ISEN YNCREA MEDITERRANEE

ENGLISH TAUGHT COURSES

FULL CATALOG

2023

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SPECIALIZATION - Information and Communication Technologies

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR**
ECTS	3
COURSE TITLE	**WebDevJava + Project**
PREREQUISITES	Understanding object oriented programming and its concepts; basic language; Java classes and objects; inheritance and polymorphism.
LEARNING OUTCOMES	Become more efficient with Java concepts and be able to write an application which collects data from the web.
COURSE CONTENT	This course is about digging deeper avec the introduction course to Java. More concepts studied with more details. More API packae used. Key words: Collections,Log4J, Slf4j, I/O java system, Google map API, XML, SAX, Dom, PullParser, Services Web, Interface executor, Runnable Interface.
ASSESSMENT METHOD	Written exam and project.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR**
ECTS	3
COURSE TITLE	**Kotlin + Project**
PREREQUISITES	Basics of object-oriented programming, Java.
LEARNING OUTCOMES	Learn the foundation of Android Architecture and be able to program an application on android platform.
COURSE CONTENT	Each subject covered is accompanied by a theoretical course and an implementation through a mini project. Thus the project is built by always following the same procedure: creation of the gradle script then import into the IDE. In this way, the student has a compilation and execution mechanism independent of the IDE to processe his learning into practice. The topics covered are: - how variables and functions work in kotlin - the mechanisms of a class in Kotlin (primary and secondary constructor) - control structures in Kotlin - Lambdas in Kotlin - Extensions in Kotlin - build mechanisms via gradle - GUI design (SWING framework) + MVC design pattern, - event logging (Log4J2) - network resource usage and retrieval in kotlin objects (via data class), - management of asynchronism (via coroutines)
ASSESSMENT METHOD	Written exam and project.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	1
COURSE TITLE	**Database**
PREREQUISITES	Beginner knowledge of datatypes and database.
LEARNING OUTCOMES	The objective of this course is to acquire sufficient competency to design relationnal database from client request. When models are done, the student will use the scripting in order to create the database into the tool through SQL script. In the second time, he will manipulate the data contains into database et he will be able to gather and aggregate data in order to provide them to third interface.
COURSE CONTENT	Main Chapters: Database history and usage information Database modlees initiation with Merise method. Design by using MCD, MLD and MPD SQL queries . database creation by script, data manipulation (INSERT, UPDATE, DELETE, SELECT) Function creation and usage Triggers initiation Stored procedure initiation Part of course is done on PC by student (SQL Express)
ASSESSMENT METHOD	Written exams and practical work assessment.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**Linux Shell O.S.**
PREREQUISITES	Knowledge in at least one procedural programing language - be able to differentiate interprated language versus compiled one.
LEARNING OUTCOMES	Know the basics of LINUX operating system and a first set on shell command. Know how to write a shell script to automatise and capitalize on operations in the operating system.
COURSE CONTENT	Main chapters: Introduction to the LINUX operating system, Introduction to SHELL (first commands), SHELL language (control structures, iterations, variables, etc. , SHELL scripts, SHELL tools.
ASSESSMENT METHOD	Written exam and practical work assessment.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**Artificial Intelligence**
PREREQUISITES	Basic knowledge of C language.
LEARNING OUTCOMES	Master base concepts of Artificial Intelligence and related know-how of : Genetic algorithms, Reinforcement learning, Decision tree and branch pruning.
COURSE CONTENT	Main chapters: Artificial Intelligence introduction, Genetic algorithms, Reinforcement learning, Decision tree and branch pruning.
ASSESSMENT METHOD	Written exams.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	1
COURSE TITLE	**Development Platform (GIT)**
PREREQUISITES	Basic knowledge of Web development and network.
LEARNING OUTCOMES	The course aims to introduce to the basic tools of programming like automation of compilation process and versioning.
COURSE CONTENT	Main chapters: Introduction, Cmake, Subversion, GIT.
ASSESSMENT METHOD	Practical work assessment.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Pyhton - AI Application**
PREREQUISITES	Basic notions in applied probabilities theory and mathematic optimization.
LEARNING OUTCOMES	Be able to perform a full analysis of a database, as in: prepare the database for the analysis, perform descriptive statistics, understand the importance of separating data, know how to identify problems (regression versus classification) from the variable to study, know how to set up a regression/classification algorithm by choosing the appropriate Python library, know how to analyse the output of a supervised learning algorithm, know how to evaluate the quality and predictive power of a model, know how to compare one or more different models (with many different types of parameters), know how to identify improvement possibilities of a model.
COURSE CONTENT	This course is about learning artificial intelligence (& Data science) and the Python programing language. It has 2 main parts: The first part is a lecture containing some theoretical exercises (treated during the course in the form of interactive tutorials) and practical work on a machine (aimed at learning the language of Python programming). This course, after an initiation phase and/or Python programming refresher, starts with a quick introduction to Syllabus cycle Master BDD Course 11 Data Science with reminders of probability and statistics. Then, the course focuses on supervised learning algorithms in presenting in detail the simple and multiple linear regression before to attack the classification algorithms. Classification algorithms binary such as the "k nearest neighbours", logistic regression or even the Naïve Bayes are presented or recalled. The Perceptron algorithm is presented after a more formal introduction to artificial intelligence. The concepts of deep learning and error backpropagation are quickly mentioned throughout the presentation of the Perceptron multilayer. Multi-class classification algorithms and strategies are also presented. For each of these learning algorithms supervised, at least one illustration example on a dataset is presented in Python. Finally, a summary of good practices for the analysis complete database is presented. The second part of the course focuses on a Project carried out in the form of TP (with a database and a specialty-oriented topic for each Option or groups of Options). The project, which covers all major aspects of the course, implements theoretical and practical skills taught in the first part.
ASSESSMENT METHOD	Report and Practical work assessment.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	4
COURSE TITLE	**Web development**
PREREQUISITES	Fundamentals on HTML5, CSS3, JavaScript.
LEARNING OUTCOMES	Learning medium to advanced knowledge on well-known JavaScript libraries.
COURSE CONTENT	This lecture presents widely used JavaScript libraries like AngularJS, NodeJS or jQuery. The purpose is to understand the architecture of Web applications bases on those libraries.
ASSESSMENT METHOD	Written exam, practical work assessment and project.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Systems programming**
PREREQUISITES	Fundamentals on operating systems UNIX, LINUX.
LEARNING OUTCOMES	During this training, participants learn to develop the SHELL scripts necessary for the operation and administration of a system. The course begins with learning simple scripts to automate common commands. It continues by adding menus, functions, user interactions, and conditional logic elements. At the end of this training, the participants will be able to understand the different initialisation scripts and create their hands, allowing the automation of daily tasks.
COURSE CONTENT	Main chapters: The role of the shell Features of different shells File processing commands (tr, sort, uniq, head, tail, ...) The order reminder Wildcards Escape characters Overview of special characters Redirects The tubes (pipe) The principle Executions shebang Shell Options Development The right rules for designing a script The structure of a script Variables (types, creation, advanced manipulation) Arrays (initialization, advanced manipulation) The environment customization files (the profile, ...)
ASSESSMENT METHOD	Practical work assessment.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Network**
PREREQUISITES	Layered model (OSI and DoD) IPv4 and routing Frame Switching and Routing
LEARNING OUTCOMES	Understand and implement VLANs using manageable switches Architect and implement simple filtering or packet handling rules under different systems (firewalls) NAT and maskerading Filtering and firewalling Analyze traces and solve complex problems using a packet dissector (Wireshark) Understand encryption and the different types of VPNs, implement them Basics of symmetric and asymmetric encryption IPsec OpenVPN (routed or bridged) Wireguard Implement network equipment monitoring with SNMP
COURSE CONTENT	Deepening of the network concepts covered in the previous years. Introduction to security mechanisms and network reliability. Implementation of LAN security technologies (VLAN, firewall, encryption, etc.). Reminders Typology of networks OSI model Internet Protocol (IP) LAN architecture Spanning Tree VLAN Security NAT Firewall ¦ Linux Netfilter/iptables ¦ Linux Netfilter/nftables Cryptography ¦ Public key ¦ Secret key ¦ VPN Trouble-shooting Monitoring Debugging
ASSESSMENT METHOD	Written assessment and report.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	
COURSE TITLE	**Cloud computing and vitualization**
PREREQUISITES	Syllabus is being updated, please contact international-mediterranee@yncrea.fr
LEARNING OUTCOMES	
COURSE CONTENT	
ASSESSMENT METHOD	

