GRANDE ÉCOLE D'INGÉNIEURS

ISEN
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COURSE CATALOGUE

Brest and Nantes Campuses

Classes taught in English
for International Exchange Students

Academic year 2021 - 2022

Dear International Student,

Welcome to ISEN Yncréa Ouest and thank you for choosing us as your study abroad destination!

The ISEN International Student Course Catalogue provides you with the list of classes taught in English at our two campuses in Brest and Nantes. The catalogue is designed to help you choose your preferred modules for your study abroad semester. It gives you a brief outline of the class content and assessment components and specifies the number of class hours, the estimated student workload and the ECTS credits to be awarded upon successful completion of the class.

Campus locations and course choices

Please note that it is not possible to combine courses taught in Brest with those taught in Nantes. You must choose all your classes at the same campus.

For **2021-22** and **2022-23,** we currently offer classes taught in English for the following programmes:

Study period	Campus	Level of study	Study programme(s)
Fall Semester 2021	Brest	Master 2	Marine Technologies Electrical Engineering Computer Science and IoT
Spring Semester 2022	Nantes	Year 3	Informatics & Digital electronics
Fall Semester 2022	Brest	Master 2	Marine Technologies Electrical Engineering Computer Science and IoT
Fall Semester 2022	Nantes	Year 3	Physics & Mathematics tools Informatics & Digital electronics
Spring Semester 2023	Nantes	Year 3	Informatics & Digital electronics

Choosing your courses – how does the ISEN programme relate to your home university course?

ISEN Yncréa Ouest is a 'Grande Ecole' Engineering School. We offer an engineering programme with a focus on Computer Science and a range of specialised electives in applied Digital Technologies.

The particularity of the French 'Grande Ecole' system is that it does not deliver a bachelor degree. Full-time French students take a 5 year programme which leads to the award of a Master's degree. In the first two years, French students take post high school 'preparatory' classes which qualify them to proceed on to the Engineering degree programme from the 3rd year onwards. In France, the Master's level begins in the 4th year of study after high school and lasts for two years. The 3rd Year in an Engineering School is an intermediary year between Bachelor and Master's level studies.

Which ISEN courses are suitable for your level of study?

At ISEN, exchange students can enrol **either** in 3rd Year IT and Computer Science classes in Nantes **or** in Master's level specialised electives in Brest.

Bachelor degree exchange students: you should choose from the 3rd year courses in Nantes

Master's degree exchange students: your home degree course will have a specialised area of interest. Our **2nd year Master's classes** are ISEN elective courses which should be appropriate for both **1st and 2nd Year Master's students from other institutions**.

In all cases, please check **the prerequisite knowledge** in order to determine if the class is suitable for your level of study. If you have any questions about this, don't hesitate to contact the ISEN International Relations Coordinator for more information.

How do I make my course choices?

Unless you have specific exemptions from your home university coordinator, you should aim to choose enough classes to obtain **30 ECTS credits for the semester**. We offer a range of scientific classes in which you will study with French students, and a range of French language and cross-cultural awareness classes which are available only for International students. Please note that some course choice restrictions apply:

In Nantes: Exchange students can choose any of the courses on the list provided.

In Brest: Exchange students must first choose one of our 3 Elective topics (*Marine Technologies*, *Electrical Engineering* or *Computer Science and IoT*) and then choose from the course list available in that Elective. If you wish, you may replace **one** module in your preferred Elective list by **one** module in the Management module list.

French language and cross-cultural classes are available at both the Brest and Nantes campuses each semester. Exchange students may choose as many of these modules as they wish. These classes are for international students only and are suitable for both Bachelor and Master level students

ADDITIONAL COURSE INFORMATION

Scientific project modules – learning by doing - applying theory to real-life contexts

ISEN project classes are capstone courses designed to enable students to gain hands-on experience of conducting a scientific research or design project in accordance with real-life technical specifications and deadlines. Students are required to draw upon their full range of scientific and technical knowledge and learn to develop their project management, teamwork and intercultural skills by working in small groups of mixed nationality participants. Each team is supervised by faculty staff specialised in the relevant domain.

French language and Cross-cultural Skills classes for International Students

International exchange students may also choose to take French language and cross-cultural skills classes designed specifically to help them make the most of the cultural experience of studying in France. These classes are appropriate for both Bachelor and Master's degree students.

No previous knowledge of French is required for French language classes. Students will take a level test at the start of the semester so that groups can be organised according to the level of the attendees.

An important part of your study abroad semester is discovering the culture and way of life in your chosen host country. At ISEN Yncréa Ouest, we aim to provide our exchange students with an enriching cultural experience in which they not only study and socialise with French students, but are also helped to reflect meaningfully on their cross-cultural experience as exchange students, and become actively involved in community service actions and special internationally-focused events which bring them into contact with a wider range of French people.

