

**JRL301 Robotics Technology
I Sem (Autumn) 2017-18**

Instructors: S. K. Saha, Kolin Paul, I. N. Kar, Sumantra Dutta Roy

Rough Distribution of Topics:

S. K. Saha: Dynamics and Design

Kolin Paul: Systems, Embedded Systems

I. N. Kar: Control

Sumantra Dutta Roy: Vision and Image Analysis

Marks distribution:

Minor I: 15, Minor 2: 15, Major: 35, Assignments: 10, Project: 25

Regular Class Schedule: Tue, Thu 07:00pm-08:30 pm, SIT Seminar Room

Venue: SIT Seminar Hall (most lectures)

Attendance Policy: <75%: one grade less, <50%: nomarks in projects/assignments

Schedule Summary

Class#	Date, time	Duration	Venue	Instructor	Topic
1	01 Aug (Tue), 07:00pm-08:30pm	1.5	SIT Seminar Room	SKS	Introduction to Robotics
2	03 Aug (Thu), 07:00pm-08:30pm	1.5	SIT Seminar Room	SDR	Introduction to Geometry, Cameras Basic hierarchy of linear transformations: Euclidean/Simila rity/Affine/Project ive. Motivation for projective representations: better representation of infinity.
3	08 Aug (Tue), 07:00pm-08:30pm	1.5	SIT Seminar Room	SKS	Orientation Representations
4	10 Aug (Thu), 07:00pm-08:30pm	1.5	SIT Seminar Room	SDR	Motivation for projective representations: getting a most general 8-parameter

					<p>linear transformation representation. A projective transformation subsumes all other linear transformations. Introduction and outline of the rest of the course: Affine transforms, Projective transforms and their practical applications. Camera models, Calibration.</p>
5	17 Aug (Thu), 07:00pm-08:30pm	1.5	SIT Seminar Room	SDR	The 'Physics' and 'Maths' of Image Formation: Radiosity and Projective Models.
6	22 Aug (Tue) 07:00pm-08:30pm	1.5	SIT Seminar Room	SKS	Homogeneous Transformation and Rob
7	24 Aug (Thu), 07:00pm-08:30pm	1.5	SIT Seminar Room	SDR	Affine Transformation details, and properties
---	26 Aug (Sat)	---	---	---	No class
8					
9					
10					
11					
12					

Examinations:

Minor I: (to be announced)

Some Course-Related Announcements:

Shraddha Chaudhary will help you out with OpenCV, and handling images. Please watch this space for an announcement regarding the date/time:

Link with contact information: [\[link\]](#)

Attendance Records: [\[link\]](#)

Marks: [\[link\]](#)

Anonymous Course Feedback: [\[link\]](#)

Links to some reference material:

SK Saha: <http://www.sksaha.com/courses/jrl301>

Vision:

Please brush up your C programming: you will need this for the Vision and Embedded parts.

[Assignment #0: Reading and Writing Images \[for practice\]](#)

You will use the [OpenCV](#) library for handling images, not your own routines, as above: this is an open-source library, which you can compile on your favourite OS. You can also use pre-compiled binaries available at the OpenCV site.

Shraddha Chaudhary will have a tutorial session on OpenCV: installation (e.g., on a Windows machine), and programming using OpenCV. [Date: 16 Aug (Wed), 1-3pm PAR Lab]

[Assignment #1: Camera Calibration and Structure Computation](#)

Some local resources: [\[IITD Internal link\]](#)

Link for Tsai's calibration algorithm: Reg Willson's code [\[IITD Internal link\]](#)

Notes for the eigen-optimisation to get the camera matrix, and notes to get the 3-D structure from two calibrated cameras [\[IITD Internal link\]](#)

The main topics in the Vision and Image Analysis portion:

Introduction to Geometry, Cameras

Camera Models & Calibration: estimation of M , parameters from M

Stereo