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Language Security Programming**
PREREQUISITES	Fluency with at least one programming language.
LEARNING OUTCOMES	Goroutines, await/async, undefined behavior, and SMT solvers, all in one module!
COURSE CONTENT	Many, many programming languages are in active use, and many more have been created. What makes them different, especially security wise? Why can't anyone agree on them? This module will help you answer this question, and then gives an overview of good security practices in the field of software engineering. You will also learn a cool new language!
ASSESSMENT METHOD	To be defined.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Parallel computing techniques (Technical Parallelization)**
PREREQUISITES	Basic C language.
LEARNING OUTCOMES	Master threading, vectorial calculation, CPU instructions sequencing and opening to others possible sources.
COURSE CONTENT	Learn how to use multiple parallelism sources in a modern computer, from the CPU to the highest layer of the system: threading, vector computing, CPU instructions scheduling, opening to GPGPU and others.
ASSESSMENT METHOD	Written exam.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	1
COURSE TITLE	**API**
PREREQUISITES	Basic knowledge in computer science, basic understanding of HTML and CSS, basic notions of JavaScript (first steps in JavaScript module and JavaScript objects).
LEARNING OUTCOMES	Get familiar with API, what they can allow to do and how to use them in the code.
COURSE CONTENT	Main chapters: Introduction, How API works, API management.
ASSESSMENT METHOD	To be defined.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Micro Service deployment**
PREREQUISITES	Fundamentals on operating systems, networks and software architecture.
LEARNING OUTCOMES	Learning fundamentals and medium knowledge on Microservices architecture.
COURSE CONTENT	This lecture presents the concept and use of Micro-Services architecture. The practice is provided as a complete solution implementation and deployment.
ASSESSMENT METHOD	Written exam and project.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	4
COURSE TITLE	**Web Technologies level 1 / Web Technologies level 2**
PREREQUISITES	HTLM / CSS. Javascript or other web langage is a plus.
LEARNING OUTCOMES	Be able to build a simple Angular application linked to an existing REST API.
COURSE CONTENT	Learn Angular bases, the Google's frontend. Able to manage components, services, routing and understand the observables.
ASSESSMENT METHOD	Project / Written test.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR** **MASTER**
ECTS	5
COURSE TITLE	**Technical Project (Fall)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**AWS Fundation (introduction)**
PREREQUISITES	Familiarity with general networking concepts • A working knowledge of multi-tier architectures • Familiarity with cloud computing concepts.
LEARNING OUTCOMES	Upon completion of this course, students will be able to do the following: • Define the AWS Cloud • Explain the AWS pricing philosophy • Identify the global infrastructure components of AWS • Describe the security and compliance measures of the AWS Cloud, including AWS Identity and Access Management (IAM) • Create a virtual private cloud (VPC) by using Amazon Virtual Private Cloud (Amazon VPC) • Demonstrate when to use Amazon Elastic Compute Cloud (Amazon EC2), AWS Lambda, andAWS Elastic Beanstalk • Differentiate between Amazon Simple Storage Service (Amazon S3), Amazon Elastic Block Store (Amazon EBS), Amazon Elastic File System (Amazon EFS), and Amazon Simple Storage Service Glacier (Amazon S3 Glacier) • Demonstrate when to use AWS database services, including Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon Redshift, and Amazon Aurora • Explain the architectural principles of the AWS Cloud • Explore key concepts related to Elastic Load Balancing, Amazon CloudWatch, and Amazon EC2 Auto Scaling
COURSE CONTENT	AWS Academy Cloud Foundations is intended for students who seek an overall understanding of cloud computing concepts, independent of specific technical roles. It provides a detailed overview of cloud concepts, AWS core services, security, architecture, pricing, and support.
ASSESSMENT METHOD	Written exam