We hope you will enjoy reading this course catalogue. If you have any questions regarding the ISEN curriculum, course content, prerequisite knowledge or any other academic matter, please contact me at the email address given below.

We look forward to welcoming you here at ISEN Yncréa Ouest in the near future!

Lynn Andrews

Head of International Relations lynn.andrews@isen-ouest.yncrea.fr

BREST CAMPUS: FALL SEMESTER 2021: Overview of courses available

ELECTIVE: Computer Science and IoT	Course code	ECTS
Advanced electronics for telecommunication	IOTET-512EN	3
Laboratory in IoT-based LoRa deployment	IOTLO-512EN	3
Image processing	IOTIP-512EN	3
Deep learning	IOTDL-512EN	3
Mobile development	IOTMD-512EN	3
Java web development	IOTJW-512EN	3
Java framework	IOTJF-522EN	3
Laboratory project	IOTLP-514EN	9
ELECTIVE: Electrical Engineering	**Codes**	**ECTS**
Electrical machines and drives	ELEEM-522EN	3
Renewable energy technologies	ELERT-512EN	3
Electric propulsion	ELEEP-512EN	3
1 module from the Computer sciences and IoT track	IOT__-___EN	3
Laboratory project	ELELP-514EN	9
ELECTIVE: Marine Technologies	**Codes**	**ECTS**
Oceanography	MRTOC-512EN	2
Marine observatories	MRTMO-512EN	3
Underwater instrumentation and communication	MRTUI-512EN	3
Renewable energy technologies	ELERT-512EN	3
Laboratory project	MRTLP-514EN	9
MANAGEMENT Optional modules	**Codes**	**ECTS**
Project management	MANPM-512EN	3
Competitive Strategy	MANCS-512EN	3
Corporate Social Responsibility	MANSR-522EN	3
Digital Technology & Sustainability	MANSU-003EN	3
French Language & Cross-Cultural Awareness: Brest and Nantes	**Codes**	**ECTS**
French language beginner (A1)	HFRLA-000FR	3
French language intermediate (B1)	HFRLA-002FR	3
French civilization	HFRCI-003FR	3
How to work effectively with the French: a cross-cultural approach	HFRXW-003EN	3
Cross-cultural engagement project	HFREP-003EN	3
Laboratory project: cross-cultural debrief for international students	HFRXL-003EN	3

ISEN Yncréa Ouest

BREST CAMPUS

MASTER 2

ELECTIVE COURSES

Fall Semester 2021

Fall Semester 2022

ISEN Yncréa Ouest

BREST CAMPUS

MASTER 2

ELECTIVE COURSE: Computer Science and IoT

Fall Semester 2021

Fall Semester 2022

Advanced Electronics For Telecommunications				
Year: 2021-22	**Programme:** COMPUTER SCIENCE AND IoT			
Class code: IOTET-512EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Maher Jridi				

Pre-requisites: Basis of digital electronics. Solid understanding of the design with FPGAs. Some knowledge of VHDL and C/C++ languages.

Learning outcomes: At the end of the course, the student should be able to:

- understand the role of electronic components used for radio receivers,
- take not of the new trends related to software defined radio (SDR),
- classify and dimension radio receiver architectures,
- understand the system on programmable chip contribution for telecommunications,
- create, package, customize IP and design and profile system performance,
- design of some functional blocks used for new radio receiver systems.

Course description: The topics covered in this class are:

Radio receivers:

- history and fundamental of radio receiver architectures
- main characteristics of 2G/3G/4G receiver architectures
- definition of receiver parameters
- use case: on the dimensioning of Bluetooth receiver

SoPC design:

- Xilinx SoPC hardware and software environments
- use of Vivado and Vivado HLS suite for fast IP design
- advanced use of HLS directives

The laboratories will include the design of functional blocks used for new radio receiver systems. Past years, labs have included the design of direct digital synthesizer (DDS), digital filters, channel coding. Applications are drawn broadly from IEEE standardization committees.

