Samsung Innovation Campus

Smart Things Edition
Università degli Studi di Cagliari
The aim

Samsung Innovation Campus - Smart Things Edition aims to empower a generation of problem solvers by equipping them with future-proof skills and giving them practical understanding of the technologies that will shape their future and enrich sustainable growth of the world.
Samsung Innovation Campus - Smart Things Edition is an educational path developed by Samsung in partnership with some of the best Italian public universities aimed at providing students of technical-scientific paths with the AI, IoT, and soft skills necessary to drive the digital transformation that is revolutionizing the production and organizational dynamics of companies.

The course trains on the application of IoT and AI technologies in the Consumer Electronics product market, transfers skills of ideation, project management and problem solving and prepares for professional placement.

The course includes 100 hours of digital learning, 60 hours of in-class lectures held by Samsung and University professors and 80 hours of teamwork in which students develop their own project.
Target and selection process

Target Students

Bachelor and master students from STEM areas, belonging to the following departments:

- "Ingegneria Elettrica ed Elettronica"
- "Matematica e Informatica"

Admission criteria

- Admission test on programming logic and basic AI and IoT knowledge
- Motivational Interview
- Students’ university career (exams grades)

Max 25 students admitted
In-class lectures
The course consists of 60 hours of in-class or virtual lessons in which Samsung and University teachers lecture students on various topics (see slide 6 for details).

Online materials
In-class (or virtual) lessons are supported by 100+ hours of online preparatory materials.

Keynote speech event
3 hours of virtual events dedicated to students by inviting experts from cybersecurity to sustainability.

Project Work
At the end of in-class lessons, students are divided into groups of 5 and asked to work on an AI application case supervised by Samsung and University tutors.
<table>
<thead>
<tr>
<th>N. Lezione</th>
<th>Titolo Lezione</th>
<th>Giorno</th>
<th>Ora</th>
<th>Durata (ore)</th>
<th>Owner</th>
<th>Docente</th>
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<tbody>
<tr>
<td>Day 0</td>
<td>Incontro di Benvenuto</td>
<td>Mercoledì 01 Sett 2021</td>
<td>14:30-15:30</td>
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<td>Day 1</td>
<td>IoT Introduction</td>
<td>Mercoledì 01 Sett 2021</td>
<td>15:30-18:30</td>
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<td>Day 2</td>
<td>IoT Devices</td>
<td>Giovedì 02 Sett 2021</td>
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<td>Day 3</td>
<td>Application Protocols for IoT</td>
<td>Venerdì 03 Sett 2021</td>
<td>14:30-18:30</td>
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<td>Day 6</td>
<td>Lezione Peer-to-Peer Coaching</td>
<td>Mercoledì 08 Sett 2021</td>
<td>16:30-18:30</td>
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<td>5 Mentors (TBD)</td>
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<td>Lezione Job Preparation - CV/Colloquio</td>
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<td>Dott.ssa Raffaella Lixi</td>
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<td>Venerdì 10 Sett 2021</td>
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<td>Day 9</td>
<td>Lezione Job Preparation - Soft skills</td>
<td>Lunedì 13 Sett 2021</td>
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<td>Day 13</td>
<td>Deep Learning</td>
<td>Venerdì 17 Sett 2021</td>
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<td>Day 15</td>
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<td>Day 18</td>
<td>Lezione Idea and Business Model Generation</td>
<td>Venerdì 24 Sett 2021</td>
<td>14:30-18:30</td>
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<td>Design Thinking Team</td>
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<td>Day 21</td>
<td>Keynote speech event</td>
<td>Mercoledì 29 Sett 2021</td>
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<td>Esperti Esterni - Samsung</td>
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**Totale Ore** | 60
**Samsung** | 30
**Università** | 30
Online materials

1. IoT Introduction
2. IoT Devices
3. Application Protocols for IoT
4. SmartThings & IoT Market
5. AI Introduction
6. Machine Learning
7. Deep Learning
8. Cyber-security
9. Starting an AI Project
Extra Materials

TOTAL
100+ hours

In BLUE topic ownership
Online materials detail

0. Course Introduction

1. IoT Introduction
   1. IoT Overview
   1.1 The 4th Industrial Revolution
   1.2 Definition of IoT
   1.3 M2M (Machine to Machine)
   1.4 Background of IoT's Emergence

2. IoT Application
   2.1 IoT Technology and Evolution
   2.2 Smart Healthcare
   2.3 Smart Home
   2.4 Smart City
   2.5 Smart Logistics
   2.6 Smart Factory
   2.7 Smart Farm
   2.8 Connected Car
   2.9 Smart Energy
   2.10 IoT Major Services

3. IoT Components
   3.1 IoT Environment
   3.2 Cloud Computing

4. IoT Network
   4.1 IoT Network Overview
   4.2 IoT Short-range Communication Technology
   4.3 LPWA
   4.4 5G Network

5. AI Introduction
   5.1 Numeri
   5.2 La Percezione
   5.3 L'Ecosistema Samsung

6. Machine Learning
   6.1 Data preprocessing
   6.2 Machine learning with Scikit-Learn
   6.3 Data Preprocessing
   6.4 Feature Engineering

7. SmartThings
   7.1 Innovation
   7.2 Innovation: Internet of Things
   7.3 Innovation: A.I. and Big Data
   7.4 Innovation: 5G
   7.5 Innovation: Services & Devices

