

**FOREST SOILS & HYDROLOGY FO 2130 3(3-0-3)**  
**(Fall 1998)**

- Instructor: C. Shang, Office J210; Tel: 539-2977
- Prerequisite: Introduction to Soil Science (FO 1220)
- Lecture: Monday, Wednesday, Friday 9:00-9:50 A.M.
- Laboratory: Friday 3:00-5:50 P.M.
- Textbooks: Pritchett, W.L. and R. F. Fisher. 1987. Properties and Management of Forest Soils, 2nd ed. John Wiley & Sons, New York.
- Hewlett, J.D. 1982. Principles of Forest Hydrology. The University of Georgia Press, Athens, GA
- Lab manual: Shang, C. 1998. F2130 Lab Manual.

Policy:

1. It is mandatory for students to attend all the labs and field exercises in order to pass the LAB. Students who fail the LAB would automatically fail the course.
2. A student who misses his/her lab must present convincing evidence to the instructor. Otherwise it will be treated as absence.
3. Assignments must be submitted within the time period specified by instructor. Lab reports are due one week from the date the exercise is completed. A deduction of 20% per week will be applied to any delay.

## COURSE OUTLINE

### PART I. Formation of Forest Soils and Ecological Classification

1. Forest floor and forest soils
  - 1.1 Forest floor classification
  - 1.2 Formation of forest floor (litter fall and decomposition)
  - 1.3 Overview on organic matter study methods
  - 1.4 Podzolization and Podzolic soils
  - 1.5 Forest soils in Alberta
2. Ecological classification and land capability
  - 2.1 Land capability classification
  - 2.2 Site description
  - 2.3 Ecological classification of forest soils

### PART II. Forest Hydrology

3. Engineering properties of soils
4. Introduction to hydrology
  - 4.1 Definitions
  - 4.2 Water and energy balance
  - 4.3 Drainage basin morphology
5. Water budget
  - 5.1 Atmospheric water and precipitation
  - 5.2 Subsurface water
  - 5.3 Evaporation and evapotranspiration
  - 5.4 Surface water and water yield

### PART III. Chemical and Biological Processes

6. Chemical processes
  - 6.1 Acidity and acidification in forest soils
  - 6.2 Diffuse-double-layer (DDL) theory and cation retention
  - 6.3 Anion sorption, phosphate fixation and the fate of phosphate fertilizers
7. Ecology of organisms in forest soils
  - 7.1 Overview on organism world in forests
  - 7.2 Biochemical pathways of forest litter decomposition
  - 7.3 Microbial-plant interactions

### PART IV. Tree Nutrition and Soil Fertility

8. Tree nutrition and nutrient cycling
  - 8.1 Root systems
  - 8.2 Movement of nutrients to plant roots
  - 8.3 Nutrient uptake by trees
  - 8.4 Geochemical nutrient cycling
  - 8.5 Biological nutrient cycling
9. Fertilization
  - 9.1 Forest nutrition assessment
  - 9.2 Principles of fertilization
  - 9.3 Fertilizers and fertilizer application
  - 9.4 Effects of fertilization
  - 9.5 Use of wastewater and sludge as fertilizers
  - 9.6 Economics analyses

## PART V. Forest Soil Management

10. Soils and Silviculture
  - 10.1 Harvesting and nutrient cycling
  - 10.2 Effects of land cleaning and site preparation
  - 10.3 Soils and species selection
  - 10.4 Nutrition management (including symbiotic N-fixation)
11. Management of nursery soils
  - 11.1 Site selection
  - 11.2 Soil management for nursery
  - 11.3 Christmas trees and seed orchards
12. Fire-affected soils and management
  - 12.1 Effects of fire on soil properties
  - 12.2 Effects of fire on water quality
  - 12.3 Management implications
13. Management of problem soils and Land reclamation
  - 13.1 Aforestation and reforestation sites
  - 13.2 Reclamation of land to forest (reforestation)
14. Soil erosion and control
  - 14.1 Definitions
  - 14.2 Factors affecting soil erosion
  - 14.3 Prediction (USLE) and measurement of soil erosion
  - 14.4 Control and prevention
15. Environmental problems in forest ecosystems
  - 15.1 Water quality (definition and parameters)

15.2 Soil quality

15.3 Effects of land management practices on soil and water quality

**COURSE EVALUATION**

	Quantity	Weighting
Assignments	5	15
Labs including a lab exam	10	20
Presentation	1	5
Mid term exam	1	20
Final exam	1	40
Total		100

9 - POINT GRADE	PERCENTAGE EQUIVALENT	DESIGNATION
9	90 - 100	
8	80 - 89	EXCELLENT
7	72 - 79	
6	65 - 71	GOOD
5	57 - 64	
4	50 - 56	PASS
3	45 - 49	FAIL
2	26 - 44	
1	0 - 25	

### LAB EXERCISE

Week	Date	Exercise
1	Sept 4	Introduction / lecture on soil sampling
2	Sept 11	Soil profile; soil and plant sampling in field
3	Sept 18	Forest floor and nutrition regime (and plant sampling)
4	Sept 25	Site evaluation (and plant sampling)
5	Oct 2	Soil compaction and bulk density measurement
6	Oct 9	Watershed precipitation/snow density measurement
7	Oct 16	Midterm break
8	Oct 23	Saturated flow of water through porous medium
9	Oct 30	Total analysis of nutrients in plants and forest floor by digestion
10	Nov 6	Extraction of available soil N and P, and P determination
11	Nov 13	Extraction of available soil cations and K determination by AA
12	Nov 20	Water quality
13	Nov 27	Presentation
14	Dec 4	<b>Lab test</b>