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**AWS Operations (BigData, ML, AI)**
PREREQUISITES	AWS Academy Cloud Operations requires a strong foundation in IT concepts and skills. To ensure success, students should have: • Completed AWS Academy Cloud Foundations or have equivalent experience • A working knowledge of at least one scripting language
LEARNING OUTCOMES	This course teaches students how to: • Understand AWS infrastructure as it relates to system operations, such as global infrastructure, core services, and account security • Use the AWS Command Line Interface (AWS CLI), and understand additional administration and development tools • Manage, secure, and scale compute instances on AWS • Manage, secure, and scale configurations • Identify container services and AWS services that are available for serverless computing. • Manage, secure, and scale databases on AWS • Build virtual private networks with Amazon Virtual Private Cloud (Amazon VPC) • Configure and manage storage options using the storage services offered with AWS • Monitor the health of your infrastructure with services such as Amazon CloudWatch, AWS CloudTrail, and AWS Config • Manage resource consumption in an AWS account by using tags, Amazon CloudWatch, and AWS Trusted Advisor • Create and configure automated and repeatable deployments with tools such as Amazon Machine Images (AMIs) and AWS CloudFormation
COURSE CONTENT	AWS Academy Cloud Operations is designed to prepare participants to pursue entry-level DevOps, support, and cloud operations roles. It will also help prepare them to take the AWS SysOps Administrator – Associate exam. Emphasizing best practices in the AWS Cloud and recommended design patterns, this course will teach students how to solve problems and troubleshoot various scenarios. The course will show students how to create automatable and repeatable deployments of networks and systems on AWS and covers specific AWS features and tools related to configuration and deployment. With case studies and demonstrations, students will learn how some AWS customers design their infrastructures and implement various strategies and services. Students will also have the opportunity to build a variety of infrastructures via guided, hands-on activities.
ASSESSMENT METHOD	Written exam.

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	3
COURSE TITLE	**AWS Architecture**
PREREQUISITES	Familiarity with general networking concepts • A working knowledge of multi-tier architectures • Familiarity with cloud computing concepts.
LEARNING OUTCOMES	Upon completion of this course, students will be able to: • Make architectural decisions based on AWS architectural principles and best practices • Use AWS services to make infrastructure scalable, reliable, and highly available • Use AWS managed services to enable greater flexibility and resiliency in an infrastructure • Increase performance and reduce cost of a cloud infrastructure built on AWS • Use the AWS Well-Architected Framework to improve architectures that use AWS solutions
COURSE CONTENT	AWS Academy Cloud Architecting covers the fundamentals of building IT infrastructure on AWS. The course teaches students how to optimize use of the AWS Cloud by understanding AWS services and how they fit into cloud-based solutions.
ASSESSMENT METHOD	Certification (upon completion of the other AWS module).

SEMESTER	FALL
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**IBM Blumix**
PREREQUISITES	Development knowledge (javascript) Applications architecture REST APIs Command Line Interface
LEARNING OUTCOMES	Understand the different infrastructure services available on IBM Cloud. Access IBM Cloud using graphical interfaces, command line tools, and APIs. Discover appropriate IBM Cloud services available to deliver specific functionality. Articulate the different ways IBM Cloud delivers services to developers and operational teams. Summarize core groups of available database, integration, analytics, artificial intelligence, and DevOps services. Use Node-Red to develop applications in order to solve some logical challenges using IBM Cloud Services. Understand how to use these technologies in a real project
COURSE CONTENT	This course introduces you to the IBM Cloud. You will learn about the many offerings and services on IBM Cloud. The course begins with an introduction to the IBM Cloud platform which covers topics such as data center locations and configuring identity and access management. You will discover the various Infrastructure-as-a-Service (IaaS) options available on IBM Cloud. Next, you will learn about the deployment options on IBM Cloud; this includes topics such as Containers, Kubernetes, and OpenShift. You will also become familiar with IBM Cloud services such as Databases, Artificial Intelligence and Watson, Blockchain, Internet of Things, and many others. In addition to presentations, you will also see demos of various IBM Cloud features and services in action, as well as perform a lot of hands-on labs to gain practical experience with IBM Cloud at no charge. This course is of interest to anyone who wants to be a cloud practitioner and use Cloud skills as developers, architects, system engineers, network specialists, and many other roles. The material also serves the needs of those who perform the tasks of advising, building, moving, and managing cloud solutions. Throughout the course, students complete tests on the Cognitive Class platform, which allows them at the end of the course to obtain an IBM Cloud certification.
ASSESSMENT METHOD	Overview Tooling TP Challenge 1 Infrastrucure + Quizz TP Deploying applications + Quizz TP

SEMESTER	SPRING
SPECIALIZATION	Information and Communications Technology
LEVEL	BACHELOR
ECTS	10
COURSE TITLE	**Project in Laboratory**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	This module allows the student to carry out research work within one of the laboratories of the school.
COURSE CONTENT	Project shall contain a literature review on the topic relate to the research. The topic can be tailored to serve the learning outcome desired.
ASSESSMENT METHOD	Experimental tests and Result analysis assessment.

SEMESTER	SPRING
SPECIALIZATION	Information and Communications Technology
LEVEL	MASTER
ECTS	10
COURSE TITLE	**Technical Project (Spring)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SEMESTER	SPRING
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Native mobile development level 1**
PREREQUISITES	Basic knowledge in programming and object oriented programming.
LEARNING OUTCOMES	Have the basic knowledge of Android development and be able to develop an app that can be published on the google play store.
COURSE CONTENT	Creating an Android application using Android Studio Build a user interface in xml Interaction between activity and layout Webservice call to retrieve information from an API Handle persistent data
ASSESSMENT METHOD	Practical work assessment

SEMESTER	SPRING
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Native mobile development level 2**
PREREQUISITES	Course: Native mobile development level 1
LEARNING OUTCOMES	Learn how to develop an android app as a team like in a company.
COURSE CONTENT	Making a social network application as a team presented in class Design and development of their own application.
ASSESSMENT METHOD	Home work

SEMESTER	SPRING
SPECIALIZATION	Information and Communications Technology
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Native mobile development application**
PREREQUISITES	Course: Native mobile development level 1 Course: Native mobile development level 2
LEARNING OUTCOMES	
COURSE CONTENT	Project relative to the 2 courses about Native mobile development.
ASSESSMENT METHOD	

SPECIALIZATION – Internet Of Things

SEMESTER	FALL
SPECIALIZATION	Internet of Things
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	5
COURSE TITLE	**Technical Project (Fall)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SEMESTER	FALL
SPECIALIZATION	Internet of Things
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**UML Systems Architecture**
PREREQUISITES	Fundamentals on object-oriented programming, basics on Java language.
LEARNING OUTCOMES	Learning fundamentals and medium knowledge of UML formalism.
COURSE CONTENT	This lecture presents the use of UML modelling language for object-oriented programming: use cases diagrams, class diagrams, and code generation from the models. The practice is provided as a complete use case using Modelio software.
ASSESSMENT METHOD	To be defined.

