**Spring 2024**

**SYLLABUS**

**INTRODUCTION TO SOIL SCIENCE**

**Credit: 3 or 4 semester hours (Minimum 1 cr. hr. lab required)**

**Prerequisite: 1 course in H.S. Chemistry; College Chemistry is strongly recommended; Geology suggested**

**Course Description:**

IAI description: AG904: *Introduction to Soil Science* (3 or 4 semester hours)

An introduction to the chemical, physical, and biological properties of soils; the origin, classification, and distribution of soils and their influence on people and food production; the management and conservation of soils; and the environmental impact of soil use. For a 4-hour credit course, a lab component is required for IAI approval.  **Prerequisite:**The panel strongly recommends that chemistry be at least a co-requisite on the course.

**REVISION: 11/2/2023 -** Clarified credit hours for lab and non-lab courses and added range of 3-4 credits. Added a strongly recommended prerequisite of Chemistry co-requisite. Effective Spring 2024

**Objectives:**

1. To describe the basic and applied chemical, physical, and biological concepts in soil.

2. To discuss the origin, classification, and distribution of soils and their relationship to people and food production.

3. To evaluate the management, health, and conservation of soils.

4. To evaluate the environmental impact of soil use.

**Suggested Texts: (Current edition recommended)**

*Elements of the Nature and Properties of Soils,* Brady, Nyle and Ray R Weil, Pearson.

*The Nature and Properties of Soils*, Brady, Nyle and Ray R Weil, Pearson.

*Soil Science and Management*, Plaster, Edward J., Delmar Publishers.

*Understanding Soils,* Illinois Soil Classifiers Assoc., USDA, NRCS

*Soil Biology,* NRCS

**Laboratory Manuals: (Current edition recommended)**

*Introduction Soil Laboratory Manual,* J.J. Hassett, Stipes.

*Introductory Soil Science Laboratory Manual,* Palmer and Troch, Iowa State.

*Introductory Experimental Soil Science,* Sabey, Klubek, Varsa, Chong.

*Soils Laboratory Manual,* K- State Edition, Colby, J. Moorberg, and David A. Crouse.

**Topics:**  **Weeks**

I. Introduction 1-2 Weeks

A. Definition of Soil

B. Soils as a Natural Body

C. Soil Components-Air, Water, Inorganic, and Organic Solids

II. Physical Properties 2-4 Weeks

A. Soil Separates

B. Texture

C. Aggregation and Structure Characteristics

D. Temperature

E. Color

F. Properties of Soil Mixture

G. Pore Space

H. Bulk Density

I. Particle Density

J. Aeration and Drainage

K. Compaction

L. Soil Water Relationships

III. Chemical Properties 2-4 Weeks

A. Morphology of Colloids

B. Chemistry of Clays

C. Ionic Exchange

D. Acidity, Alkalinity (pH) and Salinity

E. Reactions in Liming and Acidification

IV. Biological Properties 2-3 Weeks

A. Soil Organic Matter

B. C:N Relationships

C. N Transformation

D. Soil Organism

E. Sulfur Transformation

V. Genesis and Classification 1-2 Weeks

A. Profile

B. Soil Forming Factors

C. Soil Survey Methods

D. Soil Survey Reports

E. Soil Distribution

F. Classification System

G. Parent Material

VI. Conservation and Management 1-2 Weeks

A. Drainage

B. Erosion: Mechanisms and Control

C. Irrigation

D. Land Use Classification

E. Environmental Quality

1. Plant and Animal Waste

2. Municipal and Industrial By-Products

3. Nutrient Loading

F. Tillage Systems

G. Wetlands

H. Urban Soils

I. Soil Health

J. Nutrient Loss Reduction Strategy

K. Cover Crop Systems

VII. Soil Fertility and Fertilizers 1 Weeks

A. Essential Elements

B. Fertilizers

**Possible Lab Exercises or Activities:**

*(Suggested minimum requirements would be a lab exercise or field trip for each major area of lecture.)*

1. Origin and Classification
2. Soil Surveys
3. Productivity Indexes
4. Land Use Selection exercise, i.e., soil profile, description
5. Texture
6. Structure
7. Bulk Density and Pore Space (compaction) Moisture
8. Nitrogen Transformation
9. Temperature
10. Ionic Exchange
11. Acidity, Alkalinity-pH
12. Nutrient Availability
13. Soil Organic Matter
14. Revised Universal Soil Loss Equation (R.U.S.L.E.)
15. Fertilizer Recommendations
16. Solu Bridge-Soluble Salts / EC
17. Conservation and Management
18. Using and Understanding GPS
19. Tour of Soil Testing Lab
20. Soil Sampling Procedure
21. Horticulture Soils
22. Urban Soils
23. Soil biological activity
24. Soil Health
25. Soil water relation
26. Cation Exchange Capacity
27. Soil Chemistry

**References: (Current edition recommended)**

*Soil Science Simplified,* Khonke and Franzmeier, Waveland Press.

