

# *In the name of Allah*

40-823+ Advanced Digital Image Processing

## *Course Syllabus*

**Term:**

Fall 1385 (2006)

**Instructor:**

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**Lecture:**

Sundays & Tuesdays, 13:30-15:00, Room Kh. 7..

**Website:**

The course website can be found at:

<http://ce.sharif.edu/courses/85-86/1/ce823/>

Please check this site often for important *announcements*, files needed for computer exercises, and the PDF versions of *handouts & homework*.

**Course Description:**

40-823 + provides an insight to advanced image processing theory and techniques.

Topics include: 2-D system theory, 2-D random processing, image transforms with particular emphasis on wavelet transform, advanced image enhancement, advanced image filtering and restoration, advanced image analysis, image/video compression, biometric techniques, advanced motion estimation, content-based image retrieval, and image/video watermarking.

**Prerequisites:**

40-763 (Digital Signal Processing) or 40-933 (Digital Image Processing).

**Credit:**

3 units.

**Text Book:**

*Fundamentals of Digital Image Processing*, by Anil K. Jain, Prentice Hall, 1989, ISBN: 0013-336165-9.

Additional topics will be included (e.g. video compression standards, wavelet transform, ...).

**Reference Books:**

- 1: *Computer Imaging: Digital Image Analysis and Processing*, by Scott E. Umbaugh, CRC Press, 2005, ISBN: 0-8493-2919-1.
- 2: *A Study Guide for Digital Image Processing*, by Mark J. T. Smith and Alen Docef, Scientific Publishers, 1999.
- 3: *Digital Image Processing*, by Rafael C. Gonzalez & Richard E. Woods, Addison-Wesley, 2<sup>nd</sup> edition, 2002, ISBN: 0201180758.
- 4: *Digital Image Processing using Matlab*, by Rafael C. Gonzalez, Richard E. Woods, & Steve L. Eddins, Prentice-Hall, 1<sup>st</sup> edition, 2003, ISBN: 0130085197.
- 5: *Digital Image Processing*, by William K. Pratt, John Wiley & Sons Inc., 3<sup>rd</sup> edition, 2001.
- 6: *Algorithms for Image Processing and Computer Vision*, by J.R. Parker, John Wiley & Sons, 1996, ISBN: 0471140562.
- 7: *Multidimensional Digital Signal Processing*, by Dan E. Dudgeon & Russel M. Mersereau, Prentice-Hall, 1984.
- 8: *Two-Dimensional Signal & Image Processing*, by J. S. Lim, Prentice-Hall, 1990.
- 9: *Two-Dimensional Imaging*, by Ronald N. Bracewell, Prentice-Hall, 1995.
- 10: *Computer & Robot Vision*, by Robert M. Haralick & Linda G. Shapiro, Addison-Wesley, 1993.
- 11: *Computer Vision*, by Dana H. Ballard & Christopher M. Brown, Prentice-Hall, 1982.
- 12: *Handbook of Pattern Recognition & Image Processing*, by Tzay Y. Young & King-Sun Fu, Academic Press, 1986.
- 13: *Video Processing & Communications*, by Yao Wang, Jom Ostermann, & Ya-Oin Zhang. Prentice Hall, 1<sup>st</sup> edition, 2001, ISBN: 0130175471. [SUT: TK 5105 .2 .W36 2001]
- 14: *Digital Video Processing*, by A. Murat Tekalp, Prentice Hall, 1995, ISBN: 0-13-190075-7.
- 15: *Image and Video Compression for Multimedia Engineering: Fundamentals, Algorithms, and Standards*, by Yun Q. Shi & Huifang Sun. CRC Press, 2000, ISBN: 0-8493-3491-8. (QA 76 .575 .S555 1999 C.2)
- 16: *A Wavelet Tour on Signal Processing*, by Stephane Mallat, Academic Press, 2<sup>nd</sup> edition, 1999, ISBN: 0-12-466606-X.
- 17: *Wavelets and Subband Coding*, by Martine Vetterli & Jelena Kovacevic, Prentice Hall, 1995, ISBN: 0-13-097080-8.
- 18: *Probability, Random Variables, & Random Signal Principles*, by Peyton Z. Peebles, JR., McGraw-Hill, 3<sup>rd</sup> edition, 1993, ISBN:0-07-112782-8.
- 19: *Probability, Random Variables, & Stochastic Processes*, by Athanasios Papoulis, McGraw-Hill, 1991 (QA 273 .P2 1991).

**Written Homework Problems:**

Written homework problems will be assigned by the end of each chapter.

**Computer Exercises:**

Computer assignments will also be assigned over the course. They can be provided either in Matlab or C Languages.

**Course Project:**

There will be a course project, which can be proposed by the student. Students are supposed to present the final result, associated with related software & technical report.

**Exams:**

There will be one midterm and one final exam.

**Grading Policy:**

Written & computer assignments: 3 Points

Project: 3 Points

Project report: 1 Points

Project presentaion: 1 Points  
Midterm exam: 3 Points (hold at: *1385.8.30*)  
Final exam: 9 Points (hold at: *1385.10.20, 14:30*)  
Submitted paper: 2 Extra Points

**Project Topic Confirmation Due:**

Final exam day (not confirmed course projects are not acceptable).

**Instructor Office Hour:**

Sundays, 17:00-18:00, Room 307, CE, SUT.

**Teaching Assistants:**

Ms. M. Hassanzadeh and Mr. A.A. darabi

**Course E-Mail Address:**

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