SEMESTER	FALL
SPECIALIZATION	Internet of Things
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**IOT Hardware Architecture**
PREREQUISITES	Digital electronics, architecture.
LEARNING OUTCOMES	Learn how ARM processors work and how they are designed.
COURSE CONTENT	This lecture introduces the industrial design of processors by describing the ARM architecture.
ASSESSMENT METHOD	Practical work.

SEMESTER	FALL
SPECIALIZATION	Internet of Things
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**RTOS**
PREREQUISITES	Basics of C programming language, STM32.
LEARNING OUTCOMES	Understand and master RTOS system types.
COURSE CONTENT	Main chapters: Real-time operating systems. Why real time. Critical zone and mutual exclusion. Tasks. Communication and priorities. Communication between tasks. Queue management. Exclusives ressources management with semaphores and/or mutexes.
ASSESSMENT METHOD	Written exam.

SEMESTER	FALL
SPECIALIZATION	Internet of Things
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Batteries**
PREREQUISITES	Basic knowledge in embedded system and C language for embedded systems.
LEARNING OUTCOMES	The main objective of this course is to be able to develop a device for the Internet of Things whose autonomy is several years when it is powered by a button cell type battery (CR2032). That implies manage to have an average consumption of less than 100 µW, which requires a mastery of very low energy consumption modes in embedded systems.
COURSE CONTENT	The course begins with an introduction to devices for the internet objects to have notions of their levels of consumption on industrial applications where the autonomy is several years. Next a handling of the embedded systems takes place, to know the different modes of operation of microcontrollers and in particular standby modes. Finally, a project is carried out to measure the consumption of the different applications with the aim of achieving the lowest possible consumption by minimally managing the peripherals of the microcontrollers.
ASSESSMENT METHOD	Report.

SEMESTER	FALL
SPECIALIZATION	Internet of Things
LEVEL	**MASTER**
ECTS	1
COURSE TITLE	**Network and IOT Network**
PREREQUISITES	Layered model (OSI and DoD) IPv4 and routing Frame Switching, Ethernet Digital wireless signal processing (modulation, error correction, etc.)
LEARNING OUTCOMES	Distinguish the differences between IPv4 and IPv6 Understanding the IPv6 protocol suite Analyze the uses of IPv6 in the context of the IoT
COURSE CONTENT	Introduction to IPv6 networks in the context of the Internet of Things Implementation of IPv6 on a simulated network Brief reminders The IPv6 protocol suite Differences with IPv4 The different classes of IPv6 addresses IPv6 companion protocols (ICMPv6, NDP, etc) The uses of IPv6 in the context of the IoT
ASSESSMENT METHOD	Assessement / Practical work / Report.

SEMESTER	SPRING
SPECIALIZATION	Internet of Things
LEVEL	**BACHELOR**
ECTS	10
COURSE TITLE	**Project in Laboratory**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	This module allows the student to carry out research work within one of the laboratories of the school.
COURSE CONTENT	Project shall contain a literature review on the topic relate to the research. The topic can be tailored to serve the learning outcome desired.
ASSESSMENT METHOD	Experimental tests and Result analysis assessment.

SEMESTER	SPRING
SPECIALIZATION	Internet of Things
LEVEL	**MASTER**
ECTS	10
COURSE TITLE	**Technical Project (Spring)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SPECIALIZATION - Electronics

SEMESTER	FALL
SPECIALIZATION	Electronics
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**Embedded system introduction and data BUS**
PREREQUISITES	No specific prerequisites.
LEARNING OUTCOMES	Know the data bus in embedded system, their characteristics, their differences, their added value and constraint.
COURSE CONTENT	Part 1 - Embedded Systems - Basics 1) Overview 2) Processors 3) Architectures 4) Tools and Peripherals 5) Terms Part 2 - Embedded Data Buses 1) Overview 2) Internal buses 3) External buses 4) Dedicated buses
ASSESSMENT METHOD	Written exam.

SEMESTER	FALL
SPECIALIZATION	Electronics
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**Labview Introduction**
PREREQUISITES	Basics in algorithm, have a computer with LabVIEW2021 installed.
LEARNING OUTCOMES	Learn basics about National instruments LabVIEW and be able to use it in full autonmy and realize small projects.
COURSE CONTENT	Environment, create your first application, debugging, using loops, creating data structures, using decision-making structures, modularity, acquisition, accessing files, using state-based design.
ASSESSMENT METHOD	Written exam.

SEMESTER	FALL
SPECIALIZATION	Electronics
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**Labview FPGA**
PREREQUISITES	Know the environment LabVIEW and communication principles of low level.
LEARNING OUTCOMES	Create an application LabVIEW FPGA over module my RIO.
COURSE CONTENT	Introduction Chap 1: Introduction to LabVIEW FPGA Chap 2: Getting Started with LabVIEW FPGA Chap 3 : Programming using LabVIEW FPGA Chap 4: Using FPGA I/O Chap 5: Timing in LabVIEW FPGA VIs Chap 6: Executing code in Singe-Cycle Times Loops Chap 7: Signal Processing Chap 8: Sharing Data on FPGA Chap 9 : Synchronizing FPGA Loops and I/O Chap 10: Modular Programming Chap 11: Communicating Between FPGA and Host
ASSESSMENT METHOD	Practical work assessment.