8. Application Protocols for IoT
   8.1 Protocol Overview
   8.2 Basic Structure of the IoT Platform
   8.3 IoT Platform Technology
   8.4 Examples of IoT Platform
   8.5 IoT Open Platform: OCEAN

9. Devices
   9.1 IoT Devices Introduction
   9.2 Sensor and Actuator

10. Sensors
    10.1 Definition of Sensor
    10.2 Basic Features of Sensor
    10.3 Classification of Sensor
    10.4 Applications and Roles of Sensor

11. SmartApp
    11.1 Basics
    11.2 Automations
    11.3 Lifecycles

12. Machine Learning
    12.1 Data preprocessing
    12.2 Machine learning with Scikit-Learn

13. Data Preprocessing
    13.1 Machine learning with Scikit-Learn
    13.2 Data Preprocessing
    13.3 Feature Engineering

14. Classification Prediction (Basic)
    14.1 Logistic Regression Basics
    14.2 Logistic Regression Basics
    14.3 Naive Bayes Algorithm
    14.4 KNN Algorithm
    14.5 SVM Algorithm

15. Classification Prediction (Advanced)
    15.1 Tree Algorithm
    15.2 Ensemble Algorithms
7. Deep Learning
1 Introduction to Deep Learning
1.1. TensorFlow Basics
1.2. Machine Learning with TensorFlow
1.3. Tensor Board
1.4. Artificial Neural Network
2. Deep Learning Various Topics
2.1. Convolutional Neural Network (CNN)
2.2. Recurrent Neural Network (RNN)
2.3. AutoEncoder
2.4. Generative Adversarial Networks (GAN)
3. Deep Learning with Keras
3.1. Keras Basics
3.2. AI with Keras
3.3. Natural Language Processing with Keras

8. Cybersecurity
1. Cyber Resilienza
1.1 Introduzione
1.2 Security by Design
1.3 Detection e Remediation
1.4 Il contesto delle reti 5G
1.5 Sicurezza di dispositivi e apparati
1.6 Strategia OEM (Original Equipment Manufacturer)

9. Starting an AI Project
1. Design Thinking
1.1. What is Design Thinking and Why?
1.2. Characteristics of Design Thinking

Extra materials Part I
1. Understanding of Probability
1.1. Probability Theory
1.2. Probability Rules
1.3. Random Variable
1.4. Discrete Probability Distribution
2. Understanding of Statistics I
2.1. Continuous Probability Density
2.2. Conjoint Probability
3. Understanding of Statistics II
3.1. Descriptive Statistics
3.2. Central Limit Theorem
3.3. Estimation Theory
4. Statistical Hypothesis Testing
4.1. Principles of Hypothesis Testing
4.2. Hypothesis Testing in Action

Extra materials Part II
1. IoT Device and Software
1.1 IoT Device
1.2 IoT Software
2. How to run Raspberry P
2.1 Raspberry Pi Overview
2.2 Getting Started with Raspberry Pi
2.3 Practice Environment Configuration
3. Sensor Device II
3.1 Basics of Electronics
3.2 Types of Electronic Parts
3.3 Interpretation of Circuit Diagram
4. Sensor Devide III
4.1 Digital Input and Electric Circuit
4.2 LED
4.3 Ultrasonic Sensor
4.4 7-Segment(4 Digit LED)
4.5 Temperature-Humidity Sensor
4.6 Primary Control Programming
4.7 UART Communication
4.8 Making Device
5. Node-RED
5.1 Introduction to Node-RED
5.2 Standalone Installation
5.3 Fundamentals
5.4 Docker Installation
5.5 Configuration
5.6 Understanding Node Structure, Developing and Testing
6. OpenHAB (Open Home Automation Bus)
6.1 OpenHAB Overview
6.2 OpenHAB Installation & Demonstration
6.3 Configuring OpenHAB for MQTT Binding
7. Data Analysis & Visualization
7.1 Matrix collection tools : Graphite
7.2 Open source visualization tools : Grafana
7.3 R Programming
8. Project Preparation
8.1 Project Planification
8.2 Searching for Project Ideas
In-class lectures by Samsung

**TOTAL: 30 hours**

- **Welcome & Introduction**
  - SmartThings & IoT Market
  - 1 hour
  - P&S: 4 hours

- **Samsung**
  - Peer-to-Peer Coaching
  - From Samsung Millennials Employees
  - 2 hours
  - P&S: 2 hours

- **Job Preparation**
  - 6 hours
  - Training

- **AI Introduction**
  - P&S: 2 hours

- **Cybersecurity**
  - P&S: 4 hours

- **Idea & Business Model Generation**
  - Lab
  - 4 hours

- **Develop an AI project**
  - AI Application cases: Bixby
  - 4 hours

- **Keynote speech Event**
  - 3 hours

*In LIGHT-BLUE lectures with no online materials*
In-class lectures by Università degli Studi di Cagliari

Contents to be defined according to university-specific capabilities

IoT Introduction 3 hours

IoT Devices 3 hours

Application Protocols for IoT 4 hours

Machine Learning 8 hours

Deep Learning 12 hours

TOTAL: 30 hours
Project work

- AI-IoT Project Work:
  - Students will develop the Project Work in groups of five components
  - Project work will be evaluated by Samsung and University

- Final Test on lectures and contents uploaded on the online platform

TOTAL: 80 hours

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3 students with the highest grades in Project Work and Final Test will receive an economic prize*

* The prize will be comparable to the average one-year tuition fee of Italian Public Universities
Samsung Innovation Campus
Smart Things Edition

https://www.samsung.com/it/campaign/smart-things/
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