Operational Research

Module designation	Operational Research
Semester(s) in which the module is taught	6
Person responsible for the module	Dr. Eti Dwi Wiraningsih/Tian Abdul Azis, PhD.
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: ● Lecture (i.e., small group discussions and project-based learning) ● Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 680 minutes per week which consists of 200 minutes learning activity, 240 minutes structured task and 240 minutes individual learning per week for 16 weeks. TOTAL WORKLOAD PER SEMESTER 680 X 16 = 10880 minutes = 181, 33 hours
Credit points	136 hours / 30 hours 4,5 ECTS
Required and recommended prerequisites for joining the module	*Linear Programming*

Program intended learning outcomes	PLO 5. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. PLO10. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.. PLO11. Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students are able to determine general mathematical models with constraints and model solutions and analyze the sensitivity to changes in variables and optimal solutions. CLO 2 : Students understand the types and models of queuing systems on single and multiple services. CLO 3 : Students master in modeling model of stock items in inventory management, control systems, EOQ models, stock management settlement methods, and nador methods. CLO 4 : Students are able to understand the model in the forecasting system on the time series method with computer-based solutions and forecasting settlement methods. CLO 5 : Students are able to understand the optimization Model with multiple constraints both on the types of constraints and the types of controlled optimization. CLO 6 : Students are able to understand the forms and models of decision theory on non-Linear programs and their solutions, decision-making models, and multilevel analysis programs. CLO 7 : Students are able to understand the transportation network model both in transportation problems and shipping and Assignment Problems. CLO 8 : Students are able to understand materials related to network flow models, shortest route problems, minimal spanning trees, and maximum flows. CLO 9 : Able to understand materials related to project network models in the form of Project Management, Project networks, CPM/PERT models, activity Time

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<tr><td></td><td>probability, and time-cost balance.
CLO10 : Understand monte carlo method related materials both in solving methods and algorithms.

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><th rowspan="2">CLO</th><th colspan="3">PLO</th></tr>
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<tr><td>Content</td><td>Students will learn about:

general mathematical models with constraints and solution models, sensitivity analysis of variable changes and optimal solutions, types and models of queue Systems, stock models, stock models, forecasting models and systems, optimization models with multiple constraints, forms and models of decision theory, transportation network models, distribution models of goods, project management models, and monte carlo models.</td></tr>
<tr><td>Examination forms</td><td>Assessment for this course includes:

50% structured assignments, 20% midterms and 30% final exams</td></tr>
<tr><td>Study and examination requirements</td><td>Study and examination requirements:

Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td></tr>
<tr><td>Reading list</td><td>Main References:
1. MCL web: http://fmipa.unj.ac.id/elearning/mcl/

2. Bernard W. Taylor III, Introduction to Management Science, 8th edition, Prentice Hall, New Jersey, 2004

3. Frederick S. Hillier , Gerald J. Lieberman, Introduction To Operation Research, 7th edition, Mc Graw Hill, Boston, 2001

4. Levent Kandiller, Principles of Mathematics in Operation research, Springer, 2001</td></tr>
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