for weather and climate processes.

3. Course Unit Outcomes

By the end of this unit, the student should be able to:

- Identify the real and apparent forces that cause atmospheric motions and obtain the equation of motion in simple Cartesian co-ordinates through transformation of Newton's second law of motion from inertial frame to description of motion relative a rotating frame
- Derive and explain the terms in the component equations of atmospheric motions in spherical co-ordinates
- Carry out scale analysis of frictionless atmospheric motions and explain the hydrostatic and geostrophic approximations or balances

- Describe force balances in idealized horizontal frictionless balanced motion systems
- Explain the phenomenon of thermal wind relation an identify some of its manifestations in atmospheric motions
- Describe the atmospheric phenomenon's of Divergence and Vorticity with theorems, equations and obtain their equations and scaling considerations

4. Selected Resources & references

1) An Introduction to Dynamic Meteorology, Third Edition, by J. R. Holton, Academic Press, pp.102-107, (1992)
2) Dynamic and Physical Meteorology, by G. J. Haltiner and F. L. Martin, McGraw-Hill Book Company, pp.158-177 (1957)
3) Introduction to Atmospheric Physics: International Geophysics Series, 25, Second Edition, by R. G. Fleagle and J. A. Busige, Academic Press, pp.12-16, (1980)

5. Lecturers

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