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	8
Practical activities	22
Independent study	
Estimated personal workload	30
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Theoretical written exam	1	40%
Other assignments		
Labs evaluation	4	50%
Total		**100%**

Recommended reading:

- Jridi, M. and AlFalou, A. "Direct Digital Frequency Synthesizer with CORDIC Algorithm and Taylor Series Approximation for Digital Receivers," *European Journal for Scientific Research*, Vol.30, No.4, 2009, pp. 542-553. ISSN 1450-216X
- Radio Engineering, from software radio to cognitive. Edited by Jacques Palicot, SUPELEC/IETR, Rennes, France
- Xilinx labs for design on zynq platforms

Internet Resources:

- https://www.xilinx.com/support/university/vivado/vivado-workshops.html

Note: This information is non-binding and can be subject to change

Laboratory in IoT-based LoRa Deployment				
Year: 2021-22		**Programme:** COMPUTER SCIENCE AND IoT		
Class code: IOTLO-512EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Maher Jridi				

Pre-requisites: Basis of digital electronics. Some basic knowledge on Linux administration or embedded Linux.
Learning outcomes: At the end of the course, the student should be able to:

- understand the ecosystem of IoT,
- characterize LPWAN (Low Power Wide Area Network) technologies,
- understand the radio LoRa modulation,
- dimension and design several solutions based on LoRa gateways,
- program data management with MQTT protocol and data visualization.

Course description: The topics covered in this class are:

Introduction to IoT:

- introduction to IoT ecosystem,
- overview of the enabling technologies behind the IOT,
- getting familiar with programming on raspberry-pi,

Definition of LoRa and LoRaWAN:

- definition of LPWAN (Low Power Wide Area Network),
- demystifying LoRa and LoRaWAN
- description of LoRa modulation with Matlab

Solution deployment:

- deploy LoRa based-IoT solution using Kerlink Gateway and industrial sensors
- deploy LoRa based-IoT solution using IMST Gateway
- deploy low-cost LoRa based-IoT solution using pycom sensor and gateway
- use of TTN, MQTT, Cayenne, VM for solution enhancement

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	6
Practical activities	24
Independent study	
Estimated personal workload	30
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Theoretical written exam	1	20%
Other assignments		
Labs evaluation	4	70%
Total		**100%**

Recommended reading:

- Maher Jridi, Thibault Chapel, Victor Dorez, Guénolé Le Bougeant, Antoine Le Botlan, "SoC-based Edge Computing Gateway in the Context of Internet of Multimedia Things: Experimental Platform", Journal of Low Power Electronics and Applications 2018, 8(1), 1
- Project IOT-OPEN.EU – Innovative Open Education on IoT: improving higher education for European digital global competitiveness. Erasmus+ disclaimer
- MOOC from LoRaWAN Academy: https://lora-developers.semtech.com/resources/lorawan-academy/courses/
- MOOC inria. Internet of Things with Microcontrollers: a hands-on course. https://www.fun-mooc.fr/courses/course-v1:inria+41020+session01/info

Note: This information is non-binding and can be subject to change

Image Processing				
Year: 2021-22		**Programme:** COMPUTER SCIENCE AND IoT		
Class code: IOTIP-512EN				
Level: Master	**Year**: 2	**Period**: Fall	**Language of instruction**: English	**ECTS**: 3
Lecturers: Dr Napoléon, Dr Jridi, Dr Al Falou				

Learning outcomes: At the end of the course, the student should be able to:

- understand the basis of image processing techniques and pattern recognition
- distinguish the different approaches for image and video compression and be able to compare their performance
- develop applications for image enhancement, features detection and features extraction
- be aware of the constraints linked to data variation as well as performance issues

Course description: This course is designed to provide an overview of image processing, compression algorithms and pattern recognition. It explains how to implement image enhancement, transformation, filtering and edge detection methods, how to distinguish the different approaches for image and video compression and how to compare their performance. Instruction will be given to set up detection and pattern recognition techniques and understand the constraints linked to data variation as well as performance issues.

- Image processing:
    - Introduction, human perception, color, contrast enhancement, sampling: application to watermarking
    - Thresholding, edge detection, labeling, mathematical morphology: application to projective transformation
    - Geometric transformations and filtering: application to deconvolution
- Image and video coding: introduction, principles of bitrate reduction (compression), HEVC and H264 format, performance measurements, simulations, application to the comparative study of JPEG, JPEG2000, HEVC and H264 formats
- Pattern recognition:
    - Face detection using the Viola & Jones method using Haar descriptors
    - Shape recognition methods by optical correlation: VLC, JTC, PoF
    - Recognition methods with invariance to: lighting, position, setup
    - Similarity and performance measures: PCE, ROC curves

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	30
Independent study	
Team project	20
Estimated personal workload	10
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Theoretical test	2	60%
Practical test	1	40%
Total		**100%**

Recommended reading:

- **Digital Image Processing** - Rafael C. Gonzalez et Richard E. Woods (Global Edition 2017)
- **Learn OpenCV 4 by Building Projects (Second Edition)** - David Millán Escrivá, Vinícius G. Mendonça et Prateek Joshi (Packt Publishing 2018)
- **Pattern Recognition And Machine Learning** - Christopher M. Bishop (Springer)

