Module Description of Operation research

Module Name	:	Operation research
Module Level	:	Bachelor
Code, if applicable	:	23H01121103
Subtitle, if applicable	:	-
Courses, if applicable	:	Operation research
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Prof. Dr. Aidawayati Rangkuti, MS.
Lecturer(s)	:	Prof. Dr. Aidawayati Rangkuti, MS. Agustinus Ribal, S.Si.,M.Sc., Ph.D
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory 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	:	Students have completed and taken the exams for Basic Mathematics II, Linear Algebra I
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understanding various mathematical methods and concepts, and applying these methods in related fields such as industry, economics, and agriculture; CLO 2. analyzing and implementing various operations research models in other fields of study; CLO 3. constructing mathematical models, explaining procedures, and solving linear programming problems using appropriate optimization techniques, and interpreting the results in related fields;

<table>
<tr><td></td><td></td><td>CLO 4. Communicating ideas, developing self - competence based on local wisdom, and adaptingeffectively in a society with diverse backgrounds.

The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 3</th><th>ILO 4</th><th>ILO 6</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 3</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>CLO 4</td><td>X</td><td>X</td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>Operations Research is a compulsory subject in the mathematics study program that equips students with the ability to formulate linear programming problems and solve them using optimization methods, both manually and with the aid of software. The course also introduces the concept of duality in linear programming problems along with its properties, as well as sensitivity analysis. The second part of the course focuses on transportation problems and their solutions using Vogel’s Approximation Method (VAM), the Stepping Stone method, and the Modified Distribution Method (MODI). In the final part, the course discusses project network problems and their solutions, including project management and the Program Evaluation and Review Technique (PERT). Topics covered may include: convex sets and formulation of linear programming problems, graphical and simplex methods, special cases of solutions, duality and its properties, transportation problem and its solution methods (VAM, Stepping Stone, MODI), and project management including PERT.</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: Quizzes (15%), Written Exam (30%), Report (50%), and Assignments (5%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>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>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Frederick, S. H, Gerald, 2001.” Introduction to Operation Research”. seven edition, Mc Graw- Hill, New York.
2. Gass, Saul L, 1984. “Linear Programming: Method and Application”. Fifth edition, Mc Graw- Hill, New York.
3. Ronal. E. Miller, 2000. “Optimization” Foundation and Application. Prentice Hall, Inc USA.
4. Hiller, Liebermen.2005. Introduction to Operation Research. Eighth edition, Mc Graw- Hill, Companies, one book, New York.
5. Taha, Hamdy, 2007. “Operation Research”. Eighth edition Mc Graw- Hill, New York.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>