NPTEL Video Course - Mechanical Engineering - NOC:Industrial Robotics: Theories for Implementation

Subject Co-ordinator - Dr. Arun Dayal Udai

Co-ordinating Institute - IIT-ISM Dhanbad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to and Industrial Robots
Lecture 2 - Anatomy of an Industrial Robot
Lecture 3 - Technical Specifications of an Industrial Robot
Lecture 4 - Classification of Robots
Lecture 5 - Fixed Installation Robots - Serial and Parallel Robots
Lecture 6 - Introduction to Industrial Controllers, Drives and Systems
Lecture 7 - DC Motors/Actuators and Drives
Lecture 8 - Stepper Motors
Lecture 9 - Brushless DC Motors/Actuators
Lecture 10 - AC Servo Motors
Lecture 11 - Introduction to Sensor and Transducers, Position Sensors
Lecture 12 - Position Sensors: Potentiometers, and Hall-effect. Velocity Sensors
Lecture 13 - Acceleration Sensors, AC Sensors (Resolvers and Synchros)
Lecture 14 - Non-contact (Inductive and Capacitive), Force/Torque Sensors
Lecture 15 - Limit Switches, Classification and Characteristics of Sensors
Lecture 16 - Degrees of Freedom and Kinematic Transformations : Translation
Lecture 17 - Pure Rotation, Arbitrary Axis Rotations, Euler Angles
Lecture 18 - Link and Joint Parameters (DH Notations), 2 and 3 DoF Robots
Lecture 19 - 3 DoF Cylindrical Robot (Spatial), SphericalWrist, Cylindrical Robot with Wrist
Lecture 20 - Forward Kinematics of 6-DoF Industrial Robot
Lecture 21 - Inverse Kinematics: 2 and 3 DoF Planar Manipulator
Lecture 22 - Spatial Robots - 3R, Cylindrical (RPP), 4-DoF SCARA Robot
Lecture 23 - Inverse Kinematics of a 6-DoF Industrial Robot
Lecture 24 - Differential Motion Analysis, Velocity, and Robot Jacobian
Lecture 25 - Jacobian (2R), Jacobian Inverse, Singularity, and Acceleration Analysis
Lecture 26 - Installing the Mechanical Arm and Test Run
Lecture 27 - Mastering an Industrial Robot
Lecture 28 - TCP Calibration using 4-Point method and External reference method
Lecture 29 - TCP Orientation Calibration using World Frame and Two-Point method

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Lecture 30 - Worksurface Calibration
Lecture 31 - Fixed Tool Calibration: External TCP and Workpiece Calibration
Lecture 32 - Base Linear Track and External Turn-Table Calibration
Lecture 33 - Link Forces and Moments
Lecture 34 - Gravity Compensation and External Forces/Torques
Lecture 35 - Kinetostatic Measures for Robot Design
Lecture 36 - Introduction to Dynamics, LE Approach, Dynamics of 1DoF System
Lecture 37 - Equation of Motion (EoM) for a Two-Link Manipulator using LE
Lecture 38 - Newton-Euler (NE) Approach
Lecture 39 - Equation of motion of a Two-Link manipulator using NE Approach
Lecture 40 - Payload and Supplementary Load Calibration
Lecture 41 - Identification Experiments
Lecture 42 - Repeatability Tests and ISO 9283:1998
Lecture 43 - Introduction to Control, Linear Control, Second Order System
Lecture 44 - Response of a Second Order Linear System
Lecture 45 - Transfer Function and State-space representation, ODE
Lecture 46 - A Robot Joint : DC Motor Model
Lecture 47 - Feedback control of a robot arm, PID Control, Gain Tuning
Lecture 48 - Workspace and Operator Safety
Lecture 49 - Industrial Robot Programming
Lecture 50 - Course Conclusion and Suggestions
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