

# Fundamentals in Soil Science Course

*A course offered by the Soil Science Society of America. This course is divided into six modules: Fundamentals of Soil Genesis, Classification, and Morphology, Fundamentals in Soil Chemistry and Mineralogy, Fundamentals in Soil Fertility and Nutrient Management, Soil Biology and Soil Ecology, Influences and Management of Soil Physical Properties and Soil and Land Use Management. Each module contains 2 lessons.*

Lectures are approximately two hours. To maximize learning, students will be expected to spend time reading and studying outside of the recorded lesson.

**Course Description** The Soil Science Fundamentals Review Course is designed to provide an overview of the fundamental concepts in soil science: Genesis, Classification and Morphology, Physics, Chemistry, Fertility, Biology, and Land Use. Instructors will use the Fundamentals Performance Objectives (POs) as a guide for discussing topics within each section, but will not go through each objective individually. However, students are encouraged to ask questions regarding specific POs if needed.

The objective of the course is to provide the student with a formalized way to build their fundamental knowledge and skills within the different areas of soil science to enhance their professional skills and/or to prepare to take the Fundamentals of Soil Science Exam.

Lecture material is supplemented with additional readings and practical examples to illustrate the concepts and provide practical examples of how the concepts are used in practice. This course is not designed to teach a student how to take the Fundamentals Exam, but instead is designed to complement the students existing knowledge of soil science and help the student understand the principles behind the POs.

## **Required Textbooks** *(to be purchased or obtained by the student)*

### ***Soil Science Fundamentals Exam – Performance Objectives***

This document can be downloaded for free from the SSSA website:

<https://www.soils.org/files/certifications/fundamentals-exam-objectives.pdf>

### ***The Nature and Properties of Soils*** (Brady and Weil; Pierson/Prentice Hall Publisher)

The current edition is the 14<sup>th</sup> edition, which can be found on Amazon.com for about \$137.00 (new). There are also options to buy used textbooks or rent them from various vendors. You may use earlier editions of this text, but please be aware that some information may not be as up-to-date as the information in the latest edition and instructors may not be able to give you the pages for equivalent information in an earlier text.

## **Optional Textbooks** (supplemental materials)

You may choose from these books as needed for supplemental materials on the various subject areas.

### ***Soil Science Study Guide Book*** (\$100.00)

This document may be obtained either in print format or by download from the SSSA website:

[https://portal.sciencesocieties.org/Purchase/ProductDetail.aspx?Product\\_code=190f6ed6-66e3-df11-938b-0013210e308c](https://portal.sciencesocieties.org/Purchase/ProductDetail.aspx?Product_code=190f6ed6-66e3-df11-938b-0013210e308c).

### **Field Book for Describing and Sampling Soils v 2.0**

Schoeneberger, P.J., Wysocki, D.A., Benham, E.C., and Broderson, W.D. (editors), 2002. NRCS, National Soil Survey Center, Lincoln, NE.

Available free in pdf format from:

[http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2\\_054184](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2_054184)

### **Soil Survey Manual**

Soil Survey Division Staff (1993) USDA NRCS Agriculture Handbook no.18

Available free and in doc or pdf format at

[http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2\\_054262](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2_054262)

### **Soil Taxonomy (2<sup>nd</sup> edition)**

Soil Survey Staff. 1999. USDA-NRCS, Washington, DC Agriculture Handbook 436

Available free in pdf format from:

[http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2\\_053577](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2_053577)

### **Keys to Soil Taxonomy (11<sup>th</sup> edition)**

Soil Survey Staff. 2010. USDA-Natural Resources Conservation Service, Washington, DC.

Available free in pdf format from:

[http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2\\_053580](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2_053580)

### **Soils and Environmental Quality, 3<sup>rd</sup> edition** (Pierzynski, G.M., J.T. Sims, and G.F. Vance)

The publisher is Taylor & Francis; the book can be found on Amazon.com for \$87.00 (new) with decreased prices for used books.

**Environmental Soil Chemistry** by D. Sparks, 2<sup>nd</sup> edition, available for \$47.00

**Soil Chemistry** by H. Bohn, B. McNeal, and G. O'Connor available at Amazon.com for \$131.00.

**Western Fertilizer Handbook 9<sup>th</sup> edition** (California Plant Health Association, 2002)

The 8<sup>th</sup> edition would also be fine; published by the California Fertilizer Association, 1995).

Another suggestion is the **Soil Fertility Manual** (International Plant Nutrition Institute, 2003)

<http://ppi-store.stores.yahoo.net/soilferman.html>.

**Soil Fertility and Fertilizers: An Introduction to Nutrient Management** (6th Edition) [John L. Havlin](#), [Samuel L. Tisdale](#), [Werner L. Nelson](#), and [James D. Beaton](#). Available at Amazon.com for \$80.00 new. (7<sup>th</sup> edition (new) is \$134.00)

**Principles and Applications of Soil Microbiology** (2nd edition), David Sylvia, Jeffrey J. Fuhrmann, Peter G. Hartel, and David Zuberer, 1998, Prentice Hall, Inc., Upper Saddle River, NJ.

