Digital Image Processing

Module name	Digital Image Processing	
Module level	Undergraduate	
Code	IF221126	
Courses (if applicable)	Digital Image Processing	
Semester	7	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Achmad Junaidi, S.Kom, M.Kom Wahyu Syaifullah J S, S.kom, M.Kom Hendra Maulana, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 7th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, collaboration, cooperative learning, case-study, project-based learning, problem-based learning	
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 learn the concepts and techniques of Image Processing, which include Image Acquisition, Image Histogram, Pixel and Geometry Operation, Binary Image Operation, Colored Image Processing, Image Enhancement, Image Morphology, Image Segmentation, Image Characteristic Extraction, Image Restoration, Image Compression, and case studies illustrating the implementation of image processing to solve real-world problems. The course will be conducted through case studies, group discussions, and project-based learning. Students are expected to undertake projects aimed at providing solutions to everyday problems.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand basic concepts of image processing and math operation in implementing image processing algorithm	PLO2,PLO54, PLO6, PLO7, PLO10
	CO2 Students are able to implement and build every steps of image processing method either theoretically and practically by programming.	PLO2,PLO54, PLO6, PLO7, PLO10
	CO3 Students are able to solve problems about image processing by implementing image processing techniques and methods, either by theory or practice.	PLO2,PLO54, PLO6, PLO7, PLO10

Content	Basics and Concepts of Image Processing; Image Acquisition, Image Histogram, Pixel and Geometry Operations, Binary Image Processing, Colored Image Processing, Image Enhancement, Image Morphology, Image Segmentation, Image Characteristics Extraction, Image Restoration, Image Compression, Image Processing Methods Implementations, and performance evaluations of image processing methods by Programming Language.
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	● Z. M. Jehangiri, M. Shahzad, and U. Khan, Eds., Digital Image Processing: Advanced Technologies and Applications, 2024. ● J. G. Liu and P. J. Mason, Image Processing and GIS for Remote Sensing, 2nd ed., 2024. ● A. Garnung Menéndez, Physics Meets Pixels: PDE Models in Image Processing, 2024. ● W. Hsieh, Z. Bi, J. Liu, B. Peng, and H. Zhang, Deep Learning, Machine Learning – Digital Signal and Image Processing: From Theory to Application, 2024. ● M. Kashyap, Digital Image Processing Using Python: A comprehensive guide to the fundamentals of digital image processing. BPB Publications, Jan. 28, 2025. ISBN: 978-9365898910. [Online]. Available: https://portal.igpublish.com/iglibrary/obj/BPB0000731?searchid=1755045339546uOr27whkD5KODLO5UO0Z5 ● S. M. Ahmed, Image Processing Masterclass with Python: 50+ solutions and techniques solving complex digital image processing challenges using Numpy, Scipy, Pytorch and Keras. Packt Publishing, 2023. ISBN: 9781804612845. [Online]. Available: https://portal.igpublish.com/iglibrary/obj/BPB0000204?searchid=1755045476554zt3y2tDYT_hj_l45qrCKv