

## Image Processing

Example outcomes gained by taking this track would include joining groups that design imaging systems and algorithms and utilize them in areas including digital cameras, scanners, printers and displays, image processing remote sensing, and multimedia systems. Employers include Microsoft, Google, Hewlett-Packard, Kodak, Xerox, Canon, Sony, and many others. While there are many possible tracks to this area, the fundamental courses include:

- ECE 514 Random Processes (F)
- ECE 513 Digital Signal Processing (F)
- ECE 592-009/558 Digital Imaging Systems(F)
- ECE 763 Computer Vision (S)
- ECE 542 Neural Networks (S)

The following advanced offerings are used to allow a concentration within this area,

- ECE 751 Estimation Detection Theory (SO)
  - ECE 759 Pattern Recognition (SE)
  - ECE 764 Digital Image Processing (?)
  - ECE 752 Information Theory (S)
- (F)-Fall semester, (S)- spring semester, (SE)- spring semester, even years, (SO)- spring semester, odd years.

For students interested in further studies in the area and preparation for a career in research, cross-disciplinary knowledge is essential (math, physics, computer science, biology, etc.). One could cover that background by outside EE courses (required minor). These courses include and are not limited to:

- CS 520 Artificial Intelligence I
- CS 562 Computer Graphics
- CS 565 Graph Theory
- CS 580 Numerical Analysis 1
- CS 720 Artificial Intelligence 2
- CS 780 Numerical Analysis 2
- MA 501 Advanced Mathematics for Engineers and Scientists I
- MA 502 Advanced Mathematics for Engineers and Scientists II
- MA 505 Linear Programming
- MA 511 Advanced Calculus I
- MA 512 Advanced Calculus II
- MA 515 Analysis I
- MA 518 A first Course in Differential Geometry\*\*
- MA 520 Linear Algebra
- MA 523 Linear Transformations and Matrix Theory\*\*
- MA 555 Introduction to Manifold Theory\*\*
- MA 706 Nonlinear Programming
- MA 711 Analytic Function Theory I
- MA 712 Analytic Function Theory II
- MA (OR) 719 Vector Space Methods in System Optimization\*\*
- MA 723 Theory of Matrices and Applications
- MA 784 Nonlinear Equations and Unconstrained Optimization
- CS 761 Advanced Topics in Computer Graphics
- MAE522 Non Linear System Analysis and Control
- MAE721 Robust Control with Convex Methods

\*\* recommended for PHD study

In addition to courses that are directly related to signal and image processing, numerous EE courses can provide further breadth and depth as typically required by a Ph.D. program. These include:

- ECE556 Mechatronics
- ECE555 Robotics
- ECE 570 Computer Networks
- ECE 575 Introduction to Wireless Networking
- ECE 582 Wireless Communication Systems
- ECE756 Advanced Mecharonics
- ECE755 Advanced robotics

### Sample MS Plan of Work

The following plans of work are suggestions only. (Please note that the actual courses taught are constantly changing, and these might be out of date.) Feel free to seek additional advice or to structure your own curricula. Note also that these examples assume that you are a full time student taking 10 courses over three semesters. You might choose to not overload in Spring, but take one last course in Fall after this.

Image Processing					
Fall		Spring		Fall	
ECE513	SP&CI	ECE763	SP&CI	ECE582	Comm
ECE514	None	ECE751(odd) ECE759(even)	SP&CI	ECE556	CRM
ECE558	SP&CI	ECE570	NET	Elective	
		ECE542	SP&CI		

Electives are chosen from the lists of related courses. Note the requirement for 21 hours of ECE courses and two 700 level courses in the MS plan.

### Associated Faculty

**W. E. Alexander, D. Baron, A. H. Krim, W. E. Snyder, H. J. Trussell**