	Universitas Negeri Surabaya **Faculty of Mathematics and Natural Sciences** **Undergraduate Chemistry Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Natural Materials Chemistry	4720102072	Organic Chemistry	**T=2**	**P=0**	**ECTS=3.18**	4	April 27, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Prof. Dr. Tukiran, M.Si.	Prof. Dr. Suyatno, M.Si.	Dr. Amaria, M.Si.

Learning model	**Project Based Learning**

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

Program Objectives (PO)

PO - 1	Able to use the concept of secondary metabolite compounds to screen, isolate and test the bioactivity of secondary metabolite compounds.
PO - 2	Mastering the basic concepts of secondary metabolite compounds and their benefits for humans.
PO - 3	Make decisions based on the results of screening analysis, isolation and bioactivity tests of secondary metabolite compounds.
PO - 4	Have a responsible attitude in developing extracts or isolates as herbal medicine ingredients.

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3
PO-4

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																
PO-4																

Short Course Description

Study of the benefits of secondary metabolites as bioactive compounds in the field of pharmacology and pharmaceutical industry, studying the chemistry of secondary metabolite compounds in the terpenoid, steroid, phenylpropanoid, polyketide, flavonoid and alkaloid groups, benefits and distribution in plants (medicine), screening techniques, isolation, and bioactivity testing and its role in the development of the pharmaceutical industry. Lectures are carried out using discussion methods, presentations, industry visits, and journal reviews.

References

Main :

1. Tukiran (2015). Kimia Bahan Alam (KBA) Berbasis Field Study dan Pendekatan Chemo-Entrepreneurship. Surabaya: Unesa University Press.
2. Leny Heliawati (2018). KIMIA ORGANIK BAHAN ALAM. Pascasarjana – UNPAK Jl. Pakuan PO Box 452, Bogor, 16143.
3. Tatang Shabur Julianto (2019). Fitokimia: Tinjauan Metabolit Sekunder dan Skrining Fitokimia, Universitas Islam Indonesia, Yogyakarta.

Supporters:

1. Berbagai jurnal internasional dan nasional yang berisi materi kimia bahan alam dan bioaktivitasnya.

Supporting lecturer

Prof. Dr. Suyatno, M.Si.
Prof. Dr. Tukiran, M.Si.
Dr. Ratih Dewi Saputri, S.Si., M.Si.
Nurina Rizka Ramadhania, S.Si. M.Si.
Dr. First Ambar Wati, S.Si.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1. Students understand the Natural Materials Chemistry lecture system 2. Identify, collect data, and conclude about the benefits of secondary metabolites and communicate them	1. Explain the RPS, lecture system, assessment system, determination of graduation, and rules for Natural Materials Chemistry lectures 2. Able to explain the classification and benefits of secondary metabolite compounds and mention various types of extracts that can be utilized by traditional and modern industries	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 1 INTRODUCTION TO THE CHEMISTRY OF NATURAL MATERIALS **Reference:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.*	5%
2	Identify, collect data and conclude about bioactive compounds in plants and their benefits in traditional medicine	1. Able to explain plant bioactive compounds. 2. Able to collect data about plant bioactive compounds. 3. Be able to name Indonesian medicinal plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 2 BIOACTIVE COMPOUNDS AND THEIR ROLE IN MEDICINAL PLANTS **Library:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.*	5%
3	Identify, collect data and conclude about bioactive compounds in plants and their benefits in traditional medicine	1. Able to explain plant bioactive compounds. 2. Able to collect data about plant bioactive compounds. 3. Be able to name Indonesian medicinal plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 2 BIOACTIVE COMPOUNDS AND THEIR ROLE IN MEDICINAL PLANTS **Library:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.*	5%

4	Explain the meaning of terpenoid natural compounds	Able to explain the structural characteristics of terpenoids, classification, biosynthesis and distribution in plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 3 TERPENOID COMPOUNDS, THEIR SOURCES AND ROLE IN MEDICINAL PLANTS **Library:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.* **Material:** CHAPTER II TERPENOIDS **Reference:** *Leny Heliawati (2018). ORGANIC CHEMISTRY OF NATURAL MATERIALS. Postgraduate – UNPAK Jl. Pakuan PO Box 452, Bogor, 16143.*	5%
5	Explain the meaning of natural compounds such as steroids	Be able to explain the structural characteristics of steroids, classification, biosynthesis and distribution in plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 4 STEROID COMPOUNDS, SOURCES AND THEIR ROLE IN MEDICINAL PLANTS. **Bibliography:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.* **Material:** CHAPTER III STEROIDS. **Reference:** *Leny Heliawati (2018). ORGANIC CHEMISTRY OF NATURAL MATERIALS. Postgraduate – UNPAK Jl. Pakuan PO Box 452, Bogor, 16143.*	5%

6	Explain the meaning of natural phenolic compounds.	Able to explain the characteristics of phenolic structure, classification, biosynthesis and distribution in plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 5 PHENOLIC COMPOUNDS, THEIR SOURCES AND ROLE IN MEDICINAL PLANTS. **Bibliography:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.* **Material:** Chapter 4. Phenolic Compounds **Reference:** *Tatang Shabur Julianto (2019). Phytochemistry: Review of Secondary Metabolites and Phytochemical Screening, Islamic University of Indonesia, Yogyakarta.*	5%
7	Explain the meaning of natural compounds such as phenyl propanoid.	Able to explain the structural characteristics of phenyl propanoids, classification, biosynthesis and distribution in plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 6 PHENYL PROPANOID COMPOUNDS, THEIR SOURCES AND ROLE IN MEDICINAL PLANTS **Library:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.* **Material:** CHAPTER IV PHENYL PROPANOID **Reference:** *Leny Heliawati (2018). ORGANIC CHEMISTRY OF NATURAL MATERIALS. Postgraduate – UNPAK Jl. Pakuan PO Box 452, Bogor, 16143.*	5%
8	Midterm exam	-	**Criteria:** The UTS results are given a weight of 2. **Form of Assessment** : Test	Written Test (Essay and/or multiple choice) 2 X 50		**Material:** All meeting materials 1-7 **References:**	10%