SEMESTER	FALL
SPECIALIZATION	Electronics
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	3
COURSE TITLE	**Labview Certification Practice**
PREREQUISITES	Completed course LabVIEW Introduction and FPGA.
LEARNING OUTCOMES	Learn about Split of device/edge/clouds roles - practice for certification.
COURSE CONTENT	Theory and practice to validate the knowledge needed to pass the certification of first level: Certified LabVIEW associate Developer (CLAD).
ASSESSMENT METHOD	Certification exam.

SEMESTER	FALL
SPECIALIZATION	Electronics
LEVEL	**BACHELOR** **MASTER**
ECTS	5
COURSE TITLE	**Technical Project (fall)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SEMESTER	FALL
SPECIALIZATION	Electronics
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**STM32 Level 1**
PREREQUISITES	C laguage
LEARNING OUTCOMES	ARM Cortex • Understand code execution • Understand internal blocks (NVIC, CPU, Bus) STM32 • CubeIDE use • HAL library programming • Use peripherals Langage C • Syntax & principles • Run a finite state machine
COURSE CONTENT	Students will discover ARM cortex processors and microcontroller-related principles through practice and lecture. They will use the Nucleo STM32L152RE demo board which embeds the STM32 MCU (Low power family). The goal is to understand code execution & hardware principles. They will configure registers through HAL library given by manufacturer to implement peripherals-related principles (Clock tree, GPIO, Timers, SPI). C test, ARM Cortex, STM32, Chaser (GPIO), Chaser IT (Timer, NVIC), Buzzer (PWM Timer), Pong project (EXTI, FSM)
ASSESSMENT METHOD	Practical work.

SEMESTER	FALL
SPECIALIZATION	Electronics
LEVEL	**MASTER**
ECTS	1
COURSE TITLE	**Communication Protocol**
PREREQUISITES	Syllabus is being updated, please contact international-mediterranee@yncrea.fr
LEARNING OUTCOMES	
COURSE CONTENT	
ASSESSMENT METHOD	

SEMESTER	FALL
SPECIALIZATION	Electronics
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Manufacturing process**
PREREQUISITES	Fundamental physics 1st cycle (Electrostatics, Magnetostatics), Physics of semiconductors (materials, conductivity, PN junction). Fundamental mathematics (linear and differential equations). Fundamental logic functions.
LEARNING OUTCOMES	Calculation of the fundamental parameters in order to obtain the main characteristics under DC and AC operation in CMOS technologies related to SPICE models. Distinguish between patterns of resistance integrated, diffusions, diodes and level transistors using the main semiconductor materials and topologies. Build the cells Elementary CMOS using VTn, VTp, IOnn/IOnp, Tox parameters for the different types of inverters (static charge, depletion, charge saturated, speudo NMOS and CMOS) and node-dependent intervals technology defined by the parameters [Vdd, Lg, Tox]. Make the design of digital cells for any function based on the CMOS principle in dynamic operation.
COURSE CONTENT	Chapter 1 - PART A : Conception of Digital Circuits 1. General introduction to technology scaling and production of IC's, scenario from silicon bulk (1960) to the last generations with FinFETs and Gate-AllAround (GAA), Carbon nanotubes (CNT). 2. Different families of devices and application types depending of speed and consumption 3. Principle of CMOS operation: from single gate to complex functionalities, voltage operation distinction between N-channel and P-channel devices 4. The different trends of microelectronics, SiGe, Strained Si, Double gate and FinFET, MEM's, organic and molecular electronics towards nanoelectronics Chapter 1 - PART B : Resistivity and Doping 1. Resistance and resistivity, Resistance per square, first design of integrated resistor 2. Diffused resistance, contacts and interconnections, influence of the doping 3. High integrated resistance and resistance calculation for any resistance shape 4. Measure of resistivity – 4 probe measurements Conclusions Chapter 2 : MOS (Métal-Oxide-Semiconductor) CAPACITANCE Syllabus cycle Master Embdd Cours 44 1. Introduction to the MOS capacitance structure and its uses for CCD, EEPROM and MOSFETs

	2. Basics on band diagrams build-up of the MOS structure: different regions of operations, influences of the gate type, flat-band voltage, the effects of main defects (interface traps and oxide charges) 3. Calculation of carrier concentrations (majority/minority carriers): simplified model 4. Theoretical electrostatics calculation: charge conservation, Poisson equation, electric field and space charge region extension 5. C – V Measurements: basic principle, frequency dependence and influence of main defects on the electrical characteristics 6. Summary of main C-V parameters with scaling dimensions Chapter 3 : MOSFET Transistors used for Digital Applications 1. The MOSFETs o The transistor architecture and layout o Operating regimes as a function of voltage conditions o Different types of MOSFET as a function of gate, channel types and threshold voltage 2. Region of operation and I-V characteristics as a function of VGS, VDS o From linear mode to saturation mode (SPICE Lev.1) o IDS current at any VDS : Memelinck techniques, analytical and graphical resolutions, influence of back bias VB (REV vs. FWD), effect of transistor type NMOS vs. PMOS 3. Extraction of the basic transistor parameters o Transistor gains: transconductance, conductance and bulk transconductance, small signal analysis (1st modeling without capacitances) o Sub-VT Ids-Vgs characteristics, effect of VDS and LG on IOff by Drain Induced Barrier Lowering (DIBL) o Threshold voltage VT extraction and influence of the doping profile, Short Channel Effect (SCE) and Narrow Channel Effect (NCE), effective channel length and width o Mobility Reduction with vertical field (SPICE Lev.1), 1st modeling with Gm extraction Conclusions Chapter 4 : The BASIC GATES 1. The CMOS digital logic inverter - Goals o Generalities on Voltage Transfer Characteristics (VTC): Golden rules and definition of threshold voltage for logic input/output operation (VIH, VOH, VIL, VOL) o Noise margins 2. Different inverter types: VTC analysis, layout, analytical and graphical descriptions (Memelinck Technique) o Passive load o Saturated load o Depletion load o Speudo NMOS and dynamic load with CMOS inverters Conclusions

	Chapter 5 : The Digital Model: From Static Logic Gates to Dynamic operation 1. The Digital Model • Goals and first approach : • Resistive effects • Capacitance effects • Small signal modeling • temporal parameters 2. Dynamic characteristics: Syllabus cycle Master Embdd Cours 44 • Inverter capacitance • Propagation time, • Factor of merit • 2 coupled inverters modeling and layout, • Chain of inverter gates, ring oscillators (ROs) and buffer optimization 3. Principle of CMOS gates and their switching voltage condition: • NAND gates • NOR gates • XOR and XNOR gates • Application to any logic functions 4. Summary and Final conclusions: What you have learnt in this course... Prospects
ASSESSMENT METHOD	Written exam

SEMESTER	SPRING
SPECIALIZATION	Electronics
LEVEL	BACHELOR
ECTS	10
COURSE TITLE	**Project in Laboratory**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	This module allows the student to carry out research work within one of the laboratories of the school.
COURSE CONTENT	Project shall contain a literature review on the topic relate to the research. The topic can be tailored to serve the learning outcome desired.
ASSESSMENT METHOD	Experimental tests and Result analysis assessment.

