

COURSE CONTENT

- Academic Year : 2013/2014, Semester I.
- Course Code & Title : (for undergraduates) MTH418/MH4711
Mathematical modelling in imaging, vision and graphics.
or
(for graduates) MAS 726 Topics in Scientific Computation II.
- Pre-requisites : MTH211 / MH2100 - Calculus III,
MAS311 / MTH311 / MH3100 - Real Analysis I.
Numerical analysis and PDEs are recommended.
If you do not satisfy these pre-requisites but wish to take
please seek permission from the lecturer.

Lecturer

Prof Alfred M. Bruckstein

Scheduling of the course

The lecturer is only visiting NTU during the first 8 weeks of semester, so the lectures will only be for weeks 1 through 8, but during these weeks there will be 5 hours of lectures a week and 1 hour of tutorial. The final exam will be held during the usual exam period.

Timetable

During Weeks 1-8:

- Lectures on Tuesdays 1330-1530 in Tr+15
- Lectures on Wednesdays 1530-1730 in Tr+15
- Lectures on Thursdays 1130-1230 in Tr+2
- Tutorial on Fridays 1130-1230 in Tr+5

This course is suggested for:

Any student interested in Image Processing, Image Analysis, Computer Vision and Graphics Applications. We shall study a bit of Differential Geometry, Calculus of Variation, Vector Fields, and address problems like Shape from Shading, Photometric Stereo, Stereo Vision, Image, Curve and Surface Smoothing, Denoising and Deblurring, Curve Completion and Image Inpainting.

Learning Objective:

To understand the mathematical tools used in developing algorithms for Image Processing and Analysis, Shape Description, Analysis, and Design.

Content

Functions, Curves and Surfaces.
Elements of Differential Geometry.
Vector Fields.
Calculus of Variations.
Level sets.
Applications.

Textbooks/References

Lecture Notes by A. Bruckstein.

References: Kimmel Ron: Numerical Geometry of Images, Springer.
Sapiro Guillermo: Geometric PDE's and Image Analysis, Cambridge.