



**UNIVERSITAS SEBELAS MARET**  
**FACULTY OF TEACHER TRAINING AND EDUCATION**  
**BACHELOR OF BIOLOGY EDUCATION STUDY PROGRAM**

Building D 3rd Floor FTTE UNS Jl Ir. Sutami No. 36 A Ketingan Surakarta 57126 Indonesia

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**Diversity and Classification of Invertebrates**

**Undergraduate Programme in Biology Education**

**Module Handbook**

Module Name	Diversity and Classification of Invertebrates (Keanekaragaman dan Klasifikasi Invertebrata)				
Module level	Undergraduate Programme				
Course Code	02013243003				
Abbreviation, if applicable	DCI				
Courses included in the module, if applicable	-				
Semester/Term	2 <sup>nd</sup>				
Module coordinator (s)	Puguh Karyanto, Ph. D				
Lecturer (s)	Dr. Sri Dwiastuti, M. Si.				
Language	Bahasa Indonesia (Indonesian Language)				
Classification within the curriculum	Compulsory/ <del>Elective</del>				
Teaching format/class hours per week during the semester	<b>Direct instruction/face to face/blended learning:</b> 26.7h/week : lecture, discussion, laboratorium activity, field study <b>Structured activity:</b> 32h/week (Through the analysis of journal articles, students learn to analyze the embryonal development of cellular and diploblastic organism, diversity, and classification of phylum in Invertebrates) <b>Self-study activity:</b> 32h/week (Students learn various characteristics of Invertebrates from various sources) <b>Practicum in laboratory:</b> Laboratory activity = 10 topic/week x 170 minutes = 1700 minutes Hour = 1700 minutes/60 minutes = 28.3h				
Workload					
Credit Point	Type	CSU	Face to Face	Structured Activities	Self-study
	T	2	26.7h (1.00 ECTS)	32h (1.21 ECTS)	32h (1.21 ECTS)
	P	1	28.3h (1.07) ECTS		
	Total	3	119h (4.5 ECTS)		
Credit Points	3 CSU (4.5 ECTS)				
Requirements	Has taken courses in General Biology				

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Learning goals/competencies	<p>PLO 2 : They are able to apply the basic advance knowledge in biology to solve the problem in biology</p> <p>PLO 6 : They are able to demonstrate laboratory works, design and implement the experiment based on laboratory knowledge, skills, safety, environmental issues, and social ethics problems.</p> <p>PLO 8 : They are able to communicate verbal and nonverbal effectively using the proper media.</p> <p>PLO 10 : They are able to demonstrate creativity, accuracy, discipline, responsibility, adaptability, have an independent initiative, autonomous learning, and do lifelong learning</p>										
	<p>CLO 1 Explaining the concept of an important concept in Protostomata taxonomy.</p> <p>CLO 2 Applying criteria for embryonal development and complexity of morphological structures to reconstruct diversity and classification in cellular and diploblastic organisms.</p> <p>CLO 3 Applying the principle of diversity and classification in the protostome group of acoelomate and pseudocoelomate based on diagnostic characteristics.</p> <p>CLO 4 Students were able to reconstruct diversity and classification in the coelomate triploblastic protostome group based on their diagnostic characteristics.</p>										
	CLO/ PLO	PL O1	PL O2	PL O3	PL O4	PL O5	PL O6	PL O7	PL O8	PL O9	P LO 10
	CLO1		*				*		*		*
	CLO2		*				*		*		*
	CLO3		*				*		*		*
	CLO4		*				*		*		*



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Content	<p>To achieve the specified learning outcomes, the study materials discussed include:</p> <ol style="list-style-type: none"> <li>1. Developmental trend towards Protostomata</li> <li>2. Diagnostic characteristics of Phylum Porifera, Cnidaria, Nematelminthes, Platyhelminthes, Annelida, Arthropoda and Echinodermata</li> <li>3. Biological information (morphological, physiological, molecular characteristics and distribution of several important taxa in Protostomata.</li> </ol> <p>The study material in the Practice of Diversity and Invertebrate Classification includes the study of morphology and the compilation of phenograms on representations:</p> <ol style="list-style-type: none"> <li>1. Phylum Porifera,</li> <li>2. Phylum Cnidaria,</li> <li>3. Phylum Nematelminthes,</li> <li>4. Phylum Platyhelminthes,</li> <li>5. Phylum Annelida,</li> <li>6. Phylum Arthropoda, and</li> <li>7. Phylum Echinodermata</li> </ol>
Attribute Soft skill	<ol style="list-style-type: none"> <li>1. Able to think conceptually, analytically, and logically</li> <li>2. Have good communication skills</li> </ol>

Study/exam achievements	<p>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:</p> <table border="1"> <thead> <tr> <th>Aspect</th><th>(%)</th></tr> </thead> <tbody> <tr> <td>Task/quiz/presentation / laboratory activity</td><td>30</td></tr> <tr> <td>Participation</td><td>10</td></tr> <tr> <td>Mid-Term Test</td><td>30</td></tr> <tr> <td>Final Exam</td><td>30</td></tr> <tr> <td>Final Score</td><td>100</td></tr> </tbody> </table>	Aspect	(%)	Task/quiz/presentation / laboratory activity	30	Participation	10	Mid-Term Test	30	Final Exam	30	Final Score	100
Aspect	(%)												
Task/quiz/presentation / laboratory activity	30												
Participation	10												
Mid-Term Test	30												
Final Exam	30												
Final Score	100												
Form of Media	Powerpoint slide, learning video, specimens												