SEMESTER	SPRING
SPECIALIZATION	Electronics
LEVEL	MASTER
ECTS	10
COURSE TITLE	**Technical Project (Spring)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SEMESTER	SPRING
SPECIALIZATION	Electronics
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Physics of components**
PREREQUISITES	Basic quantum physics Electrocinetics
LEARNING OUTCOMES	Summary of intended learning outcomes: Understanding of the physics phenomena leading to currents in devices, the way to control them and basic calculations of currents in devices. - Basics in Physics of Solids - Understanding of the interest of semiconductors in the realization of electronic components - Control the transport mechanisms and physical phenomena governing the operation of components of electronics.
COURSE CONTENT	Starting from the electronic structure of atoms and molecules, we study the properties of solids from their electronic band structure. This analysis leads to metal/insulator/semiconductor definition. Then we focus on the case of semiconductors, and the optical and electrical properties in intrinsic/extrinsic (doped) materials. Basic principles of physics of devices are presented: electronic and hole currents, equilibrium in heterogeneous structure, space charge layer, PN junction, field effect, metal semiconductor contacts, heterostructures… Physical phenomena implied in device operation out of equilibrium are described (radiative / non radiative recombination, light absorption, conduction mechanisms, barriers) and equations leading to current calculation are derived (minority carrier equation) and then solved in some basic cases. Lectures 1. From atomic levels to band structure / free electron gas model 2. The secrets of band structure of solids and its link to electronic properties Crystallography, insulating, semiconducting and conducting materials 3. What is a semiconductor? How can we dope them? 4. Devices: a full set of equations at equilibrium : space charge layer at interfaces 5. Devices: a trial for solutions out of equilibrium Tutorials: 1. Crystallography: direct and reciprocal lattice 2. Band structure of a 1D AB2 crystal 3. Free carrier density vs boundary condition and comparison to DRUDE model – Band structure of a crystal 4. Abrupt/Linear graded PN junction under equilibrium conditions

	5. Statistics of a bi-dimensional semiconductor (electron and hole density calculations 6. Absorption of light in a volumic semiconductor 7. Generation and diffusion currents in a PN photo-diode under illumination
ASSESSMENT METHOD	Written test.

SEMESTER	SPRING
SPECIALIZATION	Electronics
LEVEL	**MASTER**
ECTS	2
COURSE TITLE	**Modelisation of the components**
PREREQUISITES	1st cycle Fundamental Physics (Electrostatics, Magnetostatics), Semiconductior Physics (material, conductivity, PN junction). Fundamental mathematics (linear system equations, differential equations). Fundamental logic operation.
LEARNING OUTCOMES	Calculation of fundamental parameters to obtain the main electrical characteristics under DC and AC operation in CMOS technologies in relation to SPICE Modeling. Distinguish between integrated resistors, diffusion, diodes, and transistor levels using main semiconductor materials and topologies. Build-up CMOS cells using the VTn, VTp, IOnn/IOnp, Tox parameters for the different types of inverter cells (static load, déplétion load, saturation load, speudo NMOS and CMOS) depending on the technology node defined by the parameter set [Vdd, Lg, Tox]. To design adapted digital cells for a given function in CMOS principle under dynamic operation.
COURSE CONTENT	This lecture aims the conception of elementary digital cells pointing out the strong links between electrical static parameters and dynamic parameters with the physical parameters related to semiconductor processing used for integrated circuit fabrication of last CMOS nodes (from gate-length Lg= 0.5µm under supply voltage Vdd= 5V to 22nm under 0.85V). At the end of this course, the students will know how to determine the main parameters involved in DC performances for CMOS nodes (VT, IOn, IOff, Gm, Gd, Pdc) in addition to dynamique operation (Pac, Fac, tau_n, tau_p, Cload). They will know how to realize single logic functions using CMOS technologies (NAND, NOR, XOR, NO, Ring oscillators) with help of corresponding schematics . Reinforcement is done on scaling effects onto electrical parameters for N-channel and P-channel transistors, the build-up of any logic functions with CMOS gates and how to use the main parameters given by SPICE models 1-3, in order to obtain electrical characteristics from these devices to the digital cells. Chapter 1 - PART A : Conception of Digital Circuits 1. General introduction to technology scaling and production of IC's, scenario from silicon bulk (1960) to the last generations with FinFETs and Gate-All-Around (GAA), Carbon nanotubes (CNT). 2. Different families of devices and application types depending of speed and consumption 3. Principle of CMOS operation: from single gate to complex functionalities, voltage operation distinction between N-channel and P-channel devices 4. The different trends of microelectronics, SiGe, Strained Si, Double gate and FinFET, MEM's, organic and molecular electronics towards nanoelectronics

