	Universitas Brawijaya
	Faculty of Mathematics and Natural Sciences
	Department of Statistics / Bachelor Statistics Study Programme

Module Handbook

Module Name:	Research Operation (MAS62322)
Module Level:	Bachelor
Abbreviation, if applicable:	-
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	4th/Second Year
Module Coordinator(s):	Rahma Fitriani, S.Si., M.Sc. PhD
Lecturer(s):	Rahma Fitriani, S.Si., M.Sc. PhD
	Darmanto, S.Si., M.Si
Language:	Indonesian
Classification within the curriculum:	Elective Course
Teaching format / class per week during semester:	2 × 50 minutes + 100 minutes laboratory session
Workload:	1.67 hours lectures, 2 hours structural activities, 2 hours individual studies for 16 weeks + 1.67 hours laboratory session, 2 hours structural activities, 2 hours individual studies for 8 weeks and total 136 hours per semester 4.50 ECTS
Credit Points:	3
Requirements:	Linear Programming (MAS61321), Introduction to Probability Theory (MAS62111)
Learning goals / competencies:	**General Competence (Knowledge):**

	ILO3	The students are able to manage, analyze, and complete the real case using statistical method on computing, social humanities, economics, industry and life science that helped by software, then present and communicate the results.
	ILO4	The students are able to master at least two statistical softwares, including based on open source.
	ILO5	The students are able to apply logical, critical, systematic, and innovative thinking independently when applied to science and technology that contain humanities values, based on scientific principles, procedures and ethics with excellent and measurable results.
	ILO7	The students are able to improve and develop a job networks, then supervise and evaluate the team's

		performance they lead.
	ILO8	The students are able to apply and internalize the spirit of independence, struggle, entrepreneurship, based on values, norms, and academic ethics of Pancasila in all aspects of life.
	Specific Competence:	
	M1	Students are able to solve simple network optimization problems. (ILO3, ILO4)
	M2	Students are able to apply the concept of constrained optimization with more than one goal using the concept of goal programming. (ILO3, ILO4)
	M3	Students are able to apply both deterministic and probabilistic preparation models to simple problems. (ILO3, ILO4)
	M4	Students are able to apply a simple queuing model. (ILO3, ILO4)
	M5	Students are able to convey the results of their modeling and analysis in writing or verbally, in the form of individual or group assignments. (ILO5, ILO7, ILO8)
Contents:	1	Network optimization models: Shortest Path Problems, Maximum Flow Problems, CPM and PERT, Minimum Spanning Tree Problems, Dynamic Programming
	2	Goal programming
	3	Deterministic supply model: the basic model of EOQ and its development
	4	Probabilistic stock models: one-period and multi-period probabilistic models
	5	Basic queuing models: $M/M/1$, $M/M/s$, $M/M/\sim$
Soft skill attribute:	Responsible, independently, and discipline	
Study/exam achievement:	Final score (NA) is calculated as follow: 20% Assignments, 10% Quiz, 25% Midterm Exam, 25% Final Exam, 20% Laboratory Session. Final index is defined as follow: A : > 80 - 100 B+ : > 75 - 80 B : > 69 - 75 C+ : > 60 - 69 C : > 55 - 60 D+ : > 50 - 55	

	D : > 44 - 50
	E : 0 - 44
Forms of media:	Software (MS. Excel), LCD Projector, Whiteboard
Learning methods:	Lecture and assessment
Literature:	**Main:**
	Winston, W. L., & Goldberg, J. B. (2004). Operations research: applications and algorithms (Vol. 3). Belmont: Thomson Brooks/Cole.
	Support:
Notes:	