Agronomy 560 - Soil Physics
Fall Semester 2011

Course Objectives: To understand basic physical processes that occur in soils; to develop a working knowledge of the methods and instrumentation used in evaluating soil physical properties; to gain some knowledge of the effects of soil physical conditions on plant growth, to understand how soil physical processes may influence environmental quality.

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Office Hours in LILY: Soils Teaching Lab (LILY 3-427),
Friday10:30-11:30 am

Lab: Soils Teaching Lab: (Lilly 3-427) or in field.

Soils Resource Center: Lilly 3-419
- Reference notebooks on shelf
- Weeks 1 and 2 do basic soils lectures with computer and displays: **REQUIRED OF THOSE STUDENTS WHO HAVE NOT TAKEN BASIC SOILS AT PURDUE**

Websites: Agronomy Homepage: http://www.agry.purdue.edu
AGRY 560: http://www.agry.purdue.edu/courses/agry560/agry560.htm

Text: Soil Physics, 6th ed. 2004. William Jury and Robert Horton

Prerequisites: One course each in basic soils and basic physics.

Course Policy on Academic Dishonesty
Academic dishonesty or cheating in this course will not be tolerated. Examples of academic dishonesty include the following actions:
1. Obtaining or using work other than your own on assignments, exams, or quizzes.
2. Unauthorized use of calculators, or other programmable equipment during tests, exams, or quizzes.
3. Unauthorized use of study aids, answer or crib sheets.
4. Soliciting or providing answers on exams or quizzes.

Students who violate the above policy can expect disciplinary action. Disciplinary action may consist of receiving a zero on the assignment, failing the course, being reported to the Dean of Students, or other action as deemed appropriate by the course instructor.

For homework assignments and lab reports for this class, you are encouraged to discuss the questions and work together to help figure out the correct approaches to the work**. However, you must write up your own papers and discussions in your own words.** Each student must prepare their own lab report, even though you will work in pairs during the lab period.

Algebra quiz:
A mastery-level algebra quiz will be given in lecture on August 31. This is to "refresh your memory" on unit conversions and basic manipulations that you need in any scientific work. If you do not pass the quiz with at least a 90% grade the first time, you may retake other versions of the quiz until you earn a 90% (deadline Sept. 16). See the sample quiz in this manual (pp. 16-17), the Metric System Review sheet (pp. 8-15), and the posted key in the Resources Center.

Assignments:
Course consists of 2 lectures and 1 lab session per week. Course work will include assigned readings from text and other sources, problem sets, lab writeups, and exams. Problem sets and labs should be done on time for maximum benefit to you as well as for complete credit. **Problem sets not turned in on time will be penalized 30% for each day late, and will not be accepted after graded problem sets have been returned to the other students.** Lab reports turned in late will be penalized 10% for each day late up to one week late, after which they will not be accepted. **Talk to the Instructor in cases of professional meetings or special circumstances.** All assignments are due by 5 PM on the due date (see calendar of assignments and labs) (turn in assignments to instructor during class or put in slotted wooden box (near computers) in Soils Resource Center, 3-419).

Labs: **Attendance at lab is required.**
For field labs, meet promptly at the West end of Lilly Hall, in the small parking lot by the greenhouses. We will use vans to get to the field sites. Be prepared to work outside for the 3-hour period (i.e., it's often colder and sometimes raining at the field sites, even though it's warm on campus!). Close-toed shoes are required during lab periods.

-Attendance requirement exception—If you have the flu or other contagious illness, please inform the instructor by phone or email and do NOT attend lab or lecture, to protect yourself as well as other students. You will be given an opportunity to make up the lab and other coursework requirements.

Grading	Approximate number of Points
Exam (Oct. 5)	100
Exam (Nov. 10), evening	150
Final Exam (Dec. ?)	150
Full lab reports (9 @ 20 pts.)	180
Short lab-related assignments (4 @ 10 pts.)	40
Problem sets (5 sets @ 15-35 pts. each)	~100-150
Three in-lab exercises (@15)	45
	~780-820 total

Grading scheme*:
(calculated on % of total possible points)

A+	97-100%
A	90-96.9%
B+	87-89.9%
B	80-86.9%
C+	77-79.9%
C	70-76.9%
D+	67-69.9%
D	60-66.9%
F	<60%

*In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Here are ways to get information about changes in the course. My email address: kladivko@purdue.edu, and my office phone: 49-46372.

