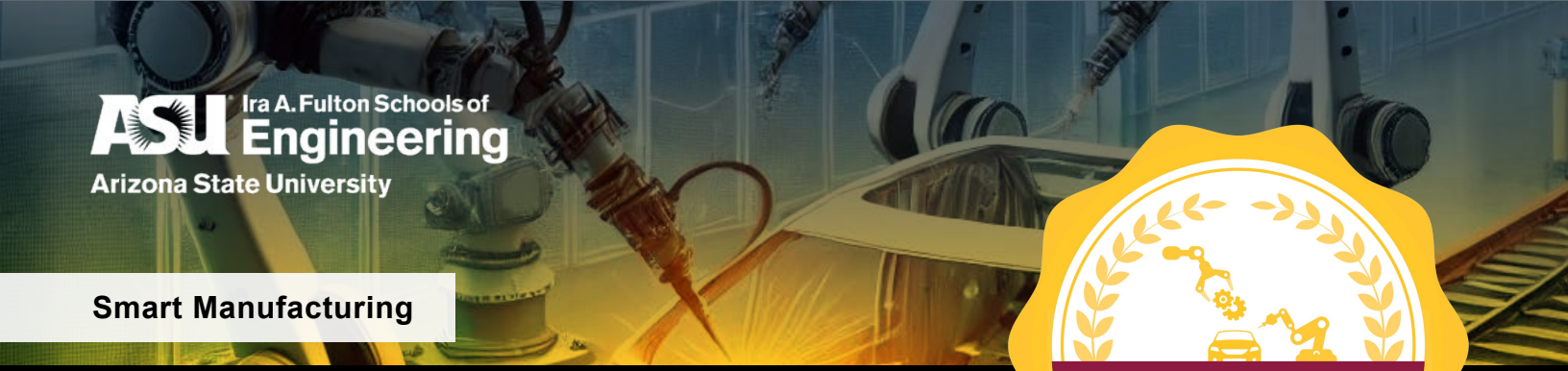


Ira A. Fulton Schools of Engineering
Arizona State University

Smart Manufacturing

Modeling and Control of Robots for Manufacturing Automation

Overview

This intensive program blends theory with hands-on practice, equipping you with the skills to model, analyze, and control robotic systems.

This program equips you with the expertise needed for roles such as Robotics Engineer, Automation Technician, and Mechatronics Engineer. Start your journey to becoming a robotics expert today!

Key Skills Covered

- Perform forward/inverse kinematics for robotic arms
- Derive motion equations for industrial robots
- Implement motion and force control strategies
- Utilize MATLAB for robotic system modeling
- Simulate robotic behavior with Simulink

- Live instruction by ASU Associate Professor Hamid Marvi
- Earn an ASU Engineering Badge to showcase your new skills
- See each micro-badge for student pricing
- In person, ASU Tempe

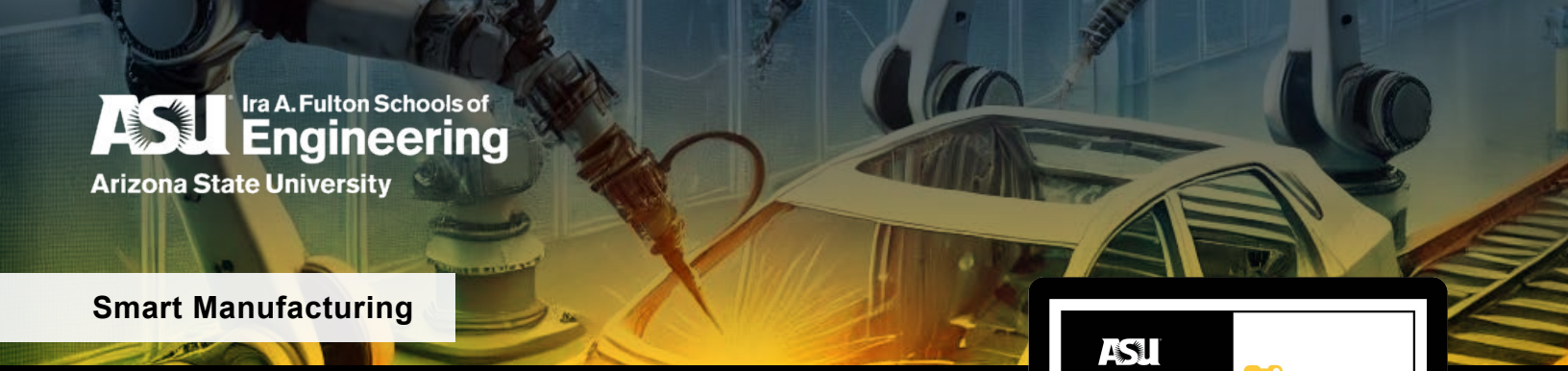
Take one micro-badge or complete all four to earn the badge! More details about each micro-badge below.