Note: This information is non-binding and can be subject to change

Deep Learning				
Year: 2021-22		**Programme:** COMPUTER SCIENCE AND IoT		
Class code: IOTDL-512EN				
Level: Master	**Year**: 2	**Period**: Fall	**Language of instruction**: English	**ECTS**: 3
Lecturer: Dr Napoléon, Dr Sedgh Gooya				

Pre-requisites: Algorithms, Python, Image processing

Learning outcomes: At the end of the course, the student should be able to:

- understand the theoretical principle of a neural network and its learning step
- choose the different parameters of a neural network to fit a given application
- distinguish the difference between machine learning, neural network and deep neural network
- develop neural network architecture and implement it using deep learning framewor*k*

Course description: This course is designed to provide an overview of machine learning using neural networks. It explains the fundamental principles of a neural network and how it learns. It studies the mathematical concepts allowing to implement the backpropagation of the gradient. Instruction will be given to develop neural network architecture and to implement it using deep learning frameworks.

- Neural Network:
    - Perceptron: human brain, artificial neuron, transfer functions, error correction, error measurement
    - Multilayer perceptron: principle, backpropagation, softmax, batch-processing, learning rate decay, implementation

- Deep Neural Network:
    - Convolutional neural networks: data processing, convolution layer (feature extractor), pooling layer, correction layer (ReLU), classification layer
    - Details of the different layers: dimensions, filters, steps, offset
    - Different architectures: CNN, auto-encoder, GAN, software implementation with standard frameworks
    - Transfer learning: principle, total fine-tuning, partial fine-tuning

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	30
Independent study	
Team project	20
Estimated personal workload	10
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Theoretical test	**1**	60%
Practical test	**1**	40%
Total		**100%**

Recommended reading:

- **Pattern Recognition And Machine Learning** - Christopher M. Bishop (Springer)
- **Perceptrons An Introduction to Computational Geometry** - Marvin Minsky (MIT Press)
- **Deep Learning**- Ian Goodfellow, Yoshua Bengio et Aaron Courville (MIT Press)

Note: This information is non-binding and can be subject to change

Mobile Development				
Year: 2020-21		**Programme:** COMPUTER SCIENCE AND IoT		
Class code: IOTMD-512EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Jean-Pierre Gerval				

Pre-requisites:

Good knowledge of HTML, CSS, and JavaScript languages. Skills in Java programming are welcome.

Learning outcomes:

At the end of the course, the student should be able to:

- Implement a mobile web application by exploiting the new features offered by HTML 5, CSS, and JavaScript.
- Implement a mobile application using a framework to target natively different types of OS: Android, iOS ...

Course description:

The topics covered in this class are:

HTML 5

- Specificities: Drawing on Canvas, Video and audio streaming, Drag and Drop, Geolocation, Text-to-speech, Offline storage (manifest, Local Storage, Session Storage, Web SQL)
- Reminders on responsive design concepts
- Application to mobile development (project)

PhoneGap & Cordova

- Introduction to PhoneGap & Cordova Frameworks
- Installation of tools and discovering features
- Application to mobile development (project)

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	6
Practical activities	24
Independent study	
Estimated personal workload	30
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Team written report	2	30%
Project evaluation	2	60%
Total		**100%**

Recommended reading:

- JavaScript and HTML5 Now by Kyle Simpson
- PhoneGap By Example by Andrey Kovalenko
- Apache Cordova 4 Programming (Mobile Programming) by John M. Wargo

Internet Resources:

- https://www.w3.org/TR/html52/
- https://phonegap.com/getstarted/

Note: This information is non-binding and can be subject to change

Java Web Development				
Year: 2021-22		**Programme:** COMPUTER SCIENCE AND IoT		
Class code: IOTJW-512EN				
Level: Master	**Year: 2**	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Jean-Pierre Gerval				

Pre-requisites:

Good knowledge of Java programming. Skills in the field of Data Bases are welcome.

Learning outcomes:

At the end of the course, the student should be able to know how to carry out a complete web application project with J2EE (Java Enterprise Edition) technology.

Course description:

The topics covered in this class are:

- Tomcat (Servlet Engine): presentation, installation
- Servlet: architecture, life cycle, examples
- JSP (Java Server Pages): architecture, life cycle, syntax, examples
- JSF (Java Server Faces): Installing the API, Life cycle, MVC (Model View Controller) architecture, syntax, examples

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	8
Practical activities	22
Independent study	
Estimated personal workload	30
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Team written report	1	30%
Project evaluation	1	60%
Total		**100%**

Recommended reading:

- Developing Enterprise web Applications in J2EE by Selvi Sellappan

Internet Resources:

- http://www.servlets.com/jservlet2/examples/
- http://www.tutorialspoint.com/jsp/index.htm
- http://www.tutorialspoint.com/jsf/

Note: This information is non-binding and can be subject to change

Java Frameworks				
Year: 2021-22	**Programme:** COMPUTER SCIENCE AND IoT			
Class code: IOTJF-512EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Mr. Grégory Roué				

Pre-requisites:

Good knowledge of Java programming and Java Web Development (J2EE).

