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# MATLAB & Simulink Applications Track: Program Overview

SEE PROJECT

Comprehensive Understanding & Practical Application

Presented by: **Agnes**

# Program Structure & Core Topics

Our program is designed to empower participants to **design, simulate, and analyze dynamic systems** using industry-standard tools: MATLAB and Simulink.

## Key Modules & Concepts

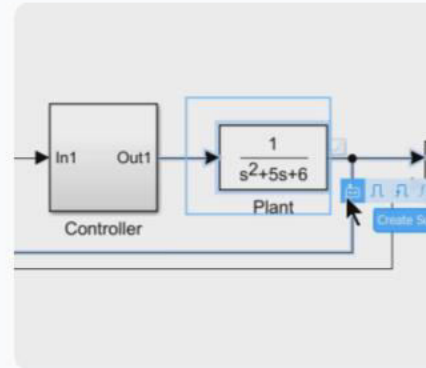
<> **MATLAB** Foundational understanding of the **Basics**: MATLAB environment, syntax, and fundamental operations.

👤 **Simulink** Introduction to graphical **Modeling**: programming for simulating dynamic systems and rapid prototyping.

📡 **Signal Processing** Techniques for analyzing, modifying, and synthesizing signals for sensor data and communication.

⚙️ **Control Systems** Principles and practical application of feedback control, stability analysis, and controller

## Program Phases & Immersion



### Phase 1: Foundational & Core Concepts

Months 1 & 2  Online

Establish a strong foundation in MATLAB and Simulink through interactive online modules and virtual labs.

### Phase 2: Industry Immersion & Integrated Project

Month 3  Offline & Hands-On

Practical application of learned skills through an intensive industry immersion, culminating in a significant project.

#### Project Examples:



# Month 1: MATLAB Fundamentals & Data Handling (Online)

Goal: Master **MATLAB programming basics**, **data manipulation**, and **visualization** to establish a robust foundation for advanced applications.

## Week 1: MATLAB Environment & Basic Operations

Initiate your journey into the MATLAB ecosystem. This week covers the fundamental interface components, efficient variable management, and the basics of script creation for streamlined operations.

Interface  
Mastery

Scripting  
Basics



## Week 2: MATLAB Programming Fundamentals

Dive deeper into MATLAB's programming capabilities. This module

# Month 2: Applied MATLAB/Simulink for ECE (Part 1 - Online)

Goal: Apply MATLAB/Simulink to **Signal Processing** and **Control Systems**.

## **E** Week 5: Signal Processing Fundamentals

**Signal Representation:** Dive into discrete-time signals and sampling theory.

**Time/Frequency Domain:** Analyze signals using convolution, FFT, and power spectral density.

**Basic Filter Concepts:** Introduce low-pass, high-pass, and band-pass filters.



## **PIN** Week 6: Control Systems Fundamentals

**System Representation:** Model systems with transfer functions and state-space models.

**System Dynamics:** Compare open-loop vs. closed-loop systems and analyze system response and stability.

**PID Control Basics:** Get introduced to Proportional, Integral, and Derivative control actions.



# Month 2: Applied MATLAB/Simulink for ECE (Part 2 - Online)

Goal: Advance proficiency in applied MATLAB/Simulink for **specialized ECE domains**, culminating in practical **mini-project scoping**.

## Week 7: Filter Design & System Simulation

This week focuses on practical digital filter design and their real-world applications within Signal Processing (DSP) systems.

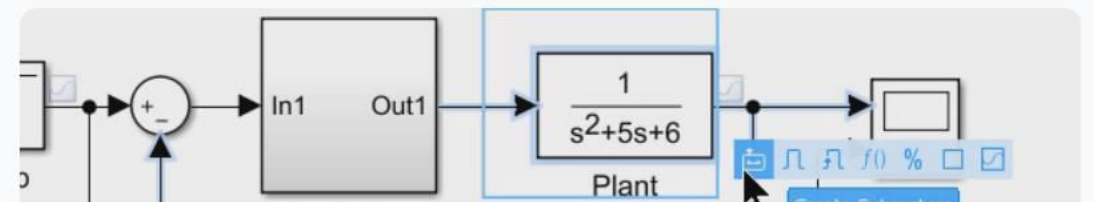
- **Digital Filter Design:** In-depth coverage of FIR and IIR filter theory and design methods.
- **Application of Filters:** Practical use cases for noise reduction and signal enhancement.
- **Simulink for DSP Systems:** Building and simulating complex signal processing chains.
- **Scripting for ECE:** Automating filter design, analysis, and simulation workflows.