9	Explain the meaning of natural compound types of polyketides	Able to explain the structural characteristics of polyketides, classification, biosynthesis and distribution in plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 7 POLYCYTEIDE COMPOUNDS, THEIR SOURCES AND ROLE IN MEDICINAL PLANTS **Library:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.* **Material:** Chapter 7. POLYKETIDES **Bibliography:** *Tatang Shabur Julianto (2019). Phytochemistry: Review of Secondary Metabolites and Phytochemical Screening, Islamic University of Indonesia, Yogyakarta.*	5%
10	Able to explain the structural characteristics of flavonoids, classification, biosynthesis and distribution in plants.	Able to explain the structural characteristics of flavonoids, classification, biosynthesis and distribution in plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 9 FLAVONOID COMPOUNDS, SOURCES AND THEIR ROLE IN MEDICINAL PLANTS **Library:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.* **Material:** Chapter 7. FLAVONOIDS **Reference:** *Leny Heliawati (2018). ORGANIC CHEMISTRY OF NATURAL MATERIALS. Postgraduate – UNPAK Jl. Pakuan PO Box 452, Bogor, 16143.*	0%

11	Explain the meaning of alkaloid type natural compounds.	Able to explain the structural characteristics of Alkaloids, as well as their classification, biosynthesis and distribution in plants.	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 10 ALKALOID COMPOUNDS, SOURCES AND THEIR ROLE IN MEDICINAL PLANTS **Library:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.* **Material:** Chapter 8. Alkaloids **Reference:** *Leny Heliawati (2018). ORGANIC CHEMISTRY OF NATURAL MATERIALS. Postgraduate – UNPAK Jl. Pakuan PO Box 452, Bogor, 16143.*	5%
12	Explain the meaning of isolation, isolation methods/techniques, and identification of isolated compounds	1. Able to explain the meaning of isolation and isolation methods/techniques. 2. Able to identify isolated compounds through chemical tests (phytochemical screening).	**Criteria:** Participation during lectures (presentations, discussions and questions and answers) is carried out through observation (weight 2). **Form of Assessment** : Participatory Activities	Presentation, discussion, question and answer, case method 2 X 50	Presentation, discussion, question and answer, case method 2x50	**Material:** Chapter 11 METHODS OF EXTRACTION, ISOLATION, PURIFICATION, AND elucidation of secondary metabolite structure in plants. **Library:** *Tukiran (2015). Natural Materials Chemistry (KBA) Based on Field Study and Chemo-Entrepreneurship Approach. Surabaya: Unesa University Press.* **Material:** CHAPTER VI METHODS FOR ISOLATION AND IDENTIFICATION OF THE STRUCTURE OF ORGANIC COMPOUNDS OF NATURAL MATERIALS Reference **:** *Leny Heliawati (2018). ORGANIC CHEMISTRY OF NATURAL MATERIALS. Postgraduate – UNPAK Jl. Pakuan PO Box 452, Bogor, 16143.*	5%
13	Able to study natural product chemistry journals	Able to explain the results of reviews of natural product chemistry journals	**Criteria:** Assessment of assignments according to each topic (chapter) is given a score with a weight of 3. **Form of Assessment** : Project Results Assessment / Product Assessment	PjBL: Assignments (article reviews), presentations and discussions. 2 X 50	PjBL: Assignments (article reviews), presentations and discussions. 2x50	**Material:** Phytochemicals and their bioactivity from Indonesian plants. **Library:** *Various international and national journals containing natural chemical materials and their applications.*	10%

14	Able to study natural product chemistry journals	Able to explain the results of reviews of natural product chemistry journals	**Criteria:** Assessment of assignments according to each topic (chapter) is given a score with a weight of 3. **Form of Assessment** : Project Results Assessment / Product Assessment	PjBL: Assignments (article reviews), presentations and discussions. 2 X 50	PjBL: Assignments (article reviews), presentations and discussions. 2x50	**Material:** Phytochemicals and their bioactivity from Indonesian plants. **Library:** *Various international and national journals containing natural chemical materials and their applications.*	10%
15	Communicate the results of working visits to a traditional medicine industry (herbal medicine), natural products industry, and/or pharmaceutical industry	Able to present the results of a working visit from a traditional medicine industry (herbal medicine), natural materials industry, and/or pharmaceutical industry as a group.	**Criteria:** 1. Assignment, a product is produced in the form of a work report 2. Assessment of assignments according to each topic (chapter) is given a score with a weight of 3. **Form of Assessment** : Project Results Assessment / Product Assessment	PjBL: Assignments (reports), presentations and group discussions. 2 X 50	PjBL: Assignments (reports), presentations and group discussions. 2x50	**Material:** Herbal medicine processing process in the Indonesian Herbal Medicine Industry. **References:**	10%
16	Understand the concepts, attitudes and skills in natural products chemistry courses	Final Semester Exam: Understand the concepts, attitudes and skills in the natural products chemistry course	**Criteria:** Summative test (UAS), carried out once, assessing all relevant indicators through a written exam (essay and/or multiple choice) **Form of Assessment** : Test	Essay and/or multiple choice 2 X 50		**Material:** All learning materials at the 9th to 15th meetings **References:**	10%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	45%
2.	Project Results Assessment / Product Assessment	35%
3.	Test	20%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.