

**Arab Academy for Science and Technology and Maritime Transport  
Computer Science Curriculum  
Course Syllabus**

<b>Course Code:</b> CS455	<b>Course Title:</b> Digital Image Processing	<b>Classification:</b> E	<b>Coordinator's Name:</b> Prof. Dr. Khaled Mahar <b>Lecturer's name:</b> Prof. Dr. Khaled Mahar	<b>Credit Hours:</b> 3
------------------------------	--------------------------------------------------	-----------------------------	-----------------------------------------------------------------------------------------------------	---------------------------

<b>Pre-requisites:</b> <input type="checkbox"/> CS212 (Data Structures and Algorithms) <input type="checkbox"/> BA201 (Calculus III)	<b>Co-requisites:</b> None	<b>Schedule:</b> Lecture: 2 hours Tutorial-Lab: 2 hours
--------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------	---------------------------------------------------------------

**Office Hours: (Room 405)**  
Thursday 10:30 a.m. -12:30 p.m.

**Course Description:**

This course emphasizes general principles of image processing, rather than specific applications. It covers topics such as image sampling and quantization, color, point operations, segmentation, morphological image processing, linear image filtering and correlation, image transforms, eigenimages, multiresolution image processing, wavelets, noise reduction and restoration, feature extraction and recognition tasks, and image registration.

**Textbook:**

Rafael C. Gonzalez , Richard E. Woods, *Digital Image Processing*, Pearson.

**References:**

- Rafael Gonzalez, Richard Woods, and Steven Eddins, *Digital Image Processing using Matlab*, Gatermark Publishing.
- Chris Solomon & Toby Breckon, *Fundamentals of Digital Image Processing: A Practical Approach*, Wiley.

<b>Course Objective/Course Learning Outcome:</b>	<b>Contribution to Program Student Outcomes:</b>
<p>1. Understand image processing, computer imaging systems, resolution concerns, and image formats.</p>	<p>(SO 6) Apply computer science theory and software development fundamentals to produce computing-based solutions.</p>
<p>2. Illustrate image digitization, image properties, and noise in images.</p>	
<p>3. Realize image pre-processing enhancements: pixel brightness transformation, geometric transformations, and local filtering using masks.</p>	
<p>4. Apply image segmentation: threshold based, edge-based, region based, and matching.</p>	
<p>5. Understand shape representation and description.</p>	
<p>6. Apply mathematical morphology</p>	
<p>7. Introduce classification and recognition in image analysis</p>	
<p>8. Implement a computer program on Matlab or Python to for an image analysis application</p>	<p>(SO 2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. (SO 5) Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.</p>
<p>9. Present a framework for an image analysis application pipeline</p>	<p>(SO 3) Communicate effectively in a variety of professional contexts.</p>

**Course Outline:**

1. Introduction to DIP
2. Image Histogramming
3. Image enhancement using transformations
4. Spatial Filtering
5. Morphological image processing
6. Morphological image processing
7. 7<sup>th</sup> week exam
8. Image segmentation

9. Image segmentation
10. Feature extraction
11. Feature extraction & Classification
12. 12<sup>th</sup> week exam
13. Recognition tasks
14. Students' presentation
15. Revision
16. Final Exam

**Grade Distribution:****7th Week Assessment (30%):**

Exam (30%)

**12th Week Assessment (20%):**

DIP project (20%)

**Year Work (10%):**

Homework Assignments (10%)

**Final Exam (40%)****Policies:****Attendance:**

AASTMT Education and Study Regulations (available at [aast.edu](http://aast.edu))

**Academic Honesty:**

AASTMT Education and Study Regulations (available at [aast.edu](http://aast.edu))

**Late Submission:**

*Late submissions are graded out of 75% (1 week late), 50% (2 weeks late), 25% (3 weeks late), 0% (more than 3 weeks late)*