LECTURE TOPICS

Field sampling and measurement techniques
Spatial variability, geostatistics
Soil structure; soil mechanics; compaction; tillage
Soil temperature; heat flow
Soil water: content and potential; flow; infiltration, drainage, evaporation
Chemical movement in soils
Soil aeration
Soil physical properties and plant growth

AGRONOMY 560 - Reading assignments for each topic

TOPIC	READING ASSIGNMENT (JURY AND HORTON TEXT UNLESS NOTED)	ADDITIONAL REFERENCES
Review basic physical terms	Hillel (2004), Chap. 1: 12-17	Hanks & Ashcroft pp. 3-10
Field sampling & measurement techniques Bulk density		Intro. S. Phys., pp. 57-64, 81-83 Methods (1986) Chap. 13
Texture, particle size, clays	Chap.1, pp. 1-16;	Hillel (2004), Chap. 3
Structure, aggregation Description, importance, measurements	Chap. 1, pp. 30-36 Hillel (2004) Chap. 5 + Handouts	Methods (1965) Chap. 39, 40 Taylor & Ashcroft Chap. 11
Soil mechanics, soil compaction	Handouts	Hillel (2004) Chap. 13: Intro. S. Phys., Chap. 10 Kohnke pp. 119-124 Fundamentals pp. 347-351 Arkin & Taylor Chap. 2
Soil temperature, heat flow	Chap. 5	Hanks & Ashcroft Chap. 5 Arkin & Taylor Chap. 7 Intro S. Phys. Chap. 9
Spatial variability, geostatistics	APPENDIX A	
Soil water retention and potential	Chap. 2	Hillel (2004) Chap. 6 Intro. S. Phys., Chap. 5 Hanks & Ashcroft Chap. 2 Methods (1986) Chap. 21, 23
Water movement in soils	Chap. 3	Hillel (2004) Chap. 7 Hanks & Ashcroft Chap. 3 Intro. S. Phys., Chap. 6, 7
Infiltration, drainage, and Field soil water regime	Chap. 4	Methods (1986) Chap. 32, 33 Hillel (2004) Chap. 14-18 Intro. S. Phys., Chap. 12-15
Chemical transport in soils	Chap. 7	Hillel (2004) Chap. 9 Fundamentals Chap. 10
Soil aeration	Chap. 6	Hillel (2004) Chap. 10-11 Arkin & Taylor Chap. 5 Taylor & Ashcroft Chap. 12 Intro. S. Phys. Chap. 8

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Suggested References

*	Hillel, D. 2004. Introduction to environmental soil physics. Elsevier/Acad. Press, San Diego, CA. 494 p.
*631.43 Sco84s 2000	Scott, H.D. 2000. Soil Physics: Agricultural and environmental applications. Iowa State Press, Ames. 421 pp.
*	Jury, W.A., and R. Horton. 2004. Soil Physics, 6th ed., J. Wiley. Hoboken, New Jersey. 370 p.
*	Dane and Topp, 2002. Methods of Soil Analysis, Part 4, Physical Methods, No. 5, Soil Sci. Soc. Amer. Book Series, SSSA, Madison, WI 1692 p.
*	Klute, A. (ed.). 1986. Methods of Soil Analysis, Part I. 2nd. ed. Agronomy 9. Am. Soc. of Agronomy, Madison, WI. 1188 p.
*	Warrick, A.W. (ed.). 2002. Soil Physics Companion. CRC Press, New York, 389 p.
	Lal, R., and M.K. Shukla. 2004. Principles of soil physics. Marcel Dekker, New York. 716 p.
*631.43 H557f	Hillel, D. 1980. Fundamentals of soil physics. Acad. Press, N.Y. 413 p.
*631.43 H557a	Hillel, D. 1980. Applications of soil physics. Acad. Press, N.Y. 385 p.
*631.43 T218p	Taylor, S. A., and G. L. Ashcroft. 1972. Physical edaphology. W. H. Freeman & Co., San Francisco. 533 p.
*631.43 H194a	Hanks, R. J., and G. L. Ashcroft. 1980. Applied soil physics. Springer-Verlag, Berlin. 159 p.
*631.43 K827s	Kohnke, H. 1968. Soil physics. McGraw-Hill, N.Y. 224 p.
*631 M7195	Arkin, G. F. and H. M. Taylor (ed.) 1981. Modifying the root environment to reduce crop stress. Am. Soc. Ag. Eng. Monograph 4, St. Joseph, MI. 407 p.
*	Rattan Lal and M.K. Shukla. 2004. Principles of Soil Physics.

*On Reserve in Life Science Library.