Goal:
To learn and practice key methods and theories in modern digital image processing.

Catalog course description:
Fundamentals of 2D signals and systems. Introduction to multidimensional signal processing. Applications in digital image processing. Image formation, representation and display. Linear and nonlinear operators in multiple dimensions. Orthogonal transforms representation and display. Image analysis, enhancement, restoration and coding. Students will carry out image processing projects.

Prerequisites:
Knowledge in elementary linear systems, transforms, and probability and stochastic processes.

Instructor:
Professor Majeed M. Hayat,
Office: ECE Building, Room 323B; Tel: 277-0297;
E-mail: hayat@ece.unm.edu; Web: www.ece.unm.edu/faculty/hayat/main.htm

Classroom & time
Building: ECE, Room: 310; TR: 5:30–6:45PM

Office hours
T, W: 11:00–12:00.

Textbook and web utility:

Students are expected to visit the course website (which can be linked to from Prof. Hayat’s website, see above for the url address) frequently for announcements, handouts, assignments, and solutions.

Key topics:
1. Introductory and motivating examples and demonstrations.
2. Signals and systems in two dimensions.
3. Practicing image acquisition, formation and display (in Mid-infrared Imaging Characterization and Application [MICA] Lab at CHTM).
4. Image sampling and quantization with application to focal-plane arrays.
5. Transforms in two-dimensions.
6. Some examples of visual perception.
7. Methods for image enhancement: point processing, spatial processing, histogram equalization, frequency domain methods.
9. Sub-sampling and interpolation schemes.
11. Video-sequence processing for resolution enhancement (microscanning).
13. Image segmentation for grayscale, color and spectral imagery.
15. Image representation using principal components.
16. Introduction to wavelets and multiresolution analysis (time permitting).

Computer usage:
Assignments require the use of Matlab including the signal-processing and image-processing toolboxes.

Course requirements
- 40% Homework assignments & projects.
- 25% One in-class midterm examination.
- 35% Final examination.

Tentative grading policy
90 or above: A
75–89: B
60–74: C
59 or below: F

References
Each chapter of the text has an excellent list of relevant references.

Additional reading materials (notes and journal articles) will be distributed/posted during the course; students are required to study these.
Academic honesty

All students are expected to demonstrate personal integrity. Although discussions and interaction among students regarding homework assignments are strongly encouraged, each student must show his/her individual effort. Exchange of information during in-class or take-home examinations as well as copying homework/project solutions from each other is strictly prohibited. Students exhibiting any form of academic dishonesty will be subject to penalties in accordance with UNM policies.