



Department of Computer Science and Information Technology

College of Science

University of Salahaddin

Subject: Image Processing

Course Book: M.Sc. Computer Science

Lecturer: Dr. Taban Fouad Majeed

Academic Year: 2023/2024

Course Book

1. Course name	Advanced Image Processing
2. Lecturer in charge	Dr. Taban Fouad Majeed
3. Department/ College	Computer Science and Information Technology / Collage of Science
4. Contact	e-mail: taban.majeed@su.edu.krd
5. Time (in hours) per week	Theory: 3
6. Office hours	
7. Course code	
8. Teacher's academic profile	<p>Taban F. Majeed From Erbil-Iraq, I finished my study in Erbil. I received the B.Sc. in computer science from the University of Salahaddin/ Erbil/ Iraq in 2003 and M.Sc. degrees in computer science from the University of Koya/ Koya/ Erbil/ Iraq in 2007. I got my Ph.D. degree in applied computing department at the University of Buckingham/ Buckingham/ UK in 2016. My research interests (medical Image Analysis, Breast cancer detection and Mammogram analysis).</p> <p>Dr. Taban can teach several courses like Data Structure, Logic, Probability and Statistics, Numerical Analysis, Data Security, Image Processing, Computer Application, Computer Networking, Data Communication, and Computer Graphics.</p> <p>For More info please see the following webpage: https://academics.su.edu.krd/taban.majeed</p>

9. Keywords	Image Enhancement, Image segmentation, Image detection and Classification.
<p>10. Course overview:</p> <ul style="list-style-type: none"> • Digital imaging has become a major tool in various information systems with applications ranging from medical imagery to remote sensing and person's identification. Since 1964 the advent of large - scale digital computers and the space program have made digital image processing one of the most rapidly growing fields in computer Science. • Now image processing has found much more wide applications in the areas such as medicine, biology, industrial automation, astronomy, law enforcement, defence, and intelligence. • The main aim of this course is to study basic concepts of image processing, Image analysis, and image enhancement. Visual information plays an important role in almost all areas of our life. Today, much of this information is represented and processed digitally. Digital image processing is ubiquitous, with applications ranging from television to tomography, from photography to printing, from robotics to remote sensing. • I expect to cover topics such as image acquisition and display, properties of the human visual system, colour representations, sampling and quantization, point operations, linear image filtering and correlation, transforms and nonlinear filtering, contrast and colour enhancement, dithering, image restoration, image registration, and simple feature extraction and recognition techniques. As a result, it is normal that efforts should be made to include some of the human visual system properties in the encoding schemes to achieve even further compression with less noticeable reductions. 	

11. Course objective:

Upon completing the course, the student will be able to: Multimedia & Digital Image Processing

1. Understand the beginnings imaging processing systems and applications.
2. Identify fundamental components of an image processing system
3. Understand how spatial and grey-level resolutions are related to visual image quality.
4. Describe basic intensity transformations.
5. The student will learn some point-based as well as filter-based image manipulation both in the spatial and frequency domain.
7. Understand the Segmentation of an image. To subdivide images into its components depending on the type of shapes and objects searched for in the image.

12. Student's obligation

While in the classroom, students should behave in a manner that is neither distracting to nor disrespectful to the professor or other students. Cell phones should be turned off. Preparing and sending the assignments and HomeWorks at the right time specified by the lecturer. Regularly check the email.

13. Forms of teaching

In the beginning give the students theory lecture by using data show. However, additional materials may offer during the presentation of the course. Methods of teaching inside the class by using the data show to explaining diagrams or flowcharts and for analyzing, programming algorithms base on the whiteboard.

14. Assessment scheme

- Mid exam 20%
- Activates 30 % = (Assignment + Quizzes+ Seminars + Reports)
- Final exam 50 %

15. Student learning outcome

On successful completion of the module students should be able to demonstrate:

- 1- The understanding of the mathematical analysis of different image processing techniques.
- 2- The ability to analysis different methods to improve the quality of an image and image restoration.
- 3- The ability to recognize different ways to extract information and features from digital images.
- 4- The ability of understanding various techniques used in image compression.
- 5- The understanding of basic concepts of Colour images and related processing techniques.
- 6- To understand the techniques used for pattern recognition and computer vision.

16. Course Reading List and References

• Required Texts:

Gonzalez, Rafael C.; Woods, Richard E., "Digital Image Processing", Pearson Education (US), 4th edition, 2018.

• Recommended Texts:

Petrou, Maria; Petrou, Costas, "Image Processing: The Fundamentals", Wiley-Blackwell, 2nd edition, 2010.

• Other Resources:

Instructor hand-outs and reading material.

17. Course Outline of Topics\Expected Time Frame (14 weeks)

Week(s)	Basic Tutorial Subject to be covered
1-2	Fundamental principles of image processing
3-4	Image Enhancement and spatial Filtering
5	Filtering in the Frequency Domain
6	Colour Fundamental and Colour Image Processing
7	Image Restoration and Reconstruction, Noise Models and Inverse Filtering
8	First Mid Exam
9	Image Compression
10	Wavelet and Multiresolution Processing: Image Pyramid, subband coding, the Haar Transformation.
11-12	Image Description and pattern recognition using ANN and CNN
13	Revision
14&15	Final Exam

19- Practical Topics (If there is any)

The program code is required for all up mentioned theoretical topics.

20. Examinations**21. Extra notes:****22. Peer review**