Learning outcomes:

At the end of the course, the student should be able to know how to use functionalities of Spring and Hibernate frameworks in the context of creating web applications with J2EE technology.

Course description:

The topics covered in this class are:

Application development with Spring:

- Concept of software architecture, the lightweight Spring container, advanced techniques, Aspect Oriented Programming (AOP)

Web development with Spring MVC (Model View Controller):

- Initialization of Spring MVC, Controllers, JSP (Java Server Pages), JSTL (Java server page Standard Tag Library), JSTL FMT (Formatting Tag Library), Forms management

Persistence with Hibernate:

- Introduction to Hibernate, manipulation of Entity objects, relations between Entity objects, the HQL language, Session interface and Criteria object, integration with Spring

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	6
Practical activities	24
Independent study	
Estimated personal workload	30
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Quiz	1	40%
Team written report	1	10%
Project evaluation	1	40%
Total		**100%**

Recommended reading:

- Spring Security in Action by Laurentiu Spilca
- Java Persistence with Hibernate 2nd Edition by Christian Bauer

Internet Resources:

Note: This information is non-binding and can be subject to change

Laboratory project				
Year: 2021-22		**Programme:** COMPUTER SCIENCE AND IoT		
Class code: IOTLP-514EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 9
Lecturers: Dr Jean-Pierre Gerval and Dr. Maher Jridi				

Pre-requisites: Computer science courses

Learning outcomes: At the end of the laboratory project, students should be able to:

- Master project management: customer needs, feasibility study, project planning, execution, monitoring & control, reporting and deliverables
- Carry out a software project for application in research or industrial
- Perform development, conduct experiment, and test their project using software and hardware engineering tools
- Apply theoretical concepts and hands-on activities that will get students familiarized with different aspects of low-power long-range IoT technologies.

Course description: Projects offered to students change annually given the academics needs and industrial partnerships.

Course content: Non-exhaustive list of past projects:

- Students will develop a demonstrator of common types of cybersecurity attacks and hacking ...
- Students will develop an augmented reality service on smartphone allowing to associate several pieces of sugar to a food product by scanning the product barcode
- Students will develop an E-commerce web site in order to sell and to send personalized postcards using client's pictures
- Student can develop some new use cases to be integrated of the Living Lab demonstrator of L@bISEN. The Living Lab has been initially designed to maintain elderly persons by using smart cameras designed to fall detection and avoidance. The Living Lab include several sensors capable to capture data and process it to the dedicated servers.
- Student may also use the French FIT IoT Lab platform. One of the theoretical study that can be held is about the study of effect of massive IoT use in the context of smart environment or the effect of the deployment of certain modulation types on data rate, SNR, RSSI and other intrinsic parameters.
- Some part of the laboratory project may be proposed by industrial partner. Student could help to realize a part of industrial project.

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Project presentation and supervision	20
Independent study	
Team project	120
Estimated personal workload	40
Total student workload	**180 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all project meetings	10%
Other assignments		
Team written report	1	40%
Team oral presentation	1	30%
Demonstration	1	20%
Total		**100%**

Recommended reading:
The bibliography will be given at the beginning of the project

Internet Resources:
The resources will be given at the beginning of the project

Note: This information is non-binding and can be subject to change

ISEN Yncréa Ouest

BREST CAMPUS

MASTER 2

ELECTIVE COURSE: Electrical Engineering

Fall Semester 2021

Fall Semester 2022

A student who chooses the Electrical Engineering elective will have to choose a module from the elective “Computer Science & IoT” in addition to those described hereafter.

Electrical machines and drives				
Year: 2020-21		**Programme:** ELECTRICAL ENGINEERING		
Class code: ELEEM-512EM				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Yassine AMIRAT				

Pre-requisites:

Basic circuits and systems theory

Learning outcomes:

At the end of the course, the student should be able to:

- Describe the fundamental parts of electrical drives including converter, electrical machine and load.
- Explain the operating principles of induction machines, synchronous machines, switched reluctance machines and brushless dc machines
- Identify parameters in models of electrical machines.
- Analyze the steady-state behavior of electrical machines in rotor / stator reference frames
- Design a control loop in an electric drive (simulation and lab works)

Course description:

The topics covered in this class are:

- Overview of electric machines and drives
- Fundamentals of electromechanical devices (Flux linkage/current relationships, Energy, co-energy Calculation of forces and torques)
- Fundamentals of power electronics and control theory
- Synchronous machines
- Induction machines
- Brushless DC machines, Switched reluctance Machines
- Industrial applications (motoring and generating mode)

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	20
Practical activities	12
Independent study	
Estimated personal workload	28
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Team written report	4	40%
Project evaluation	1	50%
Total		**100%**

Recommended reading:

Mohan, Electric Machines and Drives: A First Course, Wiley & Sons, Inc., Hoboken, New Jersey 2011.