	Chapter 1 - PART B : Resistivity and Doping 1. Resistance and resistivity, Resistance per square, first design of integrated resistor 2. Diffused resistance, contacts and interconnections, influence of the doping 3. High integrated resistance and resistance calculation for any resistance shape 4. Measure of resistivity – 4 probe measurements Conclusions Chapter 2 : MOS (Métal-Oxide-Semiconductor) CAPACITANCE 1. Introduction to the MOS capacitance structure and its uses for CCD, EEPROM and MOSFETs 2. Basics on band diagrams build-up of the MOS structure: different regions of operations, influences of the gate type, flat-band voltage, the effects of main defects (interface traps and oxide charges) 3. Calculation of carrier concentrations (majority/minority carriers): simplified model 4. Theoretical electrostatics calculation: charge conservation, Poisson equation, electric field and space charge region extension 5. C – V Measurements: basic principle, frequency dependence and influence of main defects on the electrical characteristics 6. Summary of main C-V parameters with scaling dimensions Chapter 3 : MOSFET Transistors used for Digital Applications 1. The MOSFETs o The transistor architecture and layout o Operating regimes as a function of voltage conditions o Different types of MOSFET as a function of gate, channel types and threshold voltage 2. Region of operation and I-V characteristics as a function of VGS, VDS o From linear mode to saturation mode (SPICE Lev.1) o IDS current at any VDS : Memelinck techniques, analytical and graphical resolutions, influence of back bias VB (REV vs. FWD), effect of transistor type NMOS vs. PMOS 3. Extraction of the basic transistor parameters o Transistor gains: transconductance, conductance and bulk transconductance, small signal analysis (1st modeling without capacitances) o Sub-VT Ids-Vgs characteristics, effect of VDS and LG on IOff by Drain Induced Barrier Lowering (DIBL) o Threshold voltage VT extraction and influence of the doping profile, Short Channel Effect (SCE) and Narrow Channel Effect (NCE), effective channel length and width o Mobility Reduction with vertical field (SPICE Lev.1), 1st modeling with Gm extraction Conclusions Chapter 4 : The BASIC GATES 1. The CMOS digital logic inverter - Goals

	o Generalities on Voltage Transfer Characteristics (VTC): Golden rules and definition of threshold voltage for logic input/output operation (VIH, VOH, VIL, VOL) o Noise margins 2. Different inverter types: VTC analysis, layout, analytical and graphical descriptions (Memelinck Technique) o Passive load o Saturated load o Depletion load o Speudo NMOS and dynamic load with CMOS inverters Conclusions Chapter 5 : The Digital Model: From Static Logic Gates to Dynamic operation 1. The Digital Model • Goals and first approach : • Resistive effects • Capacitance effects • Small signal modeling • temporal parameters 2. Dynamic characteristics: • Inverter capacitance • Propagation time, • Factor of merit • 2 coupled inverters modeling and layout, • Chain of inverter gates, ring oscillators (ROs) and buffer optimization 3. Principle of CMOS gates and their switching voltage condition: • NAND gates • NOR gates • XOR and XNOR gates • Application to any logic functions 4. Summary and Final conclusions: What you have learnt in this course... Prospects
ASSESSMENT METHOD	Assessment after tests / Written test.

SPECIALIZATION - BioTechnology

SEMESTER	FALL
SPECIALIZATION	Biotechnology
LEVEL	**BACHELOR** **MASTER**
ECTS	5
COURSE TITLE	**Technical Project (Fall)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SEMESTER	FALL
SPECIALIZATION	Biotechnology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**Biomedical**
PREREQUISITES	Basics of biology, basics of electronics, basics of computer science.
LEARNING OUTCOMES	Understand the legal and ethical framework surrounding: E-health and connected medicine, CNO recommendations, the societal and economic challenges of E-health (care pathways, medical applications, telemedicine).
COURSE CONTENT	Introduction - The application of information and communication technologies Level 1 - Electronic medical record (EMR) - Electronic health record (EHR) - Personal health record (PHR) - Personal health management & wellness - Diagnostics and triage - Virtual care and Telemedicine - Remote monitoring - Data and Analytics Medical Devices Level 1 - Medical devices vs. Medicine - Classification - Examples Miniaturized devices Level 1 - Electronics… Evolutions toward nano electronics - Evolutions toward MEMS - Evolutions toward microfluidics - Evolutions toward bioMEMS - Medical tricorder: Scanadu - Medical tricorder: Viatom - Medical tricorder: Cloud DX - MEMS or BioMEMS - Biocompatibility - Biosensors - Actuators - MEMS optical endoscopes - MEMS endoscopes - E-skin - Drug delivery - Cardiac balloon catheters Cell sensing Level 1
ASSESSMENT METHOD	Report.

SEMESTER	FALL
SPECIALIZATION	Biotechnology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**BioInformatics (Bio statistics)**
PREREQUISITES	Syllabus is being updated, please contact international-mediterranee@yncrea.fr
LEARNING OUTCOMES	
COURSE CONTENT	
ASSESSMENT METHOD	

SEMESTER	FALL
SPECIALIZATION	Biotechnology
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	2
COURSE TITLE	**E-Health Introduction**
PREREQUISITES	Syllabus is being updated, please contact international-mediterranee@yncrea.fr
LEARNING OUTCOMES	
COURSE CONTENT	
ASSESSMENT METHOD	

SEMESTER	SPRING
SPECIALIZATION	Biotechnology
LEVEL	MASTER
ECTS	2
COURSE TITLE	**Image Processing**
PREREQUISITES	Basic knowledge about signal processing theory.
LEARNING OUTCOMES	Be able to process images and or use filters.
COURSE CONTENT	Determination of the constituent elements of an image Procedure to modify it Filter creation Processing and Analysis
ASSESSMENT METHOD	Practical work assessment.

SEMESTER	SPRING
SPECIALIZATION	Biotechnology
LEVEL	BACHELOR
ECTS	10
COURSE TITLE	**Project in Laboratory**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	This module allows the student to carry out research work within one of the laboratories of the school.
COURSE CONTENT	Project shall contain a literature review on the topic relate to the research. The topic can be tailored to serve the learning outcome desired.
ASSESSMENT METHOD	Experimental tests and Result analysis assessment.

SEMESTER	SPRING
SPECIALIZATION	Biotechnology
LEVEL	**MASTER**
ECTS	10
COURSE TITLE	**Technical Project (Spring)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SPECIALIZATION – Smart Energy

SEMESTER	FALL
SPECIALIZATION	Smart Energy
LEVEL	**BACHELOR** **MASTER**
ECTS	5
COURSE TITLE	**Technical Project (Fall)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SEMESTER	FALL
SPECIALIZATION	Smart Energy
LEVEL	**MASTER**
ECTS	4 + 2
COURSE TITLE	**Ocean + AI & Ocean**
PREREQUISITES	Knowledge in Python and STM32.
LEARNING OUTCOMES	***Online course *** Get familiar with smart energies (mecanical and chemical) and embedded system, Learn how to do the mechanical design of autonomous primary systems, learn how to integrate smart application and power sourcing systems to monitor efficiently the environment, learn how to integrate mecanical and chemical sensors, get familiar with environmental instruments and learn how to submit a bid to a proposal request for the design of a weather station.
COURSE CONTENT	- Future vision of autonomous and remote observation technologies - Underwater vehicle control in remote applications - Underwater design considerations for underwater vehicles Group work and presentation.
ASSESSMENT METHOD	Report and homework.

