



### Module Description/Course Syllabi

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

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

MIT 81204 CLAY MINERALOGY

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

3 sks (2-1)

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

1. Prof.Dr.Ir. Dian Fiantis, MSc
2. Dr. rer.nat. Ir. Syafrimen Yasin, MS, MSc

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

1. Bergaya, F., G. Lagally. 2013. Handbook of Clay Science, Volume 5 Part A Fundamental, Elsevier, Amsterdam, 875 hal.
2. Bergaya, F., G. Lagally. 2013. Handbook of Clay Science, Volume 5 Part B Techniques and Applications, Elsevier, Amsterdam, 813 hal.
3. Velde, B. B., A. Meunier. 2008. The origin of clay minerals in soils and weathered rocks. Springer. Berlin. 426 hal.
4. Meunier, A. Clays. 2005. Springer, Berlin. 476.
5. Perkins, D. 1998. Mineralogy. Prentice Hall. 484 hal.
6. Klein, C. 2004. The 22nd edition of the Manual of Mineral Science. John Wiley & Sons, Inc. 641 hal.
7. Moore, D. M., R. C. Reynolds. 1989. X-Ray Diffractions and the identification and Analysis of Clay Minerals. Oxford University Press, Oxford, New York. 392 hal
8. Waseda, Y., E. Matsubara, K. Shinoda. Z-Ray Diffraction Crystallography: Introduction, Examples and Solved Problems. Springer-Verlag Berlin Heidelberg. London New York. 322 hal.
9. Munir, M. 1996. Geologi dan Mineralogi Tanah. Pustaka Jaya. Jakarta. 290 hal.
10. Suharyadi. 2004. Pengantar Geologi Teknik. Biro Penerbit Jurusan Teknik Sipil UGM. Yogyakarta. 134 hal

***5. pecific course information***

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

This course discusses the meaning of minerals, physical and chemical properties as well as characteristics and systematics of minerals, mineral stability and weathering, formation and classification of clay minerals, origin and characteristics of clay minerals, the relationship between clay minerals and chemistry, genesis as well as classification of soil, principles of determination and analysis of clay minerals, and mineral applications in agriculture.

**B. Course Content**

**Week Course content**

1 Meaning and role of clay minerals, factors affecting clay minerals, the history of clay mineral

2 Genesis of clay minerals: physical and chemical weathering,

and factors affecting the formation

3 Crystalline structure of clay minerals and the chemical properties, clay surface chemicals : intra and inter clay minerals

4 Clay minerals-organic matter interaction

5 Clay minerals and pesticides, role of clay minerals for reducing soil pollution

6 & 7 Identification and quantitative analyses of clay minerals using: 1. X-ray Diffraction (XRD),

2. X-ray Fluorescence (XRF)

3. Fourier Transform Infrared Spectroscopy (FTIR)

4. Scanning Electron Microscope (SEM) dan Transmission Electron Microscope (TEM)

5. Selective Dissolution Analysis

8 Mid Exam

9 Unorganic soil colloids

10 Clay mineral type 2:1 : the Properties and the

characteristics 11 Clay mineral type 1:1 : the

Properties and the characteristics

12 Sources of clay mineral surface charge ( Isomorphic substitution) and its correlation to soil chemical reaction

13 Properties and the characteristics of non-crystalline and para-crystalline clay minerals

14 Properties and the characteristics of oxide and

hydroxide minerals 15 Role of clay minerals on soil CEC

value and classification

16 Final Exam

<b><i>B. Semester when the course unit is delivered</i></b>
Even Semester
<b><i>C. Mode of delivery (face-to-face, distance learning)</i></b>
Face to face
<b><i>6. Intended Learning Outcomes (CPL)</i></b>
<b>ILO 1</b> : An ability to analyze and interpretate nature and characteristics of many soils indetermining the potency and the threat of the land and environment resources <b>PI 2</b> : An ability to analyze soil properties <b>PI 3</b> : An ability to interpretate soil data
<b>ILO 2</b> : An ability to classify soil, to evaluate land capabiity and suitability, as well as todetermine the alternative utilization for sustainable agriculture and environment <b>PI 1</b> : An ability to classify soil properties  <b>ILO 3</b> : An ability to use technology in identifying and solving problems of soil, landresource, environment problems independently, eligibly, and accurately <b>PI 2</b> : An ability to work indepently in determining soil properties
<b><i>7. Course Learning Outcomes (CPMK) ex. The student will be able to explain the significance of current research about a particular topic.</i></b>
1. Students will be able to analyze properties of many soils
2. Students will be able to interpretate data of many soils
3. Students will be able to use soil data to classify soils based on some methods of soilclassification
4. Students will be able to analyze soil independently either at laboratory or at field site

<b><i>8. Learning and teaching methods</i></b>
Cooperative Learning and Problem Base Method
<b><i>9. Language of instruction</i></b>
Bahasa Indonesia and English (English Class)
<b><i>10. Assessment methods and criteria</i></b>
<b>Summative Assessment :</b> <ol style="list-style-type: none"><li>1. Tasks : 5 %</li><li>2. Quiz : 5 %</li><li>3. Mid Semester : 25%</li><li>4. Final Semester : 25%</li><li>5. Praktikum :30%</li><li>6. Attendance : 5%</li></ol> <b>Formative Assessment:</b> <ol style="list-style-type: none"><li>1. Thumb up and thumb down</li><li>2. Minutes paper</li></ol>