



UNIVERSITAS SEBELAS MARET
FACULTY TEACHER TRAINING AND
EDUCATION
BIOLOGY EDUCATION STUDY PROGRAM
 3rd Floor D Building FKIP Jl. Ir. Sutami No. 36/A Kentingan Surakarta 57126
 Website: <https://biologi.fkip.uns.ac.id/>

Natural Materials Technology
Undergraduate Programme In Biology Education

Module Handbook

Module Name	Natural Materials Technology (Teknologi Bahan Alam)				
Module level	Undergraduate Programme				
Course Code	02013152007				
Abbreviation, if applicable	TBA				
Courses included in the module, if applicable	-				
Semester/Term	5 th				
Module coordinator (s)	Dr.Harlita, S.Si.,M.Si				
Lecturer (s)	Dr. Muzazzinah, M.Si Nurmiyati, S.Pd., M.Si				
Language	Bahasa Indonesia (Indonesian Language)				
Classification within the curriculum	Elective				
Teaching format/class hours per week during the semester	• Direct instruction /flipped classroom (blended learning)/(2 x 50 x 16 / 60) = 26.67 hours/week/semester; • Tasks assignment/structured tasks/ (4 x 60x2 /60)=8 hours/week/semester . • Practical laboratory= 1x16x170/60=45.33hours/week/semester				
Workload <					



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Learning goals/competencies:

PLO 2 They are able to apply the basic advance knowledge in biology to solve the problem in biology.

PLO 10 They are able to demonstrate creativity, accuracy, discipline, responsibility, adaptability, have an independent initiative, autonomous learning, and do lifelong learning

CLO1. Describes plants that contain natural colors and can apply color exploration methods appropriately (PLO2).

CLO2. Applying the entrepreneurial principle of natural material technology through business design activities (PLO10).

CLO3. Applying the principle of coloring based on plant characteristics through practical activities (PLO10).

CLO4. Making product variants from ecoprint through projects (PLO10),

CLO/ PLO	PLO 1	PLO 2	PLO 3	PL O 4	PLO 5	PLO 6	PLO 7	PL O 8	PLO 9	PLO 10
CLO 1		*								
CLO 2										*
CLO 3										*
CLO 4										*

Content

This elective course will provide students with knowledge about the exploration of plants that can be used as dyes in textiles. Skills in applying natural colors in textiles are also provided up to the economic analysis.

Natural Material Technology is a elective subject for the study program which includes the following studies:

- A. Definition and Chenistry of Dye (Whant is a dye; Chemistry; Fastnes of colorinf; Food coloring)
- B. Definition and Chemsitry of tannin (What is s tannin; Chemsitry; Tannin and animal skin protein; Tanning practice;
- C. History and Role of vegetable dyes (History and importance; Textile dying; Food coloring; Wood tar and host insect; The production of leathr.
- D. Botany (Dyes in plant; Tannin in plants; Prospect.
- E. Alphabetical treatment of species.



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	The TBA practicum examines: 1. Natural Dyes for Textiles. starting from choosing various types of plants that are around us both from the leaves, flowers, stems, bark or roots. As an initial indication, the plant that we choose as the material for making natural dyes is the colored part of the plant or if the plant part is scratched onto a white surface it leaves a colored mark/scratch. The manufacture of natural dyes for dyeing textile materials can be done using simple technology and equipment. 2. Exploration of Natural Dyes and Their Dyeing Techniques. The process of making a solution of natural dyes is a process to take the pigments that cause color in plants, whether they are found in leaves, stems, fruit, flowers, seeds or roots. The exploratory process of taking natural dye pigments is called the extraction process. This extraction process is carried out by boiling the material with water as a solvent. The part of the plant that is extracted is the part that is indicated to be the strongest/lots of color pigments, such as the leaves, stems, roots, fruit skins, seeds or fruit. For this Exploration process, the following materials are needed: 1). Cotton (birkoline) and silk fabrics, 2) Extracts are materials taken from parts of plants around us that we want to make a source of natural dyes such as: papaya leaves, hibiscus flowers, avocado leaves, mangosteen rind, teak leaves, sappan wood, seeds makutodewo, cassava leaves, guava leaves or other types of plants that we want to explore 3) The chemicals used are tunjung (FeSO4) , alum, sodium carbonate/soda ash (Na2CO3) , quicklime (CaCO3), this material can be get it at chemical stores. The equipment used are scales, buckets, pans, stoves, thermometers, knives and scissors. The exploration and dyeing process for natural dyes is as follows: Extraction Process for Natural Dyes'; Preparation of Dyeing With Natural Dyes: a. Mordant; Manufacture of fixer / color lock solution. Dyeing process with dyes.												
Attribute Soft skill	1. Able to think conceptually, analitically, and logically 2. Have good communication skills. 3.												
Study/exam achievements	Students are considered to complete the course and pass if they obtain at least 60% of maximum final grade. The final grade (FS) is calculated based on the following ratio: <table><tr><td>Aspect</td><td>(%)</td><td>CLO 1</td><td>CLO 2</td><td>CLO 3</td><td>CLO4</td></tr><tr><td>Participation</td><td>10</td><td>V</td><td></td><td>V</td><td></td></tr></table>	Aspect	(%)	CLO 1	CLO 2	CLO 3	CLO4	Participation	10	V		V	
Aspect	(%)	CLO 1	CLO 2	CLO 3	CLO4								
Participation	10	V		V									



