

**INTRODUCTION TO ENVIRONMENTAL
EARTH SCIENCE**

Earth Science (ES) 1020 Outline

Lectures: W, F 1:00-2:20
Room: J 204
Labs: M,T 14:30-17:20
Room: J107

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Course objectives:

This introductory course in physical geography is designed to guide the student toward a clearer understanding of planet Earth through lectures, personal study, and exercises. The focus is on atmospheric and ecological processes and on the resulting global patterns of energy flow, weather, climate, vegetation, soils, and ecosystems. It is hoped that the student will also gain a deeper appreciation of the relationships between the processes and patterns. Laboratory assignments and exams will be designed to see if the student can select and apply the relevant knowledge to various questions.

Textbook:

Briggs, D., Smithson, P., Ball, T., Johnson, P., Kershaw, P. and Lewkowicz, A. 1993. Fundamentals of Physical Geography. 2nd. Canadian edition, Copp Clark Pitman Ltd. Toronto, 692 pp..

Course requirements:

1. Development and study of lecture notes, and coordinated study of the textbook. Also,
2. Attendance of all laboratory exercises in the lab assigned during registration. Labs are meant to complement and enhance material presented in lectures and should not be taken lightly. The labs are to be completed and handed in at the end of each lab period. Material learned on the labs will be tested in two lab exams that will be scheduled for the days before the lecture midterm and final respectively. A detailed schedule of labs will be handed out during the first week of labs. Materials for exercises: Bring the following to each lab session.
 - a) the textbook and lab exercise book
 - b) a hard drawing pencil (2H) and eraser,
 - c) a ruler calibrated in cm and mm with inches,
 - d) a protractor and right triangle,
 - e) at least four coloured pencils,
 - f) a pocket calculator would be useful for most labs.
3. Completion of the Mid-term Examination:
4. Completion of the Final Examination:
Exams, as much as possible, will be **non-cumulative**.
5. Completion of two lab exams that will be given in the labs after the completion of the fourth and eighth labs.

Mark distribution:

Assignments	10%
Labs	10%
Lab exams (2X10%):	20%
Mid-term examination:	30%
Final examination:	30%

Recommendation:

Students should "survey-read" relevant sections in the textbook prior to each lecture and lab session. For each lecture series, the appropriate sections in the required text (**FPG**) are indicated.

Outline of topics for lectures: Note that the pages give may serve only the minimum requirements for each section.

WEEK	Course outline with discussion of objectives and student responsibilities. Discussion of scientific principles - hypotheses, theories, Scientific Laws, models. Begin the global energy system: concepts of energy, radiation, energy and mass transfers. FPG Ch.2:11-24.
1. Sept. 1	
2. Sept. 8	The energy balance of the atmosphere: composition of the atmosphere, short and longwave radiation, radiation and energy balances, solar radiation. FPG Ch.3:29-45.
3. Sept. 15	Heat and moisture in the atmosphere: daily and annual cycles of solar radiation, temperature, humidity. Vertical changes in temperature; stability. Cloud formation and precipitation. FPG Ch.4:57-59, 74-76, 109-111.
4. Sept. 22	Atmospheric motion: air pressure, winds, global circulation, Coriolis effect. Weather-forming systems, air masses, fronts. FPG Ch.5&6:71-112.
5. Sept. 29	Climates of the world: nature and elements of climate, climate classification, regional climates. FPG Ch.7:113-138, 640-641, 445-449.
6. Oct. 7	Climatic change: past climates, future climates. Effects of human activity. FPG Ch.9:161-193, and microclimates. FPG Ch.8:139-159
7. Oct. 14	Midterm exam, Friday Oct 18
8. Oct. 21	The global water balance, precipitation, evapotranspiration: the hydrological cycle. FPG Ch.10,11,&12:195-242.
9. Oct. 28	Soils: soil-forming system, soil profile development, soil formation and soil properties, soil formation and soil type. FPG Ch.27:529-551
10. Nov. 4	Ecosystems: structure and functions, energy cycling, world ecosystems. FPG Ch.26:515-528.
11. Nov. 11	Vegetation: structure, changes in the biosphere, environmental relationships, competition, dispersal and migration, succession, ecosystem dynamics. FPG Ch.28:553-570.
12. Nov. 18	Biogeographical cycling: nutrients in the biosphere, nutrient inputs to ecosystems, nutrient outputs from the ecosystem, biogeochemical cycling in the soil, nutrient cycling in the vegetation, nutrient cycles. FPG Ch.29:571-587.
13. Nov. 25	World ecosystems: soil and vegetation patterns, ecological relationships and the biome, tropical forests, savanna, desert and semi-desert biomes, temperate grassland biomes, temperate forests, tundra biomes. FPG Ch.30:589-615.
14. Dec. 2	Humans and the ecosystems: history of human activities, agricultural ecosystems, shifting cultivation, managed forests, human impact on aquatic ecosystems. FPG Ch.31:617-636.
	Final Exam TBA

Lab Schedule to the midterm

Lab 1: Sept. 16 Distance from the Sun (p.34-36) Surface heating (p.41-44) Solar radiation (p.45-47)	Lab 2: Sept. 23 Local climate (p.48-50) Evaporation, Latent Heat (p.56-58) Measuring Moisture (p.59-61) Clouds (video)	Lab 3: Sept. 30 Wind: Air in motion (p. 112-114) The Coriolis Effect (p.115-116) Analysing a Storm (p. 117-127)	Lab 4: Oct. 7 Tracking Hurricane Hugo (p. 149-152) Weather Radars (p. 153-159) Global Warming (p. 181-186) Hurricanes (video)
Lab 5: Oct 21 Lab exam	Subsequent labs on Oct. 28, Nov. 4, 18, and 25. The final lab exam will be on the week of Dec 4 in your regular lab period		