

CORSO DI LAUREA MAGISTRALE IN SOFTWARE PER I SISTEMI INFORMATIVI
MASTER IN SOFTWARE ENGINEERING FÜR INFORMATIONSSYSTEME
MASTER OF SCIENCE IN SOFTWARE ENGINEERING FOR INFORMATION SYSTEMS

Contenuto degli insegnamenti
Inhalt der Lehrveranstaltungen
Content of the courses

<p>Advanced Software Design Techniques</p> <ul style="list-style-type: none"> • Design Patterns Application and Interaction • Evolutionary Design Techniques (TDD, BDD, Refactoring) • Domain Modeling (DDD) • Components and Modularization • Framework Development (Extension Points, Reflection, Metadata) • Software Design Evaluation (Code Metrics, Code Smells, Software Visualization)
<p>Agile Software Development</p> <ul style="list-style-type: none"> • Origin and evolution of agile software development and modern agile • Major agile frameworks and hybrid approaches • Key agile engineering and project management practices • People-centric and teamwork in agile software development • Continuous experimentation using agile approaches • Scaling agile: distributed and/or large agile software development projects
<p>Cloud Computing and Distributed Systems</p> <ul style="list-style-type: none"> • Virtualisation • Distributed Systems Algorithms • Network Technologies • Cloud Systems • Storage
<p>Contemporary Software Development</p> <ul style="list-style-type: none"> • Software development environments • Configuration management • Software artifact management • Design and programming techniques in practice • +Tools and techniques for process management and quality assurance • Continuous integration
<p>Design and Development of Business Software</p> <ul style="list-style-type: none"> • Introduction to Business Software

- Modelling business process
- Systems for small/medium business
- Enterprise systems
- Business intelligence dashboards and online analytic processing

DevOps

- Unified processes between development and operations
- Value of DevOps and measuring DevOps
- Configuration Management
- Continuous integration and delivery and continuous testing

Information retrieval

- Document Indexing
- Vector Space Model
- Web Search
- Text Classification
- Topic Modelling
- Introduction to text mining

Introduction to parallel computing

- Introduction to architectures for parallel and distributed systems
- Shared memory model and GPU Computing
- Distributed memory model: introduction to Message Passing Interface
- Principle and design of parallel algorithms
- Selection of parallel algorithms
- Performance Analysis, optimization and tuning

Entrepreneurial Software Engineering

- Nature and characteristics of software start-ups
- Problem and solution identification and validation
- Building minimum viable products
- Lean analytics and pivoting
- Continuous retrospectives for start-up team learning
- Scaling software start-ups

Microcontroller Programming

- Basic programming syntax and structure in C
- Functions
- Conditional control structures
- Arithmetic, comparison and Boolean operators
- Pointers and addressing
- Data types
- Interrupts
- Simple electronic circuits

Mobile Robotics

- Functional architecture of unmanned systems.
- Vehicle dynamics and modeling.
- Common navigation sensors.

- Low-level, control.
- State & disturbance estimation.
- Path generation & waypoint navigation.

Programmable Logic Controllers

- Elementary switching theory
- Logical functions and ladder diagrams
- Basic of Programmable Logic Controller (PLC)
- PLC Programming

Programming and Visualization for Data Science

M1: Data Visualization and Exploration

M2: Programming for Data Science

- Languages for programming data and data visualization
- Integrated Development Environments for Data Science
- Exploratory data analytics, data exploration, and feature engineering
- Data wrangling, cleaning, and preprocessing
- Advanced libraries for linear algebra and statistics
- Data science pipelines, from data ingestion to models and analysis
- Model tuning, validation, and testing
- Reproducible analysis practices
- Human perception for effective visualization
- Data types and visual encodings
- Visualization idioms
- Advanced libraries for data visualization

Research Methods and Technology Transfer

- Research paradigms in information and computer science and research methods
- Quality assessment of research papers
- Literature Review
- Dissemination techniques for research results
- Research Planning
- Models and methods of technology transfer

Robotics

- An introduction to mechatronics and robotic systems
- An overview of industrial, mobile and service robots
- Robotics: 3D Kinematics and statics
- Direct and inverse kinematics
- Application to industrial manipulators (PUMA, SCARA)
- Differential Kinematics and Statics
- Sensors and actuators for industrial robots and mechatronic systems
- Basis on simulation and programming of robotic systems

Software and Systems Security

- Computer Security Technology and Principles
- Data security
- Software and Network Security and Trusted Systems

- Social security
- System Vulnerabilities and Attacks
- Security Management

Software for Technical Drawing

- Drawing standards and representation options
- Representation of parts and their peculiarities
- Computer-Aided Design (CAD)
- Managing drawings

Software Maintenance and Evolution

- Introduction to software maintenance and evolution
- Software Refactoring
- Mining software repositories
- Machine learning for software engineering
- Using software metrics to assess and monitor the quality of software systems
- Using textual analysis techniques in the context of software maintenance and evolution

Systems design and implementation

M1: Embedded Systems Design and Implementation

M2: Extended Reality: Augmented, Virtual and Mixed Reality

- Fundamental notions and architectures of embedded and cyber-physical systems
- Control and management of time and hardware interfaces
- Design and programming of real-time software
- Hardware architectures including MPU/MCUs, DSPs, FPGAs and ASICs
- Practical aspects of real-world implementation and engineering aspects
- General Overview, current trends and future applications of XR technologies
- Introduction to Computer Graphics – The rendering pipeline
- Working with a graphics engine (e.g. OpenGL, Unity3d)
- Input devices – controllers, motion trackers and motion capture technologies for tracking
- Output devices – Head Mounted VR Displays, Augmented and Mixed reality glasses
- Rapid XR prototyping

Verification and Reliability for Dependable Systems

- Dependable properties of systems
- Software and software systems testing
- Techniques for verification of software systems
- Advances in test design and implementation
- Search Based testing
- HW and SW reliability models

Selected topics: Infobytes (Topics can change)

- Introduction to robotics
- Digitalization of production processes – Industry 4.0
- Basic of cyber-physical systems