



MINISTRY OF HIGHER EDUCATION, SCIENCE, AND TECHNOLOGY

UNIVERSITAS NEGERI SURABAYA

FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNDERGRADUATE PROGRAM OF MATHEMATICS EDUCATION

Ketintang Campus, Jalan Ketintang, C8 C9 Building, Surabaya 60231

Phone: +62 895335466373, email: s1-pmat@unesa.ac.id

Website: <https://pendidikan-matematika.fmipa.unesa.ac.id/>

Undergraduate Program of Mathematics

Module Handbook

| | |
|---|---|
| Module Name: | Operational Research Riset Operasi |
| Module Level: | Sarjana (S-1) / Undergraduate |
| Abbreviation, if applicable: | 8420202004 |
| Sub-heading, if applicable: | - |
| Course included in the module, if applicable: | - |
| Semester/term: | 4 / Second year |
| Module Coordinator(s): | Prof. Dr. Raden Sulaiman, M.Si |
| Lecturer(s): | Dr. Endah Budi Rahaju, M.Pd. Affiati Oktaviarina, S.Si., M.Sc. Dr. Nia Wahyu Damayanti, S.Pd., M.Pd. Novita Vindri Harini, M.Pd. Dr. Mukhtamilatus Sa'diyah, M.Pd |
| Language: | Indonesia |
| Classification within the curriculum: | Compulsory course/elective studies |
| Teaching format/class hours per week during the semester | Teaching format: lectures, tutorial assignment, and individual Study/3 x 170 minutes = 510 minutes = 8.5 hours lectures |
| Workload: | 16 weeks per semester consisting of: • 1 hour lectures (1 x 50 minutes) per week, • 1 hours assignments (1 x 60 minutes) per week, ➤ 1 hours individual study (1 x 60 minutes) per week, Total workload: 16x3x170 minutes = 8,160 minutes = 136 hours=4.8 ECTS* |
| Credit Point: | 3 |
| Requirements: | Elementary Number Theory Teori Bilangan Elementer |



