

UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DISCIPLINE/DEPARTMENT: Geography

IMPLEMENTATION DATE: 1996

Revised: _____

Geography 301
SUBJECT/NUMBER OF COURSE

Synoptic Climatology
DESCRIPTIVE TITLE

4
UCFV CREDITS

CALENDAR DESCRIPTION: An advanced course in synoptic climatology. Examination of the structure of the atmosphere through climatological and meteorological data analysis. Weather prediction using satellite imagery and radar. Emphasis is placed on applied laboratory exercises.

RATIONALE: This course is part of a series of upper level geography courses that builds on our lower level physical geography offerings. It is designed to give the student an advanced understanding of the study of applied climatology at the synoptic scale.

COURSE PREREQUISITES: Geography 201, and Math 104 or 106

COURSE COREQUISITES: None

HOURS PER TERM FOR EACH STUDENT	Lecture	30	hrs	Student Directed	
	Laboratory	45	hrs	Learning	hrs
	Seminar		hrs	Other - specify:	
	Field Experience		hrs	_____	hrs
				TOTAL	75 HRS

MAXIMUM ENROLMENT: 25

Is transfer credit requested? **9** Yes **:** No

AUTHORIZATION SIGNATURES:			
Course Designer(s):	Ian T. Okabe	Chairperson:	Dave Gibson
	_____		_____ Curriculum Committee
Department Head:	David Gibson	Dean:	J.D. Tunstall
	_____		_____
PAC: Approval in Principle	_____	PAC: Final Approval:	February 28, 1996
	(Date)		(Date)

SYNONYMOUS COURSES:

(a) replaces _____
(course #)

(b) cannot take _____ for further credit
(course #)

SUPPLIES/MATERIALS:

Students will be expected to have scientific calculators.

TEXTBOOKS, REFERENCES, MATERIALS (List reading resources elsewhere)

Djuric, Dusan., 1994. Weather Analysis, Prentice-Hall, New Jersey.
Bluestein, Howard B., 1992. Synoptic-Dynamic Meteorology in Midlatitudes, Oxford University Press, New York.
Carlson, Toby N., 1991. Mid-Latitude Weather Systems, Harper Collins, London.
Chang, Jen-hu, 1972. Atmospheric Circulation Systems and Climates, Oriental Publishing Company, Honolulu.
Petterssen, Sverre, 1940. Weather Analysis and Forecasting, McGraw-Hill, New York.

OBJECTIVES:

This course is intended to provide students with the advanced scientific principles that modern climatology is based upon. Physical and dynamical processes of the atmosphere will be examined at the synoptic scale. Upon successful completion of the course the student will be able to:

1. demonstrate an advanced understanding of the structure of the atmosphere
2. analyse standard climatological and meteorological data, and
3. predict the weather at an advanced level.

METHODS:

The format of the course includes lectures, laboratory sessions and assignments, assigned readings, and out-of-class projects. The lecture topics will emphasize conceptual and theoretical issues and will be supplemented by the use of audio visual aids throughout the course. Laboratory assignments will emphasize advanced techniques in the analysis and application of meteorological and climatological data.

STUDENT EVALUATION PROCEDURE:

Laboratory Exercises	30%
Forecast Competition	10%
Mid-term Examination	30%
Final Examination	30%

COURSE CONTENT

Lecture Topics

1. Upper Atmosphere
Upper atmospheric structure. Polar and subtropical jetstreams. Low level jetstreams and the tropical easterly jetstream. Confluence theory and secondary circulation. Storm development potential.
2. Upper Circulation
Propagation of long and short waves in the westerlies. The Rossby wave equation. Vorticity and thickness advection. The quasi-geostrophic equation and development potential. Divergence, convergence, and vertical ascent.
3. Motion and Development I
Atmospheric forces and the equations of motion. Geostrophic and gradient winds. Wave theory of extratropical cyclones. Horizontal divergence and vorticity.
4. Motion and Development II
Development of extratropical cyclones. Initial stages and self development. Three dimensional structure and the conveyor belt theory. Energetics and storm potential. Final mature stage.
5. Frontal Structure I
Air mass theory. Frontogenesis, and frontolysis. Deformation wind fields and isotherm patterns. Arctic, maritime, and polar front theory.
6. Frontal Structure II
Dynamic versus static processes in frontal surfaces. Stationary, cold, and warm fronts. Occlusion and troughs.
7. Thermodynamics and Hodographs
First Law of Thermodynamics. Hydrostatic equilibrium. Adiabatic processes. Thermal wind concept and thickness advection. Wind shear and turbulence. Frontal identification and stability changes.
8. Tephigrams
Vertical structure of the atmosphere. Atmospheric stability. Normand's rule. Lifting condensation level and the level of free convection. Airmass and cloud identification. Convective storm indices.
9. Extratropical Weather Prediction
Short range prognosis. Subjective and objective kinematic techniques. Control line charts and isochrone analysis. Motion and development of pressure systems. Movement of frontal systems. Pressure gradients and isallobaric techniques.
10. Tropical Weather Prediction
Latent energy and angular momentum transfer. Mean circulation. Trade winds and the intertropical convergence zone. Vertical structure. Common tropical disturbances from easterly waves to vortices. Hurricane motion and development.

COURSE CONTENT con't

Laboratory Exercises are an essential component of the course and are designed to complement the lecture material.

1. Jet Stream Analysis
2. 500 mb Vorticity and Thickness Analysis
3. Frontal Contour Analysis
4. Surface Weather Plots and SAs
5. Isobaric and Isallobaric Analysis
6. Nephanalysis and Frontal Analysis
7. Thermal Wind and Hodograph
8. Tephigram Diagnosis
9. Weather Prediction Case I Winter Storm
10. Weather Prediction Case II Hurricane