Algorithm Design and Analysis

Module name	Algorithm Design and Analysis	
Module level	Undergraduate	
Code	IF221216	
Courses (if applicable)	Algorithm Design and Analysis	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 20 students	
Teaching Methods	Simulation and case-study	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	In this course students are expected to be able to design precise and efficient algorithms and implement it into a program aimed at providing solutions to real-world problems.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to design precise and efficient algorithms and implement it into a program aimed at providing solutions to real-world problems.	PLO9,PLO10
Content	The material studied by students in this course includes: the understanding of algorithms and their development, important types of algorithms, the framework for algorithm analysis, brute force algorithms, decrease and conquer algorithms, divide and conquer algorithms, transform and conquer algorithms, greedy algorithms, dynamic programming, iterative algorithms, and limitations of algorithm power and ways to overcome them.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% Students must have a final grade of 55.6% or higher to pass.	

Reading List	● T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms. Cambridge, MA, USA: MIT Press, 2022. ● A. Chatterjee and U. Kiao, Data Structures and Algorithms Coding Cheatsheet: The DSA Takeover Edition, 2024. ● D. S. Myers, Data Structures and Algorithms in Java: A Project Based Approach, 2024. ● F. Kereki, Data Structures and Algorithms in JavaScript: A Modern Guide Integrating Advanced JavaScript Features with Algorithm Optimization Techniques, 2025. ● M. Blondel and V. Roulet, "The elements of differentiable programming," *arXiv preprint arXiv:2403.14606*, 2024. ● Hemant Jain, Problems Solving in Data Structures and Algorithms Using C++: A practical approach to competitive programming. BPB Publications, Oct. 28, 2024. ISBN: 978-9365890389. [Online]. Available: https://portal.igpublish.com/iglibrary/obj/BPB0000690?searchid=1755045080260KXc3dzhhit7AWe71~v0AR ● M. Makrehchi, Efficient Algorithm Design: Unlock the power of algorithms to optimize computer programming. Packt Publishing, Oct. 2024. ISBN: 9781835886823. [Online]. Available: https://portal.igpublish.com/iglibrary/obj/PACKT0007631?searchid=1755045139630D5Ln84ABgPRhpQKmHQzYN