



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

	<div>3) Understand the complementarity of the various characterization techniques</div> <div>4) Apply the characterization techniques to analyze relevant structure-property relationships in different materials</div>																																
Content:	<div>The course presents a broad view of the different experimental characterization techniques and the principles on which they are based, including:</div> <div><div>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);</div><div>ii. Optical Spectroscopy (Light-matter interactions; vibrational and Raman spectroscopy; electronic spectroscopy; basics of ultrafast spectroscopy);</div><div>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)</div></div>																																
Study / exam achievements:	<div>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:</div> <div><div>Final score = 35% assignments + 35% midterm exam + 30% final exam</div></div> <div>The final score then converted into the grade as follows:</div> <table><thead><tr><th rowspan="2">Final score</th><th colspan="2">Conversion</th></tr><tr><th>Grade</th><th>Points</th></tr></thead><tbody><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></tbody></table> <div>For passing this course, students must obtain grade D or higher.</div>	Final score	Conversion		Grade	Points	86 – 100	A	4.00	81 – 85	A-	3.67	76 – 80	B+	3.33	71 – 75	B	3.00	66 – 70	B-	2.67	61 – 65	C+	3.33	56 – 60	C	2.00	41 – 55	D	1.00	0 – 40	E	0.00
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86 – 100	A	4.00																															
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71 – 75	B	3.00																															
66 – 70	B-	2.67																															
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41 – 55	D	1.00																															
0 – 40	E	0.00																															
Forms of media:	Board and LCD Projector																																
Literature:	<div>1. Berg, J. M., Tymoczko, J. L., Stryer, L., & Stryer, L. 2002. Biochemistry. New York: W.H. Freeman.</div>																																

	<p>2. Devlin, T.M., 1997. Textbook of Biochemistry with Clinical Correlations. 4th edition. WileyLiss, Inc., New York.</p> <p>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</p>
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PLO and CO mapping

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