

BIRLA INSTITUTE OF SCIENCE AND TECHNOLOGY PILANI
INSTRUCTION DIVISION)
SECOND SEMESTER 2015-2016
Course Handout – II

Date: 12/01/2016

In addition to part-I (general handout appended to the time table) this portion gives further specific details regarding the course.

Course No. : BITS F441
Course title : ROBOTICS
Instruction-in-charge : B. K. ROUT

1. Scope and Objective of the course

Robotics is an interdisciplinary area ranging from mechanical & electrical component design to advanced sensor technology, incorporating computer systems and Artificial Intelligence (AI). With advances in AI-techniques & computational power in recent years, it has become one of the most interesting areas for multidisciplinary research, with lots of commercial applications already in market.

The included subject matter, aims at developing thorough understanding of Robotics & its applications in a unified and coherent manner; preparing students of engineering discipline for industries' requirements and applied research in the field. It will also make students capable of handling robot manipulator tasks in real, as well as in simulation environment.

2. Text Book:

T1. Mittal, R.K. and Nagrath, I.J., *Robotic and Control*, Tata McGraw Hill, New Delhi, 2003.

Reference Books:

- a) Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., *Robotics Control, Sensing, Vision and Intelligence*, McGraw Hill, 1988.
- b) Craig, J.J., *Introduction to Robotics: Mechanism & Control*. Addison Wesley, 1986.
- c) Paul, R.P., *Robot Manipulator: Mathematics Programming & Control*. MIT Press, 1981.
- d) Groover, M.P., *Industrial Robotics Technology, programming & Application*, McGraw Hill, 1986
- e) Siegwart, R. , Nourbakhsh, I.R. , Scaramuzza, D., *Introduction To Autonomous Mobile Robots*, 2nd Edition, PHI, New Delhi

3. Journals to be Referred:

- a) IEEE Trans. Robotics & Automation.
- b) IEEE Trans. System Man & Cybernetics
- c) IEEE Trans. Automatic Control
- d) International Journal of Robotics Research
- e) ASME Trans. on Dynamics Measurement & Control.
- f) ASME Trans. on Mechanical Design
- g) ROBOTICA
- h) Robotics and computer Integrated Manufacturing

4. Course Plan

Topic	Lectures	Text Book Chapter reference
1. Introduction	1	Chapter 1
2. Transformation	4	Chapter 2
3. Forward Kinematics	3	Chapter 3
4. Inverse Kinematics	2	Chapter 4
5. Jacobian	5	Chapter 5
6. Dynamics	4	Chapter 6
7. Trajectory Planning	3	Chapter 7
9. Sensors & Actuators	2	Chapter 6 (Ref. Book : Fu, Lee)
8. Robot Manipulator Control Path planning	6	Chapter 10 (Ref. Book : Fu, Lee) Chapter 5 (Ref. Book : Fu, Lee)
11. Artificial Intelligence Techniques for robotics application	2	Class Note
12. Mobile Robotics (Kinematics and Dynamics) & Navigation	4	TEACH your Instructor
13. Laboratory Classes (CRIS)	5	MATLAB Assignment/ Robotics Tool Box/ Articulated Arm/ Stepper and DC Servo motor Interfacing/ Sensor Interfacing (Ultra sonic and IR sensors)/ MATLAB Simulink Control System Toolbox/ABB 1410, Industrial Manipulator
Total Lecture Hours	41	

a. Evaluation Scheme

Component	Duration	Weight age (%)	Date	Remarks
MIDSEMESTER	min	35	14/3 9:00 - 10:30 AM	CB
Comprehensive	min	45	13/5 FN	Partial OB
Quiz/Assignment/ Seminar/Report/Pr esentation, Software & Lab Assgn (OTHERS).	**	20	Will be announced in the class	TAKE HOME or CLASS ASSIGNM ENT

**** (Unstructured) Submission dates will be announced in the class.**

b. Chamber Consultation Hours, will be announced in the class

c. Notices

All notices regarding the course will be put up on **Mechanical Engineering Group** Notice board.

Instructor-in-Charge
BITS F441