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<b>DEPARTMENT</b>	Centre for Mechatronics
<b>INSTITUTE</b>	IIT Kanpur
<b>COURSE OUTLINE</b>	<p>Introduction to Robotics: degrees of freedom (dof), Links, joints and type of Robots based on the physical structure, concepts of Jacobean;</p> <p>Singularity and workspace of manipulators, Work Volume estimation;</p> <p>Transformations, rotation and translation transformations, representation of rigid body motion, and development of the basis of D-H parameters useful in frame transformations needed in kinematics;</p> <p>Forward &amp; Inverse Kinematics;</p> <p>Sensors used for internal and external sensing for close loop control of robots;</p> <p>Actuation and various types of actuators;</p> <p>PD, PID control systems;</p> <p>Robot dynamics;</p> <p>Motion planning in 2D;</p> <p>VAL-II robot programming language, particularly of PUMA 560 industrial robot;</p> <p>Micro controller architecture and programming;</p> <p>Advanced Robotics Topics: biped, mobile manipulators, aerial, underwater, etc;</p> <p>Experiments: 8;</p> <p>Basic Electronics: Experiments Digital and Analog gates, MSI and LSI IC's, Counters, Flip Flops ADC, DAC, etc;</p> <p>Mechanisms: joints, links, types of manipulators;</p> <p>Microcontroller Programming – interfacing sensors, actuators (input/output), and control;</p> <p>Sensors: pressure, encoder and IR and US sensors, their Installation and programming, National Instrument's myDAQ data acquisition hardware and sensor interface;</p> <p>Actuators: Servo, DC, DC servo and Steppermotor control (manual, microcontroller based and motion control card based control using LabVIEW platform);</p> <p>Study and building: Mobile robots, educational robot ;</p> <p>Study and building of Arm Robot;</p> <p>PUMA Robot: Industrial robot PUMA, its architecture, demo and</p>

		programming using VAL-II language and teach pendant;
COURSE DETAILS		
S. No	Module ID/ Lecture ID	Lecture Title/Topic
1	L1	Introduction to Robotics
2	L2	Work volume
3	L3	Transformations
4	L4	Forward & Inverse Kinematics
5	L5	Sensors
6	L6	Actuators
7	L7	Control systems
8	L8	Dynamics
9	L9	Motion planning
10	L10	Robot programming language VAL-II
11	L11	Micro controller Architecture and Programming
12	L12	Advanced Robotics Topics
13	L13	Basic Electronics
14	L14	Mechanisms
15	L15	Microcontroller Programming
16	L16	Sensors
17	L17	Actuators Servo DC Stepper
18	L18	Mobile Robots

19	<b>L19</b>	Arm Robot
20	<b>L20</b>	PUMA Robot

**References if Any:**

1. Introduction to Robotics by John Craig, Pearson publishers and
2. Industrial Robotics by M P Grover, McGraw Hill India

Name and contact details of two referees for the course:

1. Prof. S. K. Saha, ME Dept. IIT Delhi
2. Prof. T. Asokan, ME Dept. IIT Madras