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| Learning Goals: | <p>PLO-5: Possesses basic mathematical knowledge to solve mathematical problems and their applications in education.</p> <p>PLO-6: Masters the principles of mathematical knowledge to support mathematical thinking skills in solving mathematical problems.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|---|-----------------------------------|--------------------------------|-----------------------------------|----------------|---|-------|-------|---|---|-------|-------|---|---|-------|-------|---|---|-------|-------|---|---|-------|-------|---|---|-------|-------|---|---|-------|-------|---|---|-------|-------|----|---|-------|-------|---|----|-------|-------|---|----|-------|-------|---|----|-------|-------|---|----|-------|-------|---|----|-------|-------|---|----|-------|-------|---|----|-------|-------|----|-------|-----------------|-------------|---|------|----------------------|----|------|-------------------|
| Content: | Studying linear program modeling and its solution methods (simplex, Big M, Two Phase, duality), use of computer applications, and application to transportation and assignment methods. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Study/exam achievements | <ul style="list-style-type: none">Students are considered competent and pass if the final score is at least 55 or C.Final score is calculated as follows:<table border="1"><thead><tr><th>Week</th><th>Course Learning Outcomes (CLO)</th><th>Programme Learning Outcomes (PLO)</th><th>Evaluation (%)</th></tr></thead><tbody><tr><td>1</td><td>CLO-1</td><td>PLO-6</td><td>5</td></tr><tr><td>2</td><td>CLO-1</td><td>PLO-5</td><td>2</td></tr><tr><td>3</td><td>CLO-1</td><td>PLO-5</td><td>2</td></tr><tr><td>4</td><td>CLO-1</td><td>PLO-6</td><td>5</td></tr><tr><td>5</td><td>CLO-1</td><td>PLO-5</td><td>2</td></tr><tr><td>6</td><td>CLO-1</td><td>PLO-5</td><td>5</td></tr><tr><td>7</td><td>CLO-1</td><td>PLO-5</td><td>5</td></tr><tr><td>8</td><td>CLO-1</td><td>PLO-5</td><td>20</td></tr><tr><td>9</td><td>CLO-3</td><td>PLO-5</td><td>5</td></tr><tr><td>10</td><td>CLO-2</td><td>PLO-5</td><td>5</td></tr><tr><td>11</td><td>CLO-2</td><td>PLO-5</td><td>2</td></tr><tr><td>12</td><td>CLO-2</td><td>PLO-5</td><td>5</td></tr><tr><td>13</td><td>CLO-2</td><td>PLO-6</td><td>5</td></tr><tr><td>14</td><td>CLO-2</td><td>PLO-5</td><td>2</td></tr><tr><td>15</td><td>CLO-3</td><td>PLO-6</td><td>5</td></tr><tr><td>16</td><td>CLO-3</td><td>PLO-6</td><td>30</td></tr></tbody></table>Final index is defined as follow:<table border="1"><thead><tr><th>Index</th><th>Converted Score</th><th>Score Range</th></tr></thead><tbody><tr><td>A</td><td>4.00</td><td>$85 \leq A \leq 100$</td></tr><tr><td>A-</td><td>3.75</td><td>$80 \leq A- < 85$</td></tr></tbody></table> | Week | Course Learning Outcomes (CLO) | Programme Learning Outcomes (PLO) | Evaluation (%) | 1 | CLO-1 | PLO-6 | 5 | 2 | CLO-1 | PLO-5 | 2 | 3 | CLO-1 | PLO-5 | 2 | 4 | CLO-1 | PLO-6 | 5 | 5 | CLO-1 | PLO-5 | 2 | 6 | CLO-1 | PLO-5 | 5 | 7 | CLO-1 | PLO-5 | 5 | 8 | CLO-1 | PLO-5 | 20 | 9 | CLO-3 | PLO-5 | 5 | 10 | CLO-2 | PLO-5 | 5 | 11 | CLO-2 | PLO-5 | 2 | 12 | CLO-2 | PLO-5 | 5 | 13 | CLO-2 | PLO-6 | 5 | 14 | CLO-2 | PLO-5 | 2 | 15 | CLO-3 | PLO-6 | 5 | 16 | CLO-3 | PLO-6 | 30 | Index | Converted Score | Score Range | A | 4.00 | $85 \leq A \leq 100$ | A- | 3.75 | $80 \leq A- < 85$ |
| Week | Course Learning Outcomes (CLO) | Programme Learning Outcomes (PLO) | Evaluation (%) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | CLO-1 | PLO-6 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | CLO-1 | PLO-5 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | CLO-1 | PLO-5 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | CLO-1 | PLO-6 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | CLO-1 | PLO-5 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | CLO-1 | PLO-5 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | CLO-1 | PLO-5 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | CLO-1 | PLO-5 | 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | CLO-3 | PLO-5 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | CLO-2 | PLO-5 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | CLO-2 | PLO-5 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | CLO-2 | PLO-5 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | CLO-2 | PLO-6 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | CLO-2 | PLO-5 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | CLO-3 | PLO-6 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | CLO-3 | PLO-6 | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Index | Converted Score | Score Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | 4.00 | $85 \leq A \leq 100$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A- | 3.75 | $80 \leq A- < 85$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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| | | |
|----|------|-------------------|
| B+ | 3.50 | $75 \leq B+ < 80$ |
| B | 3.00 | $70 \leq B < 75$ |
| B- | 2.75 | $65 \leq B- < 70$ |
| C+ | 2.50 | $60 \leq C+ < 65$ |
| C | 2.00 | $55 \leq C < 60$ |
| D | 1.00 | $40 \leq D < 55$ |
| E | 0.00 | $0 \leq E < 40$ |

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|-----------------------|--|
| Forms of Media | Slides and LCD projectors, whiteboard |
| Literature | <ol style="list-style-type: none">1. Ravindran, A R., Operations Research and Management Science, 2008, Taylor & Francis Group.2. M. S. Bazaraa, J. J. Jarvis and H. D. Sherali, 2010, Linear Programming and Network Flows, Fourth Edition, John Wiley & Sons, New York.3. Thaha, H.A, 2007, Operations Research: An Introduction, Eighth edition, Pearson Education Inc4. Poler, 2014, Operation Research Problems, Statements and Solutions, Springer.5. Harini, N. V, 2024, Design Contextual Problems and Solutions Related to Linear Programming Topics with The Help of Geogebra. Noumerico: Journal of Technology in Mathematics Education, 2(2), 156-164. |
| Note | Based on the regulation of the minister of education and culture of Indonesia number 3 of 2020 concerning national higher education standards, it is state 1 CU equals to 170 minutes per week. Therefore, in one semester (16 weeks, including midterm a final exam) $1 \text{ CU} = 170 \times 16 = 2.720$ minutes or 45.3 hours. Therefore, workhours in $144 \text{ CU} \times 45.3 \text{ hours} = 6.523.2$ hours. Unesa decided that 1 ECTS with 144 CU , $6.523.2/229 \text{ ECTS} = 28.48$ hours, so that $1 \text{ CU} = 1.59 \text{ ECTS}$ |