Module Description of Economics and Financial Mathematics

Module Name	:	Economics and Financial Mathematics
Module Level	:	Bachelor
Code, if applicable	:	23H01121903
Subtitle, if applicable	:	-
Courses, if applicable	:	Economics and Financial Mathematics
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Prof. Dr. Aidawayati Rangkuti, MS.
Lecturer(s)	:	Dr. Amran, S.Si.,M.Si., Prof. Dr. Aidawayati Rangkuti, MS., Jusmawati Massalesse, S.Si.,M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the written examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understand interest rates, present value analysis, probability theory, the probability of normal random variables, and their properties; CLO 2. identify techniques and theorems related to interest rates, present value, and Brownian motion, and establish their relationship in deriving the Black–Scholes formula; CLO 3. apply the Black–Scholes concept effectively to solve option pricing problems in economics.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 4</th><th>ILO 5</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CLO 2</td><td></td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td></td><td>X</td><td></td><td>X</td><td>X</td></tr>
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<tr><td>Content</td><td>:</td><td>This course introduces the Black-Scholes formula for option pricing based on the Brownian Motion approach. To understand the formulation, students are required to have sufficient knowledge of probability theory, particularly the properties of normally distributed random variables. The course also covers key financial concepts such as interest rate, present value, and arbitrage, which are fundamental in determining option prices in both single and multi-period settings. Main topics include probability theory, normal random variables, Brownian Motion and Geometric Brownian Motion, interest rate and present value analysis, arbitrage theory, and the Black-Scholes formula.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Written Exam (20%), Report (50%), and Assignments (30%)

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

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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Reading list	:	An Elementary Introduction to Mathematical Finance (Third Edition). Cambridge University Press, Sheldon M. Ross. 2011.
Last revision date	:	February 5th, 2025