- **Objectives**

The objective of my part of the course is to introduce three-dimensional shape/space processing in human or machines. The course will examine 3D vision from mainly the computational aspects. It will cover both theoretical aspect as well as the practical implementation of solutions to problems encountered in shape recovery. Concepts underpinning modern vision such as Marr's paradigm would also be touched on.

- **Pre-requisites:** EE3206 "Introduction to Computer Vision and Image Processing" or equivalent. This course also requires a solid background in linear algebra. Familiarity with Matlab is recommended . If you have never used it before, it only takes a couple of weeks to learn.

- **Subject description** **Hours**

Introduction 4
Introduction to computer vision and its applications. Marr's paradigm. Shape from X. Depth perception. Geometrical modeling of cameras. Mathematical tools and terminology. Projective geometry.

Stereopsis 4
Correspondence. Geometry of stereo imaging. The concept of Fundamental matrix and Essential matrix. Structure from stereo.

Motion 4
Optical flow. Correspondence. Reconstruction from image streams. Factorization methods.

- **Assessment**

Assessment to be based on final examination (allow to bring in one A-4 sheet) and continuous assignment (about 40%).

- **Textbooks** (for my part):

E. Trucco and A.Verri. Introductory techniques for 3-D Computer Vision. Prentice Hall, 1998.
*Yi Ma, J. Kosecka, S. Soatto and S. Sastry. An Invitation to 3-D Vision: From Images to Models. Springer-Verlag, 2003.
*R. Hartley and A. Zisserman. Multiple View Geometry in computer vision. Cambridge University Press 2000.
+ Richard Szeliski. Computer Vision: Algorithms and Applications. 2010. Access from NUS e-book platform:
http://springerlink.metapress.com/app/home/search-citations.asp?wasp=8dfq3mltvk5xqpplequy
* Expensive but more comprehensive coverage. Recommended for students interested in doing vision research.
+ Excellent graduate-level coverage with many application examples.

^ Gary Bradski, Adrian Kaehler. Learning OpenCV: Computer Vision with the OpenCV Library. 2008.
^ This book would be most useful to someone who already has a fundamental understanding of computer vision and image processing and wants to see how the open source OpenCV will make their programming tasks easier.

- **Supplementary textbooks and journals:**

B.K.P. Horn. Robot Vision. MIT Press, 1986.
O.D.Faugeras. Three-Dimensional Computer Vision. MIT Press, 1993.
A.M. Tekalp. Digital Video Processing. Prentice Hall. 1997.

- **Textbook on Linear Algebra:**

Introduction to linear algebra. Gilbert Strang. Wellesley-Cambridge Press, 1998.
Elementary Linear Algebra. W. Keith Nicholson. McGraw-Hill.