**Introduction to Environmental Soil Physics** (D. Hillel, 2004, Elsevier)

Any basic soil physics book would be appropriate; this one is a suggestion of a fairly comprehensive text on soil physics. Another suggestion is **Soil Physics** by W.A. Jury and R. Horton, 6<sup>th</sup> edition.

**Math for Soil Scientists** (M.S. Coyne and J.A. Thompson, 2006)

The publisher is Thomson/Delmar Learning; found on Amazon.com for about \$40.00.

**Quizzes**

A ten question quiz will be offered after each lesson which must be passed (7 out of 10 or 70%) in order to move on to the next lesson in the module. There will not be a final exam for this course, and grades will not be assigned. A certificate of completion will be available after the module is completed or after the entire course is completed if you purchased the full course.

Certified individuals seeking Continuing Education Units (CEUs) will receive the CEUs after the quiz is passed by scoring 7 out of 10 or 70%. Total CEUs for all six modules for CCAs/CPAGs include 8.0 in Nutrient Management and 16.0 in Soil & Water Management or 24.0 Professional Meetings CEUs for CPSS/CPSC.

**Use of Class Materials**

Registrant agrees that the name indicated on the registration form is the sole individual receiving the on-line instruction and the only person completing the quizzes. Individuals found in violation of this policy will be subject to dismissal from this course, revocation of certification, and possible loss of privileges to participate in future offerings from the Soil Science Society of America.

The PowerPoint presentations, class recordings, quizzes, worksheets, and other materials developed specifically for this class are for the educational purposes and use of students registered for this class. Students are not to be copy, forward or share in any way with anyone for any other use without the permission of the Soil Science Society of America.

**Syllabus**

Topics	Reading Assignment Prior to Class
<b>Fundamentals of Soil Genesis, Classification and Morphology</b>	
Soil Morphology Soil Forming Factors Soil Genesis	Read Brady and Weil: Chapters 1, 2 Skim Field Book for Describing and Sampling Soils
Soil Classification Soil Mapping Geomorphology	Read Brady and Weil: Chapters 3, 19 Read Soil Survey Manual: Chapters 2, 6 Skim Soil Taxonomy and Keys to Soil Taxonomy
<b>Fundamentals in Soil Chemistry and Mineralogy</b>	
Basic Concepts Solid Phase and Weathering Ion Exchange	Bohn, McNeil, O'Connor: 1-48,68-203 Brady and Weil: 31-75, 315-357, 499-519
Acidity Oxidation-Reduction Salt Affected Soils	Bohn, McNeil, O'Connor: 209-409 Brady and Weil: 358-442

Topics	Reading Assignment Prior to Class
<b>Fundamentals in Soil Fertility and Nutrient Management</b>	
Basic Concepts Plant Nutrients and Availability in Soil pH; Acidifying and Liming of Soils	Havlin et al: 28-73,86-298 Brady and Weil: 363-400, 513-539, 542-678
Sampling Analyses and Interpretations Nutrient Management	Havlin et al: 300-405 Brady and Weil: 678-738
<b>Fundamentals in Soil Biology and Ecology</b>	
Basic Concepts Cycles Soil Ecology	Brady and Weil: Chapter 11 Chapter 1 pages 56-60 Chapter 13 Chapter 14 pages 602-608 (Sylvia et al: Covers more depth for all soil biology topics)
Biological and Biochemical Activities SOM Applications	Brady and Weil: Chapter 12 Chapter 7 pages 269-280, 288-292 Chapter 18 pages 800-816 Chapter 20 pages 874-875 (Sylvia et al: Covers more depth for all soil biology topics)
<b>Influences and Management of Soil Physical Properties</b>	
Basic Concepts Physical Properties Soil-Water Relationships	Brady and Weil: Chapter 1 pages 17-25 Chapt. 4 pgs. 121-138, 148-152, 158-162 Chapter 5 Add'l references to be listed in slides
Soil-Water Relationships con't Water Movement Soil Aeration Temperature Engineering properties	Brady and Weil: Chapter 5 Chapter 6 pages 218-220, 238-251 Chapter 7 pages 266-282, 288-307 Chapter 4 pages 162-168 Add'l references to be listed in slides

Topics	Reading Assignment Prior to Class
<b>Fundamentals in Soil and Land Use Management</b>	
Erosion/Sedimentation Water Quality Wetlands/Hydric Soils Regulatory/Resource Agencies	Brady and Weil: Chapter 17 Chapter 7 pages 283-288
Soil Quality Management <ul style="list-style-type: none"> <li>• Urban Soils</li> <li>• Forest Soils</li> <li>• Ag soils</li> </ul>	Brady and Weil: Chapter 20 Chapter 4 pages 138-148, 152-157 Chapter 6 pages 221-227, 251-263 Chapter 19