## Week 8: System Simulation & Scripting

The final week explores advanced system simulation techniques and extensive scripting for automation and optimization in control systems.

- **Advanced Simulink Modeling:** Mastering hierarchical models and custom block creation.
- **Dynamic System Simulation:** Simulating and analyzing the behavior of diverse engineering systems.
- **PID Controller Tuning:** Advanced methods for optimizing PID gains for robust performance.
- **Automation:** Developing sophisticated scripts for data analysis and report generation.





# Month 3: Capstone Mini Project Kick-off & Implementation (Offline)

Goal: Design, implement, test, and document a practical simulation/signal processing project, culminating in a hands-on, real-world application.

## Week 9: Project Kick-off

This foundational week focuses on collaborative planning and resource acquisition to ensure a strong project foundation.

### Key Activities:

- **Team Formation & Mentor Allocation:** Collaborating with peers and receiving dedicated expert mentorship.
- **Detailed Design:** Developing comprehensive project specifications and system architectures.
- **Data/System Acquisition:** Sourcing real-world data and identifying required components.

Collaborative Design

Expert Mentorship

Resource Planning



## Week 10: Implementation & Core Functionality



# Month 3: Project Completion & Career Launchpad (Offline)

Goal: Deliver a **high-quality, fully tested project** and equip participants with essential skills for **successful career entry and advancement** in engineering.

## ✓ Week 11: Rigorous Testing & Optimization

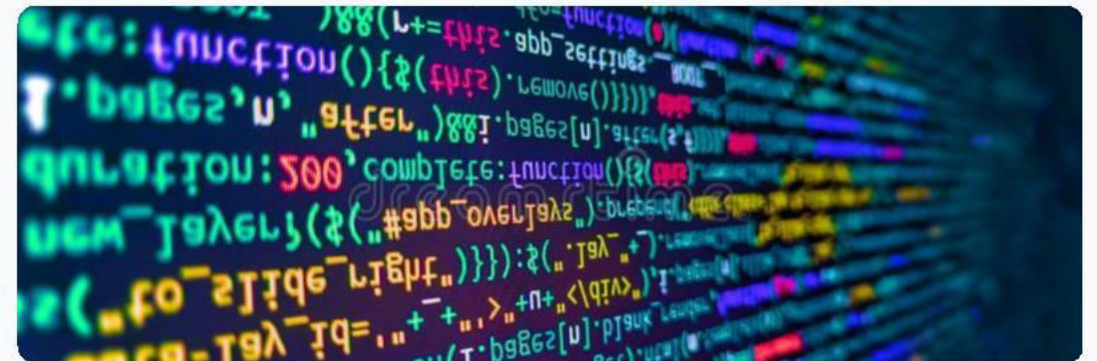
The penultimate week is dedicated to refining your capstone project to ensure its robustness, efficiency, and accuracy. This phase is crucial for validating all implemented functionalities and optimizing performance.



**System Testing:** Comprehensive validation of module integration and functionality.

## 🚀 Week 12: Showcase & Career Launchpad

The final week culminates in presenting your project and preparing for your professional journey, ensuring you leave with a strong portfolio and essential career skills.



**Final Presentation:** Articulating your project's objectives, results, and impact.

**Project Documentation:** Developing professional-grade technical

# Program Conclusion & Next Steps




## Program Goal Achieved: Empowering Dynamic System Expertise

You are now fully equipped to **design, simulate, and analyze complex dynamic systems** with confidence and precision.

### Mastered Skills


Through intensive training and practical application, you have developed robust proficiency in:


 **MATLAB** Scripting & Programming: algorithm development.

 **Simulink Modeling** Graphical simulation & system design.

### Future Pathways


Your capabilities open doors to high-demand roles across diverse industries, including:

 **DSP Engineer** Audio, image, and communication systems.

 **Control Systems Engineer** Automation, robotics, and industrial control.

### Your Certification

This certification is a testament to your commitment and comprehensive learning:

 **Official Recognition** A formal acknowledgment of your specialized training.

 **Validated** Proof of