Objective: To discuss the different approaches for 3D depth estimation (third dimension z) using 2D images (f(x,y)) and solve the ill-posed problem.

Brief Topics:
Brief ideas on image processing,
Geometric transformation (Affine, Projective),
Camera Models: Pin hole Camera model, Real Aperture Camera,
Brightness Transformation, BRDF (bidirectional reflection distribution function), Reflectance map,
Shape from shading, Basic ideas of Calculus of Variation, Photometric stereo,
Shape from stereo (stereopsis), correspondence problem, Ideas on estimation techniques LS (least squares), CLS (constrained least squares), TLS (total least squares), LMed (least median) etc.

Motion Field and Optical flow,
Concepts of MRF (Markov random fields),
Depth from focus (real aperture camera),
depth from defocus (real aperture camera),
super-resolution imaging,
If time permits: Principal Component Analysis (PCA), Singular Value Decomposition

Outcome: The concepts help the graduate students to understand the basic concepts in computer vision (how the computer can be used to perform the tasks of human vision system). Through lectures, programming assignments and presentations the students are provided with the learning experience of

1. Analysis of images for extracting the 3D coordinates of the object
2. Develop technical presentation skills
3. Solving the problems that are of ill-posed nature.

Text Books:
1. Robot Vision by BKP Horn, MIT Press
2. Introductory Techniques for 3-D Computer Vision by Trucco and Veri, Prentice Hall
Proposed Evaluation Strategy:
Midsemester: 30%
Surprise tests: 10%
Paper Presentatation: 10%
Assignments: 10%
Endsemester Exam: 40%