Analyzing the Movement of Industrial Robotic Arms: Kinematics Feb. 8-9, 2025 | 8a.m.-1 p.m. | Scroll down for more info	Navigate the complexities of robotic arms, focusing on homogeneous transformations, kinematic algorithms, and MATLAB-driven simulations. Through a series of mini-lectures, lab activities, and a comprehensive final project, participants will learn to apply kinematic theories to practical scenarios, enhancing their analytical and problem-solving skills.
Understanding the Forces and Motion in Robotic Arms: Dynamics Feb. 22-23, 2025 | 8a.m.-1 p.m. | Scroll down for more info	Dive into the fascinating world of robotics and discover the principles that animate the dynamic movements of robotic arms. This course offers an in-depth look at the dynamics controlling robotic arms, emphasizing the derivation of equations of motion and the analysis of these machines under varied operational conditions.
Controlling Robotic Arms for Precision and Performance Apr. 5-6, 2025 | 8a.m.-1 p.m. | Scroll down for more info	Empower yourself with the essential skills demanded by today's tech-driven industries by exploring applications and core principles driving robotics and control system utilization. This course offers a comprehensive exploration of motion and force control techniques, empowering you to implement precise and efficient control solutions.
Simulating Robotic Arms with MATLAB/Simulink Apr. 12-13, 2025 | 8a.m.-1 p.m. | Scroll down for more info	As you navigate through the intricacies of analyzing and controlling robotic systems, you'll gain hands-on experience that transforms theoretical knowledge into practical expertise, enabling you to model and simulate industrial robotic arms with proficiency.

What you'll earn!

Participants will earn a digital micro-badge from the Ira A. Fulton Schools of Engineering for each micro-badge completed and the full badge when completing all four micro-badges. Participants will also qualify for Continuing Education Units (CEU).

Start your Industrial Robotics journey today!



Ira A. Fulton Schools of Engineering
Arizona State University

Smart Manufacturing

Analyzing the Movement of Industrial Robotic Arms: Kinematics

Overview

Navigate the complexities of robotic arms, focusing on homogeneous transformations, kinematic algorithms, and MATLAB-driven simulations.

~~$999~~ **$150 for current ASU students!**

20 SWAP Hub scholarships are available to make this program free! Click here to complete your application.

SWAP Hub Scholarship

Course Description

This Level 3 micro-badge is designed to challenge you with higher-order thinking tasks, requiring you to apply analytical skills and creative problem-solving to real-world scenarios. Through a combination of lectures, practical exercises, and lab activities, you'll gain hands-on experience with tools like MATLAB and Simulink, crucial for modern robotics. You'll learn to perform kinematic calculations, analyze robotic arm motion, and plan trajectories, culminating in a final project focused on trajectory planning and obstacle avoidance.

This course is ideal for those pursuing careers in robotics engineering, automation, and control systems, providing valuable skills that will enhance your technical proficiency and problem-solving abilities, preparing you for advanced studies or professional roles in the rapidly evolving field of robotics.