P.C. Sen, Principles of Electric Machines and Power Electronics, 3rd Edition, Wiley, 2013.

Note: This information is non-binding and can be subject to change

Renewable Energy Technologies				
Year: 2021-22		Programme: ELECTRICAL ENGINEERING		
Class code: ELERT-512EN				
Level: Master	**Year**: 2	**Period**: Fall	**Language of instruction**: English	**ECTS**: 3
Lecturer: Dr Zhibin ZHOU				

Pre-requisites:

Basic knowledge of electrical power conversions

Learning outcomes:

At the end of the course, the student should be able to:

- Understand power conversion and control in a renewable power system (wind, PV and marine current generation).
- Implement electrical machines and power converters in a renewable power system.

Course description:

The topics covered in this class are:

- Power conversions in wind / marine current generation
- Power conversion in solar energy (PV)
- Different generator types in wind and marine current power system
- Power converters (DC/DC, AC/DC and DC/AC) for a renewable power system
- Simulation of a marine current turbine generation system via MATLAB/Simulink (Project)

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	30
Practical activities	
Independent study	
Estimated personal workload	30
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Team written report	2	40%
Project evaluation	1	50%
Total		**100%**

Recommended reading: Electric Renewable Energy Systems, Muhammad H.Rashid, ELSEVIER Inc., 2016

Note: This information is non-binding and can be subject to change

Electric Propulsion				
Year: 2021-22	**Programme:** ELECTRICAL ENGINEERING			
Class code: ELEEP-512EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Zhibin ZHOU				

Pre-requisites:

Basic knowledge of electrical machines and electrical powers

Learning outcomes:

At the end of the course, the student should be able to:

- Size an electrical propulsion system for electrical vehicles, train and boat.
- Implement electrical machines and energy storage system for an electrical propulsion system.

Course description:

The topics covered in this class are:

- Characteristics of electrical and hybrid propulsion
- Mechanical forces required for a propulsion system
- Different electrical machines used in a propulsion system
- Sizing an electrical machine (speed and torque) for an electrical propulsion system
- Simulation for the electrical propulsion part via MATLAB/Simulink

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	20
Practical activities	
Independent study	
Estimated personal workload	40
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Team written report	2	40%
Project evaluation	1	50%
Total		**100%**

Recommended reading:

Electric Machinery (seventh edition), Fritzgerald & Kingsley, McGRAW-HILL INTERNATIONAL EDITION, 2014

Note: This information is non-binding and can be subject to change

Laboratory project				
Year: 2021-22		**Programme:** ELECTRICAL ENGINEERING		
Class code: ELELP-514EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 9
Lecturer: Dr Yassine Amirat				

Pre-requisites: Electrical engineering courses, computer sciences

Learning outcomes: At the end of the laboratory project, the students should be able to:
- Master project management: customer needs, feasibility study, project planning, execution, monitoring & control, reporting and deliverables
- Carry out an electrical engineering project for application in research or industrial
- Perform measurements, conduct experiment and test their project in research laboratory

Course description: Projects offered to students change annually given the academics needs and industrial partnerships.

Course content: Non-exhaustive list of projects. With the support of the research group, an the laboratory facilities:

- The students will develop and implement a machine current signature analysis (MCSA) algorithm for a condition monitoring system. The students will use their knowledge on signal processing combined with artificial intelligence and machine learning to provide an innovation fault detection and diagnosis system for electrical machines.
- The students will develop an underwater inductive contactless power transfer (ICPT) system for AUV charging purpose.
- The students will develop a software for optimal sizing and control of a hybrid power generation system for rural electrification.
- The students will develop and implement a grid tied converter and investigated various control algorithms in highly varying power production context.

The students will be able to do some tests on a dedicated test rig for renewable energy converter emulation.

