Advanced Programming

Week 1: Course Introduction & Modern Trends

Prof. Agon Bajgora

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Welcome to Advanced Programming!

This course is designed to be:

- **Practical** and hands-on
- Focused on **modern software engineering**
- Aligned with **industry practices**
- **Project-based** rather than exam-focused

About Me

- Prof. Agon Bajgora
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Course Focus Areas

- 🤖 AI-Assisted Development
- 🌐 Modern Architectures
- 🔄 DevOps & Automation
- 🔒 Security Integration

Course Overview

Goal: Learn modern software development practices that are used in industry today

By the end of this course, you will:

- Develop modern, AI-assisted software
- Work with microservices and APIs
- Implement security best practices
- Use CI/CD and DevOps tools
- Build impressive portfolio projects

Course Approach:

- Minimal theory, maximum practice
- Real-world tools and techniques
- Project-based assessment
- Peer collaboration and review
- AI-powered development

15-Week Course Schedule

Course Modules

Module 1: AI-Powered Software Development

Weeks 1-5

- Week 1: Course Introduction & Modern Trends
- Week 2: AI-Assisted Coding
- Week 3: AI in Testing and CI/CD
- Week 4: AI-Driven Debugging & Code Analysis
- Week 5: Ethics and Effective Use of AI Tools

Module 2: Modern Software Architecture & DevOps

Weeks 6-9

- Week 6: Microservices Architecture
- Week 8: Cloud-Native Development & Infrastructure as Code
- Week 9: Continuous Integration & Deployment (CI/CD)

Module 3: Security and DevSecOps

Weeks 10-12

- Week 10: Secure Coding & OWASP Top 10
- Week 11: DevSecOps & CI/CD Security
- Week 12: Cloud Security & Monitoring

Module 4: Integration, Projects, and Wrap-up

Weeks 13-15

Weekly Class Structure

Session 1 (135 min)

Theory + Hands-on Coding

- Brief lecture (30-40 min)
- Guided coding exercises
- AI-assisted development activities
- Examples from industry
- Interactive demonstrations

Session 2 (90 min)

Applied Lab Work

- Mini-project work
- Peer code reviews
- Debugging sessions
- Group discussions
- Mentor support

Grading Breakdown

Mini-Projects (40%)

Three projects throughout the semester

Final Project (40%)

Team project applying course concepts

Peer Code Reviews (10%)

Quality of reviews given & applied

Participation (10%)

In-class engagement, discussions

No traditional exams - your projects are your assessments!

Required Tools & Setup

GitHub Account

All projects and assignments

VS Code

Recommended editor

Git

Version control

Docker

Containerization

Cloud CLI Tools

Optional/as needed

Language Tools

Node.js, Python, etc.

We'll set these up today!

Detailed setup guide provided in the course repository

Modern Software Development Trends

Top 5 Industry Trends (2025)

🤖 AI in Programming

Copilot, ChatGPT, AI-assisted testing, code generation

🔄 Microservices

Breaking monoliths into manageable, independent services

⚙️ DevOps/DevSecOps

Automated pipelines, shifting security left in the process

☁️ Cloud-Native

Applications designed specifically for cloud deployment

🔌 API-First Design

Defining contracts before implementation for better integration

AI in Software Engineering

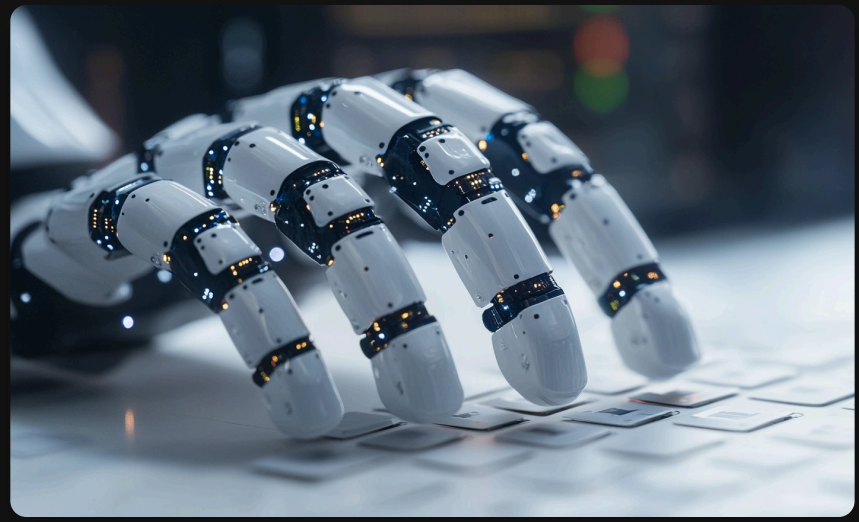
AI Integration Areas

- **Code generation** and auto-completion
- **Testing** and quality assurance
- **Debugging** assistance
- **Documentation** generation
- **Workflow optimization**

Research Insights

"Just five years ago, LLMs in software engineering at Google were a novelty. Now, ML integrations permeate the developer experience."

- Google Research, 2024



Research shows developers using AI assistants: - Complete tasks up to 55% faster - Report higher job satisfaction - Focus more on creative problem-solving

The Evolution of AI Tools in Development

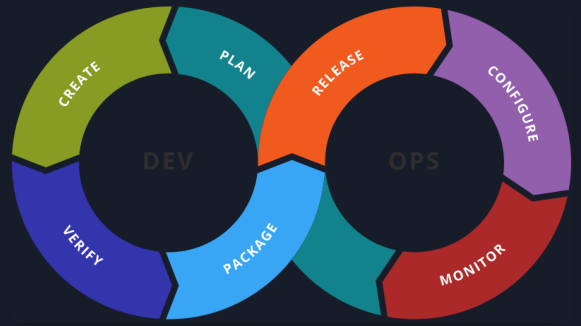
Generation	Focus	Examples
First Gen	Code completion	IntelliSense, Tabnine early versions
Second Gen	Context-aware suggestions	GitHub Copilot, Amazon CodeWhisperer
Current	Multi-tool AI assistants	Copilot X, Claude Code, advanced LLMs
Future	AI agents in development	Autonomous bug fixing, auto-optimization

We'll explore all of these in this course!

From basic completion to advanced AI collaboration

Modern Software Practices

DevOps & DevSecOps



- Continuous Integration/Continuous Deployment
- Infrastructure as Code
- Security integrated throughout
- Automated testing

Modern Architectures

From monoliths to distributed systems:

- **Microservices**: Independent, deployable services
- **Serverless**: Event-triggered functions
- **API-First**: Designing the contract first
- **Cloud-Native**: Built for scalability
- **Container Orchestration**: Managing applications

Week 1 Goals

Setup Environment

Install all tools needed for the course

Understand Course

Know structure and expectations

Join Repository

Access course materials and code

Try AI Coding

First experience with AI-assisted development

Meet Classmates

Begin building your learning community

Modern Mindset

Start thinking about current industry practices

Today’s Agenda

1. Course Overview (done!)
2. Tool Setup (next)
3. GitHub Repository Tour
4. "Hello World" with AI Assistance
5. First Week Assignment

Let's get started with setup!

Follow along with the setup guide

Thank You!

https://github.com/Agonb/advanced-programming-2025

Questions?