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AI-Powered SoC Engineering Workflow

Practical AI Adoption for RTL Design, Verification, Debug, and Engineering Productivity

FA-0091

Agentic & Generative AI · Cybersecurity

Introduction

Artificial Intelligence is becoming an increasingly important tool within semiconductor and SoC development environments. Engineering teams are beginning to leverage AI to accelerate RTL development, verification activities, debugging, documentation, automation, and knowledge management. While AI is not a replacement for engineering expertise, it can significantly improve productivity when applied appropriately and validated correctly.

This course provides a practical introduction to AI-powered engineering workflows for SoC teams. Participants will learn how modern AI tools, copilots, retrieval systems, and agentic workflows can be applied throughout the semiconductor development lifecycle while maintaining engineering rigor, security, and governance requirements.

The training is delivered by an instructor with over 30 years of industry experience and focuses on practical, industry-demanded workflows and real engineering use cases rather than purely academic concepts.

Learning outcomes

Upon completion of this course, participants will be able to:

- Understand how AI is being applied within SoC engineering workflows
- Apply prompt engineering and context engineering techniques
- Utilize AI copilots to improve engineering productivity

- Leverage AI for RTL development and review activities
- Use AI to accelerate verification workflows
- Develop AI-assisted engineering automation utilities using Python
- Understand Retrieval-Augmented Generation (RAG) concepts for engineering knowledge management
- Understand agentic AI concepts and engineering automation workflows
- Understand AI hardware accelerator concepts used in modern SoCs
- Apply governance, validation, and security practices for AI-generated outputs
- Integrate AI into end-to-end semiconductor engineering workflows

Prerequisites

- Basic understanding of digital design concepts
- Familiarity with RTL development concepts
- Familiarity with verification concepts
- Basic programming or scripting knowledge
- General understanding of SoC development workflows

Training outline

1. Introduction to AI in SoC Engineering

1. AI in semiconductor workflows
2. AI opportunities in RTL and verification
3. AI limitations and hallucinations
4. Enterprise AI considerations
5. Secure AI usage

2. AI Fundamentals for Engineering Teams

1. LLMs and Generative AI
2. Tokens, context windows and embeddings
3. Cloud vs local/on-prem models
4. Prompt engineering
5. Context engineering
6. AI workflow patterns

3. AI Copilots and Engineering Productivity

1. AI copilots for developers
2. VS Code AI workflows
3. AI-assisted coding
4. AI-assisted documentation
5. AI-assisted debugging
6. Engineering productivity optimization

4. AI-Assisted RTL Development

1. Verilog generation using AI
2. Parameterized RTL generation
3. FSM generation
4. RTL optimization and refactoring
5. RTL review and analysis
6. Identifying RTL anti-patterns
7. RTL documentation generation

5. AI-Assisted Verification Workflow

1. AI-generated testbenches
2. Assertion generation
3. Stimulus generation
4. Coverage improvement
5. Debugging simulation failures
6. Log analysis
7. Waveform interpretation
8. Verification workflow acceleration

6. AI-Assisted Python Engineering Utilities

1. Python scripting for engineering workflows
2. Parsing engineering logs
3. Automation scripts
4. Report generation
5. Data extraction and transformation

6. Batch engineering workflows

7. Retrieval-Augmented Engineering Workflows

1. Engineering knowledge assistants
2. Using AI with specifications
3. AI-assisted document querying
4. Retrieval-Augmented Generation (RAG)
5. Context-aware engineering assistants
6. Internal engineering knowledge workflows

8. Agentic AI for Engineering Automation

1. Introduction to AI agents
2. Agents vs copilots
3. Multi-step engineering workflows
4. Human-in-the-loop workflows
5. AI orchestration concepts
6. Engineering workflow automation

9. Introduction to AI Hardware and Accelerators

1. AI accelerators in modern SoCs
2. NPUs and tensor processing
3. AI inference basics
4. Quantization concepts
5. Memory and bandwidth considerations
6. Power efficiency considerations
7. Edge AI concepts

10. AI Governance and Validation

1. Validating AI-generated RTL
2. Verification of AI outputs
3. Handling hallucinations safely
4. Security and IP protection
5. Responsible AI usage

6. Enterprise AI governance

11. End-to-End AI-Augmented SoC Workflow

1. AI-assisted RTL creation
2. AI-assisted verification
3. AI-assisted debugging
4. AI-assisted automation
5. Integrated engineering workflows
6. Productivity optimization strategies

Disclaimer

This outline is intended as a general training framework and guideline. The trainer reserves the right to modify, rearrange, expand, reduce, substitute, or omit topics as necessary to accommodate audience requirements, participant skill levels, available course duration, evolving technology trends, and organizational objectives. Course content and delivery may therefore be amended at the trainer's professional discretion without prior notice.

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