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Literature references)	(primary	<p>1. Fried &amp; Hedemenos.(2009). <i>Living Things Diversity</i>. Ganesha Exact.</p> <p>1. Pechenik,J.A. (2015). <i>Biology of Invertebrata</i>. 7th edition. WCB. Publisher. USA.</p> <p>2. Perez, D. G., &amp; Fontanetti, C. S. (2011). Hemocitical responses to environmental stress in invertebrates: a review. <i>Environmental monitoring and assessment</i>, 177(1), 437-447.</p> <p>3. Matozzo, V., Fabrello, J., &amp; Marin, M. G. (2020). The effects of glyphosate and its commercial formulations to marine invertebrates: a review. <i>Journal of Marine Science and Engineering</i>, 8(6), 399.</p> <p>4. Pagano, M., Stara, A., Aliko, V., &amp; Faggio, C. (2020). Impact of neonicotinoids to aquatic invertebrates—in vitro studies on <i>Mytilus galloprovincialis</i>: A review. <i>Journal of Marine Science and Engineering</i>, 8(10), 801.</p> <p>5. Rusyana, A. (2011). <i>Zoologi Invertebrata</i>. Bandung: Alfabeta.</p> <p>6. Jordan, E. L, Verma. P.S. (2009). <i>Invertebrate Zoology</i>. Ram Nagar, Newd Delhi, India : Rajendra Ravinda Printers.11</p>
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**Assessment**

Dimension	Weight (%)	Score	WxS	Comments
Participation	10			
Team Based Project/Mid Term	30			
Final Exam	30			
Laboratory activity:	30			
Pretes (5%)				
Performance (5%)				
Report (10%)				
Responsi (10%)				
Final Score	100%			



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**Rubric for Presentation**

DIMENSION	Scale				
	Very Good	Good	Sufficient	Deficient	Very Deficient
	≥85	71-84	60-70	40-59	<40
<b>Organization</b>	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.
<b>Content</b>	Content 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.
<b>Presentation Style</b>	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**

CLO	Question	Answer
CLO 1	1. In this world we call animals as rabbits, kangaroos, octopuses, and so on. But then, an official	1. In general, people give names to animals based on the name of the region, city, or country. However, based on this it can lead to different interpretations. To create easier communication, each animal must have a name that is known throughout the world, the goal is to create a nomenclature system that is easy to understand and applies internationally.



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	<p>international name was made to be used to refer to the name or identity of animal and plant. Why should the naming of an animal apply internationally?</p>	
2.	<p>In the sea, we find various types of animals such as sea snakes, sea cucumbers, starfish, sea urchins, and so on. While in the forest we can find tigers, lions, various birds and more. All of these animals have different characteristics and need to be classified accordingly. Explain the basis for classifying animals</p>	<p>2. Classification of animals can be classified into 3 groups, namely:</p> <p>a. Natural System Classification. Classification based on visible morphological observations. The classification of natural systems is the formation of groups of living things naturally.</p> <p>b. Classification of artificial systems. This classification is based on similarities and differences in body structure. This system provides a classification based on the number of similarities in the characteristics of each type of living thing that are grouped. Namely starting from the Kingdom, Phylum, Klassis, Order, Familia, genus, Species.</p> <p>c. Phylogenetic System Classification This classification system is based on the closeness of kinship relations. Closely related organisms have more characteristics in common than organisms or groups that are distantly related. How to group by observing morphology, anatomy, physiology, and behavior.</p>
3.	<p>There are various types of animal shapes and surfaces. Some have fur, have hair, are smooth, spiny, or porous. Porous animals or called sponges live in the sea and play a role in the sustainability of the ecosystem there. Some of them can pop</p>	<p>Eukaryotes are organisms that consist of cells that have a membrane-bound nucleus. Eukaryotic genetic material is contained in the nucleus of the cell and this DNA is organized into chromosomes. For multicellular is a term for organisms that have many cells. Organisms of this type are usually macroscopic</p>



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	<p>bubbles from their main shaft. Explain that Porifera are multicellular eukaryotic animals?</p>	
	<p>4. Aurelia aurita (jellyfish) is one of the soft animals that live in the sea. Some of them can climb into shallow seas and often reach the shoreline but eventually die. Coastal supervisors usually forbid tourists from swimming at the beach if there are lots of jellyfish on the beach. Scientifically, jellyfish are included in the Coelenterata group, and can be included in the Cnidaria group. What is the difference between Cnidaria and Coelenterata?</p>	<p>Cnidaria are organisms that already have a tissue. Cnidarians are animals that have stingers (Cnidos) known as cnidocytes which play a role in protection. Coelenterates are animals that have an enteron cavity as their intestine. Cnidaria together with Ctenophora is included in one phylum, namely Coelenterata.</p>
	<p>5. Some animals have shells that protect their bodies from external environmental threats. Turtles and turtles have shells that can expand according</p>	<p>The shell of gastropods is produced by a tissue called the mantle. The gastropod shell is composed of 3 layers, namely:</p> <ol style="list-style-type: none"><li>The periostracum layer, the thin layer that is most external, organic, slick, shiny.</li><li>The nacreatic layer is the thinnest layer that is closest to the body and is calcareous.</li><li>The prismatic layer is a thick layer in the middle between the periostracum and the nacreas, composed of the basic material of calcium carbonate which is combined with protein.</li></ol>



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	<p>to their body size. Unlike the gastropods, the shell cannot expand. It has to change its shell if it gets too small. Describe the structure of the gastropod shell</p>	
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