*Soils and Soil Fertility,* Troch, F.R. and Thompson, L.M., Oxford Press.

*Soil Fertilizer Handbook*, The Fertilizer Institute, Washington, D.C. PPI & others.

Study manuals for CCA examination-American Society of Agronomy

Test bank and online aids from textbook authors and publishers including Elements of the Nature &

Properties of Soil, Pearson

*Fundamentals of Soil Science,* Foth, H.D., Wiley Books

Math in Soil Science

NRCS Soil Quality Test Guide

Illinois Soil Classifiers Association

Illinois Soil Evaluation Fieldbook- FFA Land Use CDE Resource

**Software:**

ArcMap-ESRI

PPI - Nutrient management plan CCA CD

PPI - MEY Software

RUSLE Current NRCS

Digital Soil Survey Maps

Purdue soil program: [www.agry.purdue.edu/courses/agry255/agry255.htm](http://www.agry.purdue.edu/courses/agry255/agry255.htm)

NRCS Soils Web Sites

iFARM, United Soils Inc. website

**Hands-On Learning Activities:**

RealityWorks- Plastic Soil Monoliths

Conservation Demonstrations- Rainfall Simulator [www.rainfallsimulator.com](http://www.rainfallsimulator.com)

ISCA Soil Texture Kit

**Multi-Media:**

No Till, Protecting the Heartland-Syngenta

Tracks to Tires-John Deere

Tread Lightly and Pull Heavy-Caterpillar Price of Bounty – U of I Extension

Point of Precision-PPI

Faces of Change-PPI

Point of Revolution-PPI

Conservation on Your Own-Soil Conservation Services, National Association of Conservation

Districts Production Agriculture-Feeding People, Protecting the Environment, PPI

Forest Soils of Illinois Region 1 - Stronghurst, Fayette, Traer, Extension Services Prairie Soils of Illinois Region 1 - Tama, Muscatine, Sable, Extension Services

Soil Health Test Kit video (Check with Sustainable Agriculture Society for availability)

How Soils Erode-University of Illinois

How Water Moves Through Soil

Good Farming in Karst Country-U of I Extension

Irrigation-Kaw Valley Films

Fertile Minds video, Potash corp. (www.fertile-minds.org)

**Websites:**

USGS aerial imagery and topographic maps<http://tenaserver-usa.com>

USDA Geospatial Database http://lighthouse.nrcs.usda.gov/lighthouse/

Illinois Agronomy Handbook<http://www.ag.uiuc.eduliahi>

Soil Science of Society of America web page <http://www.soils.org/>

American Society of Agronomy web page <http://www.agronomy.org/>

PPI web page <http://www.ppi-far.org>

National Conservation Research Service web page <http://www.il.nrcs.usda.gov>

University of Minnesota web page <http://www.soils.umn.edularchive/imageslimages/thumbs>

NRCS web soil survey

Math & Calculations for Agronomy and Soil Scientists, [www.ipni.net](http://www.ipni.net)

Penn State University soils website.

Soil eLibrary <https://passel.unl.edu>

Soil Orders <http://www.cals.uidaho.edu/soilorders/>

News Prairie Press <https://newprairiepress.org/ebooks/39/>

<https://www.soils4teachers.org/know-soil-know-life/>

Ilhmp lidar- [Illinois Height Modernization (ILHMP) LiDAR Data (arcgis.com)](https://www.arcgis.com/apps/webappviewer/index.html?id=44eb65c92c944f3e8b231eb1e2814f4d)

**There are two ways to access Teaching Resources on the** [**www.ilaged.org**](http://www.ilaged.org) **website:**

**For Files Shared by Postsecondary Instructors:**

PATHWAY: [www.ilaged.org](http://www.ilaged.org) –Teach—Postsecondary Instructors—File Sharing & Teaching Resources— **SOIL SCIENCE** Lesson Sharing

 **For Files available from the Illinois Agriculture Education Secondary Curriculum:**

(A log-in is required- this is available through FCAE: <https://www.ilaged.org/Contact>)

PATHWAY: [www.ilaged.org--](http://www.ilaged.org--) Log-in- along left hand side there are two curriculum links: “Curriculum Supplemental Resources” and “Go To MYCAERT Website”