UNIVERSITAS NEGERI YOGYAKARTA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF PHYSICS EDUCATION
PHYSICS STUDY PROGRAM
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Bachelor of Physics **MODULE HANDBOOK**

Module name:	Nanomaterials Characterization
Module level, if applicable:	Bachelor Program
Code:	FSK6252
Sub-heading, if applicable:	-
Classes, if applicable:	B-E
Semester:	6
Module coordinator:	Fika Fauzi, S. Si., M. Sc.
Lecturer(s):	Fika Fauzi, S. Si., M. Sc.
Language:	Bahasa Indonesia
Classification within the curriculum:	Elective Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes individual study per week for 16 weeks.
Credit points:	2 SKS (3.25 ECTS)
Prerequisites course(s):	
Course Outcomes	At the end of this course students should be able to: 1) Describe different characterization techniques of materials, the principles on which they are based, and their limitations 2) Identify the material properties that the various techniques can probe

<table>
<tr><td></td><td>3) Understand the complementarity of the various characterization techniques
4) Apply the characterization techniques to analyze relevant structure-property relationships in different materials</td></tr>
<tr><td>Content:</td><td>The course presents a broad view of the different experimental characterization techniques and the principles on which they are based, including:
i. X-ray Diffraction (X-rays and their interaction with matter; kinematical diffraction from crystalline solids; sources of X-rays; refraction and reflection from interfaces);
ii. Optical Spectroscopy (Light-matter interactions; vibrational and Raman spectroscopy; electronic spectroscopy; basics of ultrafast spectroscopy);
iii. Electron Microscopy (Introduction on scanning and transmission electron microscopy (SEM and TEM); image formation and contrast in the TEM; electron diffraction in the TEM)</td></tr>
<tr><td>Study / exam achievements:</td><td>Course evaluation will be carried out through (1) weekly assignments, (2) midterm exam (written), and (3) final exam (written). Determination of final grade is as follows:

Final score = 35% assignments + 35% midterm exam + 30% final exam

The final score then converted into the grade as follows:

<table>
<tr><th rowspan="2">Final score</th><th colspan="2">Conversion</th></tr>
<tr><th>Grade</th><th>Points</th></tr>
<tr><td>86 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>81 – 85</td><td>A-</td><td>3.67</td></tr>
<tr><td>76 – 80</td><td>B+</td><td>3.33</td></tr>
<tr><td>71 – 75</td><td>B</td><td>3.00</td></tr>
<tr><td>66 – 70</td><td>B-</td><td>2.67</td></tr>
<tr><td>61 – 65</td><td>C+</td><td>3.33</td></tr>
<tr><td>56 – 60</td><td>C</td><td>2.00</td></tr>
<tr><td>41 – 55</td><td>D</td><td>1.00</td></tr>
<tr><td>0 – 40</td><td>E</td><td>0.00</td></tr>
</table>

For passing this course, students must obtain grade D or higher.</td></tr>
<tr><td>Forms of media:</td><td>Board and LCD Projector</td></tr>
<tr><td>Literature:</td><td>1. Berg, J. M., Tymoczko, J. L., Stryer, L., & Stryer, L. 2002. Biochemistry. New York: W.H. Freeman.</td></tr>
</table>

	2. Devlin, T.M., 1997. Textbook of Biochemistry with Clinical Correlations. 4th edition. WileyLiss, Inc., New York. 3. Fika Fauzi, Aditya Rianjanu, Iman Santoso, Kuwat Triyana,Gas and humidity sensing with quartz crystal microbalance (QCM) coated with graphene-based materials – A mini review,Sensors and Actuators A: Physical,Volume 330,2021

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CO1		✔						
CO2		✔						
CO3					✔			
CO4					✔			