



Bachelor Program in Geophysics

Faculty of Mathematics and Natural Sciences
HASANUDDIN UNIVERSITY

7. Geophysical Inversion Methods

Module Name	:	Geophysical Inversion Methods
Module Level	:	Bachelor
Code, if applicable	:	23H06122002
Subtitle, if applicable	:	-
Courses, if applicable	:	Geophysical Inversion Methods
Semester(s) in which the module is taught	:	IV (Fourth Semester)
Module coordinator(s)	:	Dr. Muhammad Hamzah S., S.Si., MT.
Lecturer(s)	:	Dr. Muhammad Hamzah S., S.Si., MT. and Sabrianto Aswad, S.Si., MT
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in the second year for Bachelor Degree in Geophysics
Type of teaching, contact hours	:	This course is delivered through Lectures (i.e., Project/Case-based learning), complemented by structured assignments (paper review, project/case evaluation) and independent study. Contact hours consist of 100 minutes lectures per week, plus 120 minutes per week for each of the following: structured assignments and independent study
Workload	:	Total workload is 90 hours per semester, consisting of 28 hours for lectures, and 31 hours each for structured assignments and independent study
Credit points	:	2 SKS (3.2 ECTS)
Requirements according to the examination regulations	:	Students are eligible to attend the examination if their absences are less than 20% of the lectures
Recommended prerequisites	:	Mathematical Geophysics I, Mathematical Geophysics II
Module objectives/intended learning outcomes	:	After completion of this module, students will be able to: CLO 1. Students are able to detail inversion variables (quantities and processes) from various geophysical data inversion principles correctly; CLO 2. Students are able to analyze inverted geophysical data correctly; CLO 3. Students are able to analyze model parameters and modeling results correctly.



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		The following is the mapping of the ILO and the CLO of this course: <table><tr><td></td><td>ILO 4</td><td>ILO 8</td><td>ILO 11</td><td>ILO 13</td></tr><tr><td>CLO 1</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>CLO 2</td><td></td><td>✓</td><td></td><td></td></tr><tr><td>CLO 3</td><td></td><td></td><td>✓</td><td>✓</td></tr></table>		ILO 4	ILO 8	ILO 11	ILO 13	CLO 1	✓				CLO 2		✓			CLO 3			✓	✓										
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CLO 2		✓																														
CLO 3			✓	✓																												
Content	:	1. Mathematical formulation of geophysical inversion problems, 2. Geophysical data inversion, 3. Physical model parameters, 4. Images of 1D linear inversion modeling results, 5. 1D nonlinear inversion, 6. 2D linear inversion, 7. 2D nonlinear inversion.																														
Study and examination requirements		Participants are marked based on their performance in theory: Project/Case Study (75%), Formative test (15%), Practical Work (10%). Students are marked based on their percentage of points obtained and based on the following grade scale: <table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr><tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr><tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr><tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr><tr><td>< 40</td><td>E</td><td>0.00</td></tr></table>	Percentage of Achievement	Grade	Conversion Value	85 – 100	A	4.00	80 - <85	A-	3.75	75 - < 80	B+	3.5	70 - < 75	B	3.0	65 - < 70	B-	2.75	60 - < 65	C+	2.5	50 - < 60	C	2.00	40 - < 50	D	1.00	< 40	E	0.00
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Exams and assessment formats	Student performance in this course is evaluated through project-based tasks, formative tests, and practical work activities. The project-based assessment requires students to work individually or in groups to identify and detail inversion variables (quantities and processes) from various geophysical data inversion principles, analyze inverted data, and evaluate model parameters and modeling results accurately. The outcomes are documented in a written report. Formative tests are a closed-book test to measure students' precision in performing mathematical modeling and formulating inversion processes, ensuring conceptual mastery and problem-solving ability. The practical work component involves hands-on laboratory activities where students process and interpret geophysical inversion data, followed by the preparation of a practical work report.
Reading list	1. Main References: 1. Meju, A Max., Geophysical Data Analysis: Understanding Inverse Problem Theory and Practice,(1994), Society of Exploration Geophysicists (SEG) 2. W. Menke, Geophysical Data Analysis: Discrete Inverse Theory, Academic Press, 1989. 3. A. Tarantola, Inverse Problem Theory: Methods for Data Fitting and Model Parameter Estimation, Elsevier, 1987. 4. M.K. Sen, P.L. Stoffa, Global Optimization Methods in Geophysical Inversion, Elsevier, 1995. 5. Grandis, H. Pengantar Pemodelan Inversi Geofisika, HAGI, 2009 6. Muhammad Hamzah, Modul Praktikum Inversi Geofisika, Departemen Geofisika Unhas, 2018.
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