Computer and Data Science for Engineers

15/06/2026 9h-12h (JSA) 1. Introduction to Data Science	**Objective:** This part is an introduction to different themes related to data science required for chemists We will take a look at different concepts related to data science • History of Data Science and computing • Computer Architecture and Systems • Major phases of data analysis • Algorithms for data acquisition and process control • Applications: sustainable cities, energy transitions
15/06/2026 14h-17h (OCA) 2. Internet of things	**Objective:** This part gives an introduction to different themes related to Internet of things required for chemists It will cover the following topics: • History of Internet of Things (IoT) • Definition of IoT • Applications : Industry 4.0, circular economy • IoT architectures • Fog/Edge/Cloud computing
16/06/2026 9h-12h (OCA) 3. Data acquisition protocols and technologies for IoT	**Objective:** This part presents data acquisition protocols and technologies for IoT We will take a look at the key concepts of IoT • IoT Technologies • Data acquisition protocols like SPI, I2C • Sensors • Actuators
18/06/2026 9h-12h (JSA) 4. Fundamentals of Programming	**Objective:** This part gives a general overview of programming in Python with the goal of using it for data analysis The student will be able to get an overview of • Fundamentals of Python programming • Manipulation of files, especially reading, writing and modifying text files and CSV/TSV and JSON files • Interaction with the user

	• Data Analysis (basic) using built-in Python methods
22/06/2026 9h-12h (JSA) 5. Data Analysis and visualization	**Objective:** This part gives the fundamentals of data analysis and visualization It will cover the following topics • Clustering algorithms • Classification algorithms • Linear regression models • Recommender systems • Visualization techniques
23/06/2026 9h-12h (OCA) 6. Practical session on Microcontrollers	**Objective:** This part gives a hands-on experience on the microcontrollers The student will be able to perform the following • Coding, compiling and flashing a firmware for microcontroller • Interacting with sensors and actuators using SPI and I2C protocols • Reading digital and analog measures
25/06/2026 14h-17h (JSA) 7. Data Mining	**Objective:** This part gives an opportunity to the students to use data mining tools We will look at the following topics: • Introduction of Python libraries like numpy, matplotlib and pandas • Manipulating CSV and JSON files using the above libraries • Data analysis • Data visualization techniques for different types of data • Clustering, classification and linear regressing using the library Scikit-learn.
26/06/2026 9h-12h (OCA) 8. Network protocols for IoT	**Objective:** This part gives an introduction to the network protocols for data communication We will cover the following topics • Network protocols like LPWAN and WPAN • Message exchange protocols like MQTT
29/06/2026 9h-12h (OCA) 9. Scaling up IoT	**Objective:** This part introduces ways to scale up the IoT architectures

	The students will discover • The challenges while scaling up IoT • IoT Lab infrastructure
29/06/2026 14h-17h (JSA) 10. Machine Learning	**Objective:** This part gives an introduction to machine learning techniques We will cover the following topics • Supervised, unsupervised and semi-supervised learning • Neural network models including single and multilayered perceptron • Analysis of sensor data • Image analysis • Prediction • Recognition of handwriting
30/06/2026 9h-12h (OCA) 11. Practical session on IoT-Lab	**Objective:** This part introduces ways to use message and network protocols for IoT lab The students will work on • LoRa WAN • MQTT
02/07/2026 9h-12h (JSA) 12. Big Data	**Objective:** This part will introduce the key concepts of Big Data Following are the topics covered in this module: • 5V of Big Data • Data storage of voluminous data, especially non-relational databases • Artificial Intelligence • Open databases and extraction of information
06/07/2026 9h-11h (OCA-JSA) Evaluation	Final exam of two hours based on all the topics covered in this module.