Session Topics:

- Introduction to Robotics and Industrial Automation
- Forward Kinematics
- Inverse Kinematics
- Differential Kinematics
- Inverse Differential Kinematics
- Trajectory Planning

Key Skills Covered:

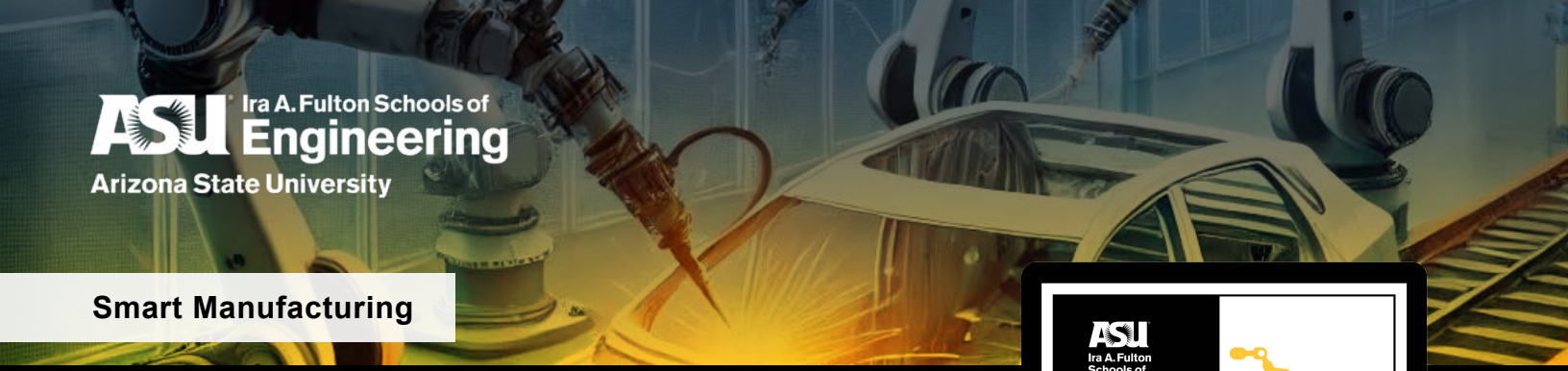
- Homogeneous transformations application and analysis
- Forward kinematics calculation and implementation
- Inverse kinematics techniques for robotic arms
- Differential kinematics and Jacobian matrices application
- MATLAB/Simulink for robotic arm simulations

Instructional sessions will be held in person at ASU Tempe

- Saturday, Feb 8, 2025, 8–1 p.m.
- Sunday, Feb 9, 2025, 8–1 p.m.

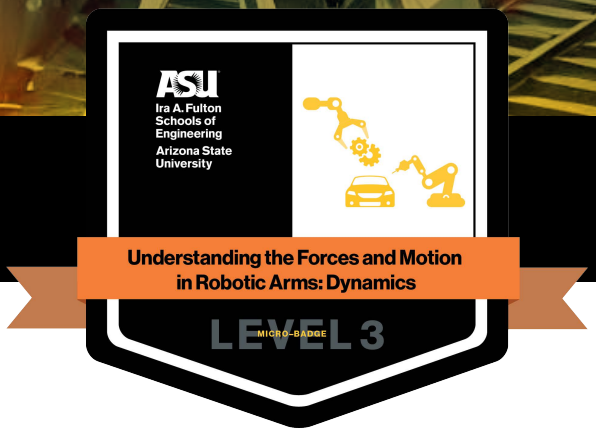
Spots are limited!

Register today



Smart Manufacturing

Understanding the Forces and Motion in Robotic Arms: Dynamics



Overview

Dive into the fascinating world of robotics and discover the principles that animate the dynamic movements of robotic arms.

~~$999~~ **$150 for current ASU students!**

20 SWAP Hub scholarships are available to make this program free! Click here to complete your application.

SWAP Hub Scholarship

Course Description

This Level 3 micro-badge immerses you in advanced concepts, challenging you to apply analytical skills and creative problem-solving. You'll study key topics such as statics, Lagrangian dynamics, and the differences between forward and inverse dynamics through a blend of lectures, practical exercises, and hands-on labs.

This course is perfect for future robotics engineers, automation and control systems technicians, and mechatronics engineers, providing you with the knowledge and skills to excel in advanced studies
or professional roles. By the end of the course, you'll be adept at tackling dynamic challenges and making impactful contributions to the robotics industry.

