Numerical Methods

Module designation	Numerical Methods
Semester(s) in which the module is taught	3
Person responsible for the module	Tian Abdul Aziz, Ph.D / Devi Eka Wardani Meganingtyas, S.Pd., M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: ● Lecture (small group discussions and project-based learning) ● Structured assignments (project development and presentation)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. TOTAL WORKLOAD PER SEMESTER 510 X 16 = 8160 minutes = 136 hours
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	*Programming Algorithm*

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.

PLO 7. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics.

PLO 8. Mastering the principles of mathematical modeling, linear programming, differential equations, and numerical methods.

PLO 9. Able to conduct research independently or in groups that can be used to provide guidance to stakeholders in choosing various alternative solutions to problems in mathematics.

PLO 10. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.

PLO 11. 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 : Be able to match data points with a curve approximation of a numerically linear and non-linear function.

CLO 2 : Mastering to calculate the roots of a non-linear equation numerically.

CLO 3 : Understand how to solve integration problems numerically.

CLO 4 : Understand how to solve differential equations numerically.

CLO 5 : Understand how to solve systems of linear equations numerically.

The relationship between PLO and CLO in this course is described as follows:

CLO	PLO					
	5	7	8	9	10	11
1	√		√			
2		√	√			
3					√	√
4					√	√
5				√		√

Content	Students will learn about: error analysis in numerical calculations, explaining floating point numbers, binary numbers and base k numbers. In addition, students are able to determine the roots of non-linear equations using closed and open methods, solve systems of linear equations using elementary row operations and iterations, explain linear and non-linear interpolation, curve fitting, numerical integration and determine initial value problems.
Examination forms	Assessment for this course includes: 30% structured assignments, 35% midterms and 35% final exams.
Study and examination requirements	Study and examination requirements: Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	Main References: Chapra, Steven C., Caynale, Raymond P., Numerical Methods for Engineers, Fifth Edition, 2006, Mc.Graw Hill International. Additional References: Kreyzig, Advanced Engineering Mathematics, John Willey Munir, Rinaldi, Metode Numerik, 2003, Informatika Bandung Sahid, Pengantar Komputasi Numerik dengan Matlab, 2005, Andi Yogyakarta Susila, I Nyoman, Dasar-dasar Metode Numerik, 1992, Depdikbud.