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Project presentation and supervision	20
Independent study	
Team project	120
Estimated personal workload	40
Total student workload	**180 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all project meetings	10%
Other assignments		
Team written report	1	40%
Team oral presentation	1	30%
Demonstration	1	20%
Total		**100%**

Recommended reading:
The bibliography will be given at the beginning of the project
Internet Resources:
The resources will be given at the beginning of the project

Note: This information is non-binding and can be subject to change

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BREST CAMPUS

MASTER 2

ELECTIVE COURSE: Marine Technologies

Fall Semester 2021

Fall Semester 2022

Oceanography				
Year: 2021-22		**Programme:** MARINE TECHNOLOGIES		
Class code: MRTOC-512EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 2
Lecturer: Dr Thierry Huck				

Pre-requisites: None
Learning outcomes: At the end of the course, the student should be able to understand physical oceanography, ocean movements, waves & tides and physical processes.

Course description:
The topics covered in this class are the ocean and physical oceanography i.e. the study of physical conditions and physical processes within the ocean.

The course is intended for students wishing to acquire terminologies, discover technologies and instruments compatible in a harsh environment, with the constraints of the maritime domain.

The aim of this course is to allow the students to understand the interest of measurements, the need for environmental acquisition systems and the main objectives of oceanographic cruises.

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	12
On-board session	3
Independent study	
Estimated personal workload	15
Total student workload	**30 hours**

Course structure and workload

Physical oceanography and ocean environment:

- Ocean morphology
- Composition and properties of seawater
- Forces and constraints acting on the ocean
- Oceanic flow
- Ocean movements, waves and tides
- Ocean and climate

Assessment

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Courses evaluation 2 h	1	50%
Other assignments		
Individual report (on board session)	1	40%
Total		**100%**

Recommended reading: *Introduction to Physical Oceanography- Knauss, Garfield (2016)*
Internet Resources: None

Note: This information is non-binding and can be subject to change

Marine observatories				
Year: 2021-22	**Programme**: MARINE TECHNOLOGIES			
Class code: MRTMO-512EN				
Level: Master	**Year: 2**	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Joaquin Del Rio Fernandes				

Pre-requisites: None

Learning outcomes: At the end of the course, the student should be able to be knowledgeable about marine sensors, instruments and observatories.

Course description:
The topics covered in this class are the marine observatories and related technologies.

This course gives an overview about different types of sensors, instruments, platforms and ongoing projects that are providing seawater information in order to study the ocean.

In the past, human intervention was necessary to take measurements, but nowadays, cabled observatories, buoys, drifters or unmanned vehicles are performing more cost-efficient data samples.

During the course the students will perform a work in group task for the design of a cabled observatory that will be presented at the end of the course. During lectures the tools and required information will be given.

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	15
Independent study	
Team project	30
Estimated personal workload	15
Total student workload	**60 hours**

Course structure and workload

- S1: Marine observatories
- S2: Sensors and instruments
- S3: Buoys, USV and AUV
- S4: Group task for design

Assessment

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Courses evaluation 2 h	1	20%
Group task for design work	1	20%
Other assignments		
Team written report	1	20%
Individual report	1	30%
Total		**100%**

Recommended reading: *Seafloor observatories: A new vision of the earth from the abyss – Favali, Beranzoli, De santis (2015)*

Internet Resources: None

Note: This information is non-binding and can be subject to change

Underwater Instrumentation and communication				
Year: 2021-22		**Programme:** MARINE TECHNOLOGIES		
Class code: MRTUI-512EN				
Level: Master	**Year: 2**	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturers: Dr Pierre-Jean Bouvet, Dr Antony Pottier, Dr Charles Vanwynsbergue (TBC)				

Pre-requisites: Signal processing, Mathematics, Physics
Learning outcomes: At the end of the course, the student should be able to:

- be knowledgeable about underwater instrumentation and communication products
- extract, manipulate and analyse acoustic data stream for passive monitoring
- perform simple data transmission by using acoustic waves

Course description: This course is designed to provide an overview of underwater instrumentation and communication techniques.

Course content: The topics covered in this class are:

- Short conferences on underwater instrumentation products provided by companies specialized on marine technologies
- Introduction to passive acoustic monitoring
- Introduction to underwater acoustic communication

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Conference on underwater instrumentation	15
Lectures on passive acoustic monitoring	3
Lab on passive acoustic monitoring	4
Lectures on underwater acoustic communication	4
Lab on underwater acoustic communication	4
Independent study	
Team project	30
Estimated personal workload	30
Total student workload	**90 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Team written report	1	40%
Individual report	1	50%
Total		**100%**

Recommended reading:

[*1] M. Stojanovic and P.-P. J. Beaujean, "Acoustic Communication," in Springer Handbook of Ocean Engineering, M. R. Dhanak and N. I. Xiros, Eds. Springer International Publishing, 2016, pp. 359–386.*
[2] L. M. Brekhovskikh and Y. P. Lysanov, Fundamentals of Ocean Acoustics, 3rd ed. New York: Springer-Verlag, 2003.
[3] R. Otnes et al., Underwater Acoustic Networking Techniques. Berlin Heidelberg: Springer-Verlag, 2012.