Session Topics:

- Introduction to robot dynamics
- Review of robotic arm kinematics
- Statics
- Langrangian formulation for manipulator dynamics
- Forward vs inverse dynamics

Key Skills Covered:

- Derivation of governing equations of motion for robotic arms
- Analysis of robot dynamics under various conditions
- Utilization of MATLAB and Simulink for dynamic modeling
- Application of Lagrangian formulation in manipulator dynamics

Instructional sessions will be held in person at ASU Tempe

- Saturday, Feb 22, 2025, 8–1 p.m.
- Sunday, Feb 23, 2025, 8–1 p.m.

Spots are limited!

Register today

Ira A. Fulton Schools of Engineering
Arizona State University

Smart Manufacturing

Controlling Robotic Arms for Precision and Performance

Overview

Empower yourself with the essential skills demanded by today's tech-driven industries by exploring applications and core principles driving robotics and control system utilization.

Course Description

This Level 3 micro-badge covers key topics such as motion control, force control, and visual servoing through a combination of lectures, practical exercises, and hands-on labs. Using MATLAB and Simulink, you will gain experience in designing and simulating control systems, essential for achieving precise robotic movements and task execution.

This course is ideal for aspiring robotics engineers, automation and control systems technicians, and mechatronics engineers, providing you with the knowledge and skills to excel in advanced studies or professional roles. By the end, you'll be proficient in implementing advanced control strategies, positioning yourself to make impactful contributions to the robotics industry.

~~$999~~ **$150 for current ASU students!**

20 SWAP Hub scholarships are available to make this program free! Click here to complete your application.

SWAP Hub Scholarship

Session Topics:

- Introduction to control of robotic arms
- Review of robotic arm kinematics and dynamics
- Motion control
- Force control
- Visual servoing

Key Skills Covered:

- Motion control strategies implementation
- Force controller development for robotic arms
- Visual servoing techniques
- Analytical skills in control systems design

Instructional sessions will be held in person at ASU Tempe

- Saturday, Apr. 5, 2025, 8–1 p.m.
- Sunday, Apr. 6, 2025, 8–1 p.m.

Spots are limited!

Register today

ASU Ira A. Fulton Schools of Engineering
Arizona State University

Smart Manufacturing

Simulating Robotic Arms with MATLAB/Simulink

Overview

Dive into the core of robotics engineering, focusing on practical skills in modeling, simulation, and control of industrial robotic arms.

Course Description

This Level 3 micro-badge takes you deep into the heart of robotics engineering, covering kinematic simulations, dynamic modeling, and the design of controllers using MATLAB/Simulink. As you navigate through the intricacies of analyzing and controlling robotic systems, you'll gain hands-on experience that transforms theoretical knowledge into practical expertise, enabling you to model and simulate industrial robotic arms with proficiency.

Perfect for aspiring robotics engineers, automation and control systems technicians, and mechatronics engineers, this micro-badge arms you with the essential skills needed to tackle the challenges of modern industrial robotics. From understanding the foundational principles of robotics to applying advanced simulation techniques in MATLAB/Simulink, each session is structured to enhance your abilities and equip you for the demands of the industry. Prepare to elevate your career and contribute to the future of robotics engineering with advanced skills in modeling, simulation, and control.

~~$999~~ $150 for current ASU students!

20 SWAP Hub scholarships are available to make this program free! Click here to complete your application.

SWAP Hub Scholarship

Session Topics:

- Introduction to modeling and control of robotic arms using MATLAB/Simulink
- Review of robotic arm kinematics, dynamics, and control
- Robotic kinematic simulations in MATLAB
- Robot dynamic modeling using MATLAB/Simulink
- Robot controller design using Simulink

Key Skills Covered:

- Kinematic and dynamic simulation of robotic arms
- MATLAB/Simulink for modeling and control strategies
- Controller design using Simulink for robotic systems
- Practical application of robotics in industrial automation
- Analyzing and integrating robotics principles with MATLAB/Simulink

Instructional sessions will be held in person at ASU Tempe

- Saturday, Feb 22, 2025, 8–1 p.m.
- Sunday, Feb 23, 2025, 8–1 p.m.

Spots are limited!

Register today