



Ministry of Education  
Federal University of Santa Maria  
Rural Science Center  
Graduate Program in Soil Science

## **Course: Experimental Soil Physics**

### **Identification**

Code: SOL885  
Credits: 4 (4 hours practical)  
Level: Master's/Doctoral  
Professors: Paulo Ivonir Gubiani and Rodrigo Pivoto Mulazzani  
Offering: Annual (First Semester)

### **Course Objectives**

To apply soil physics methodologies for the study of soil solids, pores, and fluids, and their interactions.

### **Syllabus**

Soil physical methodologies and analyses. Properties of soil solids. Mass–volume relationships of soil phases. Storage of water, air, and thermal energy. Conductivity, permeability, and diffusivity of fluids (water, gases, and heat). Flow of water, gases, and heat. Strength and deformation of soil structure.

### **Methodology and/or Teaching Instruments**

Practical classes (laboratory and field), data analysis, and interpretation of results.

### **Assessment Methods**

Evaluation based on practical exercises, reports, and data analysis.

### **Program: Title and Breakdown of the Units**

#### **Unit 1 – Soil Solids**

- 1.1 – Particle size distribution
- 1.2 – Particle density

#### **Unit 2 – Soil Aggregate Analysis**

- 2.1 – Aggregate size distribution
- 2.2 – Aggregate stability and stability indices

#### **Unit 3 – Relationships among Soil Phases**

- 3.1 – Density
- 3.2 – Porosity
- 3.3 – Soil water content
- 3.4 – Air-filled porosity

#### **Unit 4 – Soil Water**

- 4.1 – Water retention curve and hydraulic conductivity
- 4.2 – Water infiltration
- 4.3 – Instrumentation for monitoring soil water potential and water content

#### **Unit 5 – Soil Air**

- 5.1 – Aeration porosity
- 5.2 – Air conductivity and permeability



Ministry of Education  
Federal University of Santa Maria  
Rural Science Center  
Graduate Program in Soil Science

### **Unit 6 – Soil Thermal Energy**

- 6.1 – Temperature
- 6.2 – Thermal conductivity, thermal diffusivity, and specific heat

### **Unit 7 – Soil Mechanics**

- 7.1 – Consistency
- 7.2 – Compressibility
- 7.3 – Penetration resistance

### **Recommended Literature**

BLACK, C.A. (ed.) Methods of soil analysis. Part 1. Physical and mineralogical methods, including statistics of measurements and sampling. Madison: ASA, 1965. 770p.

CARTER, M.R. & CREGORICH, E.G. (eds.) Soil Sampling and Methods of Analysis. 2 ed. Boca Raton: CRC Press, 2007. 1264p.

TEIXEIRA, P.C., DONAGEMMA, G. K, FONTANA, A. TEIXEIRA, W.G. Manual de métodos de análise do solo. 3. ed. rev. Rio de Janeiro: Embrapa Solos; 2017.

DANE, J.H. & TOPP, G.C. (eds.) Methods of soil analysis. Part 4. Physical methods. 2 Soil Science Society of America Book Series, no. 5. Madison: ASA, 2002. 1692 pp.

SMITH, K.A. & CRESSER, M.S (eds.) Soil and environmental analysis: Physical methods. 2 ed. New York-Basel: Marcel Dekker, 2001. 637p