

**UNDERGRADUATE PROGRAM IN COMPUTER SCIENCE
DEPARTMENT OF COMPUTER SCIENCE AND ELECTRONICS
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS GADJAH MADA**

Module name	Science Computation
Module level	Undergraduate
Code	MII-4215
Courses (if applicable)	Science Computation
Semester	Even (Genap)
Contact person	Faizal Makhrus, Ph.D. (faizal_makhrus@ugm.ac.id)
Lecturer	Faizal Makhrus, Ph.D.
Language	Bahasa Indonesia
Relation to curriculum	1. Undergraduate degree program, elective, 5th or 7th semester. 2. International undergraduate program, elective, 5th or 7th semester.
Type of teaching, contact hours	1. Undergraduate degree program: lectures, > 5 students.
Workload	1. Lectures: 2 x 50 = 100 minutes (1.6 hours) per week. 2. Exercises: 15 minutes per week. 3. Assignments: 2x60 minutes per semester
Credit points	3 credit points (sks).
Requirements according to the examination regulations	A student must have attended at least 75% of the lectures to sit in the exams.
Recommended prerequisites	Calculus 1 and 2

Learning outcomes and their corresponding PLOs	<p>After completing this module, a student is expected to:</p> <ul style="list-style-type: none"> · LO1 Students understand ordinary differential (ODE) and their partial differential equations (PDE) · LO2 Students understand how to discretize based on space and time, calculate derivative, Taylor theorem, integration and interpolation. · LO3 Students understand the usage of smoothing function and its types. · LO4 Students understand how to solve PDE using finite difference and Runge-Kutta). · LO5 Students understand how to find a solution of a non-linear system using Descent Gradient method and accelerate the process. · LO6 Students understand how to find a solution of a non-linear system with constraints using Penalty method od Karush-Kuhn-Tucker method. · LO7 understand how to calculate the error of approximate solution in PDE · LO8 Students understand the model of patterns and analyze them using linear combination 	<p>PLO3</p> <p>PLO3</p> <p>PLO3</p> <p>PLO4</p> <p>PLO4</p> <p>PLO4</p> <p>PLO5</p> <p>PLO5</p>
Content	<p>Linear and non-linear equation, ordinary and partial differential equation and Taylor theorem, calculate error, numerical integration, Finite Difference Method, Runge-Kutta, Gradient Descent Method, Penalty Methods, KKT Method,</p>	

Study and examination requirements and forms of examination	Mid-terms examination and Final examination.
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Media employed	LCD, blackboard			
Assessments and Evaluation	LO	Evaluation Method	Type	Percentage
	LO-1	1 question in Assignment 1 1 question in midterm exam	Summative	12.5
	LO-2	1 question in Assignment 1 1 question in midterm exam	Summative	12.5
	LO-3	1 question in Assignment 1 1 question in midterm exam	Summative	12.5
	LO-4	1 question in Assignment 1 1 question in midterm exam	Summative	12.5
	LO-5	1 question in Assignment 2 1 question in final exam	Summative	12.5
	LO-6	1 question in Assignment 2 1 question in final exam	Summative	12.5
	LO-7	1 question in Assignment 2 1 question in final exam	Summative	12.5
	LO-8	1 question in Assignment 2 1 question in final exam	Summative	12.5

Reading List

W1: Press, William H, et al, Numerical Recipes in Fortran 90, Cambridge

University Press, 1996 (online)

A1: Nocedal, Jorge, Numerical Optimization 2nd Edition, Springer, 2006