SEMESTER	SPRING
SPECIALIZATION	Smart Energy
LEVEL	**MASTER**
ECTS	10
COURSE TITLE	**Technical Project (Spring)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SPECIALIZATION – Business

SEMESTER	FALL
SPECIALIZATION	Business
LEVEL	**BACHELOR** **MASTER**
ECTS	5
COURSE TITLE	**Technical Project (Fall)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SEMESTER	SPRING
SPECIALIZATION	Business
LEVEL	**MASTER**
ECTS	10
COURSE TITLE	**Technical Project (Spring)**
PREREQUISITES	Basic knowledge of project management & technical course related to the project topic.
LEARNING OUTCOMES	Put in practice technical courses and project management knowledge.
COURSE CONTENT	This course consists of a technical project that students must carry out with the help of their tutor.
ASSESSMENT METHOD	Project acceptance assessment.

SPECIALIZATION – SHES (Social, Human and Economical Sciences)

SEMESTER	FALL
SPECIALIZATION	SHES
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	1
COURSE TITLE	**Agility**
PREREQUISITES	Interests or competency in project management.
LEARNING OUTCOMES	Understand and be able to apply quickly the principles of Agile project management.
COURSE CONTENT	Agility principles and agility in the corporate world. Main chapters: AGILE fundamentals, SCRUM and KANBAN, AGILE vs Agility, AGILE within a company (implementation).
ASSESSMENT METHOD	Written exam.

SEMESTER	FALL
SPECIALIZATION	SHES
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	1
COURSE TITLE	**UX Design**
PREREQUISITES	None
LEARNING OUTCOMES	Bring attention onto the user experience. Emphasize the importance of interaction with the users/customers when developing a product or service. Share methodologies and processes that serves this in project management.
COURSE CONTENT	This course will unfold like a project with a common thread for all students to guide them throu the course. Main chapters: User Observations (Interviews management, Problem identification, Personas), Design Thinking (process, Business cases, First Prototype), UX Design & Pitch (key principles, Lean, Demo) Pivot Management and lean startup are common approaches.
ASSESSMENT METHOD	Will depend on the instructor.

SEMESTER	FALL
SEMESTER	SPRING
SPECIALIZATION	SHES
LEVEL	**BACHELOR** (only if pre-requisites are fully met) **MASTER**
ECTS	1
COURSE TITLE	**Project Management**
PREREQUISITES	None
LEARNING OUTCOMES	The objective of this course is to give students sufficient notions for the correct management of a project from its initiation to its closure.
COURSE CONTENT	Main chapters include: - What a project is as a whole - The roles and responsibilities of each persons involved in the project - Applicable procedures - Reporting and communication - Closing a project
ASSESSMENT METHOD	Will depend on the instructor.

LANGUAGE COURSES

SEMESTER	FALL
SEMESTER	SPRING
SPECIALIZATION	Language courses
LEVEL	**BACHELOR** **MASTER**
ECTS	2
COURSE TITLE	**French for foreign students**
PREREQUISITES	Beginner to B1 in French.
LEARNING OUTCOMES	Students will aim to reach B2 or Higher level to be able to follow courses in French.
COURSE CONTENT	Learn the basics or improve your grammar and pronunciation, learn more vocabulary, and speak up!
ASSESSMENT METHOD	Will depend on the instructor.

SEMESTER	FALL
SEMESTER	SPRING
SPECIALIZATION	Language courses
LEVEL	**BACHELOR** **MASTER**
ECTS	2
COURSE TITLE	**English**
PREREQUISITES	Beginner or B2 depending on the course level chosen.
LEARNING OUTCOMES	Reach B2 or C1 or more depending on the course level.
COURSE CONTENT	Learn the basics or improve your grammar and pronunciation, learn more vocabulary, and speak up!
ASSESSMENT METHOD	Will depend on the instructor.

SEMESTER	FALL
SEMESTER	SPRING
SPECIALIZATION	Language courses
LEVEL	**BACHELOR** **MASTER**
ECTS	2
COURSE TITLE	**Spanish**
PREREQUISITES	Beginner to B2.
LEARNING OUTCOMES	To be defined with the teacher.
COURSE CONTENT	Learn the basics or improve your grammar and pronunciation, learn more vocabulary, and speak up!
ASSESSMENT METHOD	Will depend on the instructor.

SEMESTER	FALL
SEMESTER	SPRING
SPECIALIZATION	Language courses
LEVEL	**BACHELOR** **MASTER**
ECTS	2
COURSE TITLE	**Japenese**
PREREQUISITES	Beginner to B2.
LEARNING OUTCOMES	To be defined with the teacher.
COURSE CONTENT	Learn the basics or improve your grammar and pronunciation, learn more vocabulary, and speak up!
ASSESSMENT METHOD	Will depend on the instructor.

SEMESTER	FALL
SEMESTER	SPRING
SPECIALIZATION	Language courses
LEVEL	**BACHELOR** **MASTER**
ECTS	2
COURSE TITLE	**Italian**
PREREQUISITES	Beginner to B2.
LEARNING OUTCOMES	To be defined with the teacher.
COURSE CONTENT	Learn the basics or improve your grammar and pronunciation, learn more vocabulary, and speak up!
ASSESSMENT METHOD	Will depend on the instructor.

SEMESTER	FALL
SEMESTER	SPRING
SPECIALIZATION	Language courses
LEVEL	**BACHELOR** **MASTER**
ECTS	2
COURSE TITLE	**German**
PREREQUISITES	Beginner to B2.
LEARNING OUTCOMES	To be defined with the teacher.
COURSE CONTENT	Learn the basics or improve your grammar and pronunciation, learn more vocabulary, and speak up!
ASSESSMENT METHOD	Will depend on the instructor.