



## Module Description/Course Syllabi

Study Programme : Magister of Soil Science  
Faculty of Agriculture  
Universitas Andalas

### **1. Course number and name**

MIT 81102 ADVANCED SOIL PHYSICS

### **2. Credits and contact hours/Number of ECTS credits allocated**

3 sks (2-1)

### **3. Instructors and course coordinator**

1. Prof. Dr. Ir. Yulnafatmawita, MSc; 2. Dr. Ir. Adrinal, MS

### **4. Text book, title, outhor, and year**

1. Yulnafatmawita. 2023. Dasar-Dasar Fisika Tanah (=Fundamental of Soil Physics).Andhra Grafika Publisher.
2. Baver, L.D. 1972. Soil Physics. Academic Press
3. Hillel, D. Fundamental of Soil Physics. Academic Press
4. Hank, R.J. and Ashcroft, G.L. 1980. Applied Soil Physics. Adv Series in Agric Scie 8 5. Hank, R.J. 2017. Applied Soil Physics. Soil Water and Temperature Application.Springer
6. Marshal, T.J., Holmes, J.W., and Rose, C.W. 1996. Soil Physics. 3<sup>rd</sup> edition, CambridgeUniv. press. 453 pp.
7. Koorevaar, P., Menelik, G., and Dirksen, C. 1983. Elements of soil physics. Elsevier Sci.Publishers B.V. Amsterdam, 228 hal.
8. Yulnafatmawita. 2012. Peranan Bahan Organik dalam Memperbaiki Sifat Fisko-KimiaTanah. Dalam "Fachri Ahmad dari Akademisi sampai Birokrasi. Unand Press 9. Yulnafatmawita dan Adrinal. 2014. Physical Characteristics of Ultisols and The Impacton Soil Loss During Soybean (Glycine Max Merr) Cultivation in Wet Tropical Area.Agrivita J. Vol 36, No 1 (2014)

DOI: <http://doi.org/10.17503/agrivita.v36i1>

**5. Specific course information**

**A. Brief description of the content of the course (catalog description)**

This Soil Physics course discusses matters concerning the physical properties of soils for plant growth and preventing land degradation. Soil physics material includes the role of texture as a determinant of soil physical properties in general, and the influence on other physical properties (BD, Porosity, water retention and transmission, etc.), soil chemical and biological properties; specific surface area (SSA) affecting soil physico-chemical properties; the process of forming and stabilizing soil aggregates; increasing soil consistency; soil organic matter: the importance in improving soil physical properties, the classification and the oxidation process; availability of ground water for plants, balance of aeration and soil drainage, management of soil physical properties.

**Course Content**

**Week Course Content**

- 1 Scope of soil physics, and the importance in building soil fertility and avoiding land degradation
  - 2-3 Particle size distribution, soil texture and specific surface area of soil particles. The relationship between soil texture and other soil physical properties, as well as soil chemical and biological properties
  - 4 Soil structure, the formation processes, the role determine soil quality, the ability to modify soil texture characteristics
  - 5-6 Soil organic matter: the importance in soil improving soil physical properties, the impact on environment, the classification, factors affecting, and the efforts to improve OC sequestration in soils
  - 7 Soil consistency & plasticity: the importance and the effect on other soil physical properties for plant growth, the measurement and the data interpretation
  - 8 Soil compaction & consolidation: factors affecting; the impact on soil physical properties; and the efforts to improve the soil physical properties for plant growth
- MID TERM EXAM**
- 9 Soil tillage: the importance ; the short and long term impact; types & the characteristics of tillage; factors considered to choose tillage types for agricultural purposes
  - 10-13 Soil Water: The importance, Factors affecting; efforts to improve soil water content; water balance curve to predict agriculture activities: plant

water need calculation; prediction of water stock of a certain area

Soil Water Potential: the importance; factors building the potential; relation curve between soil water potential and water content; factors affecting the soil water potential; plant available water calculation; factors improving plant available water.

Soil water movement under saturated & unsaturated condition: the importance; factors affecting; calculation of water movement rate;

14 Soil air & aeration: the importance; factors affecting and controlling soil air; amount of O<sub>2</sub> availability for crop growth

15 Soil temperature: The importance of soil temperature on physiology process of plants; factors controlling soil temperature; soil temperature regime

16 Soil physics problems: types of problems (compaction; low PAW; low water retention; bad drainage;... ) and methods to reclaim

FINAL EXAM

***C. Semester when the course unit is delivered***

Even Semester

***D. Mode of delivery (face-to-face, distance learning)***

Face to face

***6. Intended Learning Outcomes (CPL)***

**ILO 1:** An ability to analyze and interpretate nature and characteristics of many soils indetermining the potency and the threat of the land and environment resources **PI 1 :** An ability to identify soil properties

**PI 2 :** An ability to analyze soil properties

**PI 3 :** An ability to interpretate soil data

**ILO 2 :** An ability to classify soil, to evaluate land capabiity and suitability, as well as todetermine the alternative utilization for sustainable agriculture and environment

**PI 1 :** An ability to classify soil properties

**PI 2** : An ability to evaluate soil capability

**ILO 3** : An ability to use technology in identifying and solving problems of soil, land resource, environment problems independently, eligibly, and accurately

**PI 2** : An ability to work indepently in determining soil properties

**7. Course Learning Outcomes (CPMK) ex. The student will be able to explain the significance of current research about a particular topic.**

1. Students will be able to identify properties of many soils

2. Students will be able to analyze properties of many soils

3. Students will be able to interpretate data of many soils

4. Students will be able to use soil data to classify soils based on some methods of soilclassification

5. Students will be able to use soil data to evaluate soil capability and land suitability

6. Students will be able to analyze soil independently either at laboratory or at field site

**8. Learning and teaching methods**

Cooperative Learning, Case Base Method, and Project Base Method

**9. Language of instruction**

Bahasa and English (English Class)

**10. Assessment methods and criteria**

**Summative Assessment :**

1. Tasks : 5%

2. Quiz : 5 %
3. Mid Semester : 25%
4. Final Semester : 25%
5. Praktikum :30%
6. Attendance : 5%

**Formative Assessment:**

1. Thumb up and thumb down
2. Minutes paper