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	Team Based Project/Mid Term	30			V	V
	Final Exam	30	V	V		
	Laboratory activity:	30		V	V	V
	Pretes (5%)		V		V	
	Performance (5%)		V		V	
	Report (10%)					
	Responsi (10%)		V		V	
	Final Score	100				



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Form of Media	Power point slide, essay, curriculum document, proposal sample, natural ingredients
Literature (primary references)	1. de Souza, M. T. F., Ambrosio, E., de Almeida, C. A., de Souza Freitas, T. K. F., Santos, L. B., de Cinque Almeida, V., & Garcia, J. C. (2014). The use of a natural coagulant (<i>Opuntia ficus-indica</i>) in the removal for organic materials of textile effluents. <i>Environmental monitoring and assessment</i>, 186(8), 5261-5271. 2. Fröse, A., Schmidtke, K., Sukmann, T., Junger, I. J., & Ehrmann, A. (2019). Application of natural dyes on diverse textile materials. <i>Optik</i>, 181, 215-219. 3. Elsayhida, K., Fauzi, A. M., Sailah, I., & Siregar, I. Z. (2019). Sustainability of the use of natural dyes in the textile industry. In <i>IOP Conference Series: Earth and Environmental Science</i> (Vol. 399, No. 1, p. 012065). dos Santos Silva, P. M., Fiaschitello, T. R., de Queiroz, R. S., Freeman, H. S., da Costa, S. A., Leo, P., & da Costa, S. M. (2020). Natural dye from Croton urucurana Baill. bark: Extraction, physicochemical characterization, textile dyeing and color fastness properties. <i>Dyes and Pigments</i>, 173, 107953. 4. Chequer, F. D., De Oliveira, G. R., Ferraz, E. A., Cardoso, J. C., Zanoni, M. B., & de Oliveira, D. P. (2013). Textile dyes: dyeing process and environmental impact. <i>Eco-friendly textile dyeing and finishing</i>, 6(6), 151-176. 5. Rehan, M., Mashaly, H. M., Mowafi, S., Abou El-Kheir, A., & Emam, H. E. (2015). Multi-functional textile design using in-situ Ag NPs incorporation into natural fabric matrix. <i>Dyes and Pigments</i>, 118, 9-17. 6. Gong, K., Rather, L. J., Zhou, Q., Wang, W., & Li, Q. (2020). Natural dyeing of merino wool fibers with <i>Cinnamomum camphora</i> leaves extract with mordants of biological origin: a greener approach of textile coloration. <i>The Journal of The Textile Institute</i>, 111(7), 1038-1046. 7. Alemayehu, T., & Teklemariam, Z. (2014). Application of Natural Dyes on Textile: A Review. <i>International Journal of Research-Granthaalayah</i>, 2(2), 61-68.



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Presentation Assessment Rubric (CLO4)

Aspect	Weight (%)	Score	WxS	Comments
Material mastery (Content)	30			
The accuracy of solving the problem (Content)	30			
Communication skills (Presentation Skills)	20			
Ability to deal with questions (Presentation Skills)	10			
Presentations (Organization)	10			
Final Score	100			

ASPECT	Scale				
	Very Good	Good	Sufficient	Deficient	Very Deficient
	≥85	71-84	60-70	40-59	<40
Organisation	Well organized by presenting facts that are supported by examples that have been analyzed according to the concept	well organized and present convincing facts to support conclusions.	The presentation has focus and presents some evidence to support the conclusion	Sufficiently focused, but insufficient evidence to be used in drawing conclusions	There is no clear organization. Facts are not used to support statements.
Content	Content are absolutely accurate can inspire listeners to develop their minds.	Contents are accurate and complete. Listeners get new insights about the topic.	Content is generally accurate, but incomplete. Listeners can learn some implied facts, but they don't add new insight into the topic	The content is less accurate, because there is no factual data, it does not add to the listener's understanding	The content is inaccurate or too general. Listeners don't learn anything or are sometimes misled.
Presentation Style	Speak with passion, transmit enthusiasm and enthusiasm to listeners	The speaker is calm and uses proper intonation, speaks without relying on notes, and interacts intensively with the listener. The speaker always makes eye contact with the listener.	In general, the speaker is calm, but with a flat tone and quite often relies on notes. Sometimes eye contact with the listener is ignored.	Based on the notes, no ideas are developed outside the notes, the sound is monotonous	The speaker is anxious and uncomfortable and reads notes rather than speaking. Listeners are often ignored. There is no eye contact because the speaker is looking more at the whiteboard or screen.

FINAL EXAM

Rubric

CLO	Question	Key for Answer
1	Mention and explain in detail the plants on campus that can be used as a source of fabric dye.	Get to know the plants on campus



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2	Identify plants on the UNS campus that can be used as mordant in the ecoprint.	more detailed identification of some plants that contain tannin
2	Explain the function of the mordant	
3	Mango leaves, produce a green color in the fabric for dyeing. Make a flowchart of how the procedure and steps work so that it produces color in the fabric.	
1	Why do teak leaves have more pronounced color footprints in the fabric than castor leaves>?	
4	Explain how to apply plant dyes on a piece of cloth. Describe the procedure according to what has been implemented in a personal project /	You can to explain in more detail the procedure for carrying out dyeing in fabrics, which is the result of a personal task