10. Mathematical Geophysics II

Module Name	:	Mathematical Geophysics II
Module Level	:	Bachelor
Code, if applicable	:	23H06120103
Subtitle, if applicable	:	-
Courses, if applicable	:	Geophysics Study Program
Semester(s) in which the module is taught	:	III (Third Semester)
Module coordinator(s)	:	Dr. Muhammad Alimuddin, Eng
Lecturer(s)	:	Dr. Muhammad Alimuddin, Eng Dr. Muhammad Taufiq Rafie
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in the second year of the Bachelor of Geophysics program
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 150 minutes lectures per week, plus 180 minutes per week for each of the following: structured assignments and independent study
Workload	:	Total workload is 135 hours per semester, consisting of 38 hours for lectures, and 48.5 hours each for structured assignments and independent study
Credit points	:	3 SKS (4.8 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
Module objectives/intended learning outcomes	:	After completion of this module, students will be able to: CLO 1. Able to apply the use of special functions in ordinary differential equations (ODE). CLO 2. Able to solve transformation method problems in geophysics. CLO 3. Able to demonstrate partial differential equations (PDE) in geophysics problems.

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<tr><td></td><td></td><td>contexts both orally and in writing with group.

The following is the mapping of the ILO and the CLO of this course:

<table>
<tr><td></td><td>ILO 5</td><td>ILO 11</td></tr>
<tr><td>CLO 1</td><td>✓</td><td></td></tr>
<tr><td>CLO 2</td><td></td><td>✓</td></tr>
<tr><td>CLO 3</td><td></td><td>✓</td></tr>
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<tr><td>Content</td><td>:</td><td>1. Ordinary Differential Equation (ODE)
2. Laplace Transform
3. Z Transform
4. Fourier Series and Fourier Transform
5. Linear Partial Differential Equation (PDE) (parabolic, hyperbolic, elliptic)</td></tr>
<tr><td>Study and examination requirements</td><td></td><td>Participants are marked based on their performance in theory: Case Study (100%)

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>
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Exams and assessment formats		Assessment in this course is fully case-based. The case-based component requires students to apply the formulation and solution of ordinary and partial differential equations (ODEs and PDEs). Students also apply analytical methods such as Laplace, Z-, and Fourier transforms to model and interpret physical processes. This work is developed over several weeks under instructor guidance, culminating in a written report and an oral presentation of results.
Reading list		**Main References:** 1. Yang, W.Y., Choi, Y.K., Kim, J., Kim, M.C., Kim, H.J., dan Im, T. 2018. Engineering Mathematics with Matlab. Chapman and Hall/CRC **Additional References:** 1. Kreyszig, E., Stroud, K., dan Stephenson, G. 2008. Advanced engineering mathematics. Integration, 9(4). 2. Strang, G. 2016. Introduction to linear algebra Fifth Edition. Wellesley, MA: Wellesley-Cambridge Press
Last revision date		July 1st, 2025