Internet Resources:

Ocean explorer https://oceanexplorer.noaa.gov/explorations/sound01/background/acoustics/acoustics.html

Note: This information is non-binding and can be subject to change

Renewable Energy Technologies				
Year: 2021-22		Programme: ELECTRICAL ENGINEERING		
Class code: ELERT-512EN				
Level: Master	**Year**: 2	**Period**: Fall	**Language of instruction**: English	**ECTS**: 3
Lecturer: Dr Zhibin ZHOU				

Pre-requisites:

Basic knowledge of electrical power conversions

Learning outcomes:

At the end of the course, the student should be able to:

- Understand power conversion and control in a renewable power system (wind, PV and marine current generation).
- Implement electrical machines and power converters in a renewable power system.

Course description:

The topics covered in this class are:

- Power conversions in wind / marine current generation
- Power conversion in solar energy (PV)
- Different generator types in wind and marine current power system
- Power converters (DC/DC, AC/DC and DC/AC) for a renewable power system
- Simulation of a marine current turbine generation system via MATLAB/Simulink (Project)

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	30
Practical activities	
Independent study	
Estimated personal workload	30
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Team written report	2	40%
Project evaluation	1	50%
Total		**100%**

Recommended reading: Electric Renewable Energy Systems, Muhammad H.Rashid, ELSEVIER Inc., 2016

Note: This information is non-binding and can be subject to change

Laboratory project				
Year: 2021-22		**Programme:** MARINE TECHNOLOGIES		
Class code: MRTLP-514EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 9
Lecturer: Dr Yves Auffret				

Pre-requisites: Marine technologies courses, Embedded systems, Computer sciences

Learning outcomes: At the end of the laboratory project, the students should be able to:

- Master project management: customer needs, feasibility study, project planning, execution, monitoring & control, reporting and deliverables
- Carry out a marine project for application in research or industrial
- Perform measurements, conduct experiment and test their project in real condition at sea

Course description: Projects offered to students change annually given the academics needs and industrial partnerships.

Course content: Non-exhaustive list of projects. With the support of Celadon / Sea Test Base, an innovative platform for sea trials or with the framework of the instrumented marine platforms network IROMI currently deployed in the bay of Brest:

- The students will develop a detection system for marine traffic based on mixed acoustic and AIS signals. The students will use their knowledge on passive acoustic monitoring combined with artificial intelligence and machine learning to provide an innovation detection system for maritime zone guarding
- The students will develop an underwater acoustic communication system between two platforms. The students will use their knowledge on acoustic communications to provide an end-to-end undersea transmission system
- The students will develop a passive acoustics monitoring for dolphins or other marine mammals' detections and positioning

The students will be able to do some tests on a marine observatory or to do some bathymetric surveys in shallow water.

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Project presentation and supervision	20
Independent study	
Team project	120
Estimated personal workload	40
Total student workload	**180 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all project meetings	**10%**
Other assignments		
Team written report	1	40%
Team oral presentation	1	30%
Demonstration	1	20%
Total		**100%**

Recommended reading:
The bibliography will be given at the beginning of the project

Internet Resources:
The resources will be given at the beginning of the project

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MASTER 2

OPTIONAL MODULES: Management

Fall Semester 2021

Fall Semester 2022

Corporate Social Responsibility				
Year: 2021-22		**Programme:** MANAGEMENT		
Class code: HFRSR-522EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Anne CHOQUET				

Pre-requisites:
Students are expected to have an understanding of knowledge of corporate policy and strategy, and of management

Learning outcomes:

At the end of the course, the student should be able to:
Apply high standards of ethics and professional responsibility to positively contribute to business and society

In line with the program objective, the purpose of this module is to enable students to develop critical awareness of corporate social responsibility issues in management and learn about appropriate management responses.
This module supports the learning outcomes related to students being able to:

- Integrate sustainability practices into company management and policies, thus creating sustainable value.
- Manage organizational change and innovation, as building CSR into the company's management often requires significant change. This module enables students to find responsible solutions to business problems by finding innovative solutions taking into consideration international and interdisciplinary differences.

Course description:

This course prepares students to analyze and evaluate critical issues regarding the social, ethical and environmental responsibilities of business, to transfer sustainability-related knowledge and ethical theories to business practice, and to assess the relevance of CSR tools and apply them to specific business needs.

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	15
Practical activities	12
Independent study	
Estimated personal workload	93
Total student workload	**120 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Group	Work in class	40%
Other assignments		
Final written report	1	60%
Project evaluation		
Total		**100%**

Recommended reading:
- Crane, Andrew & Matten, Dirk. (latest edition). Business Ethics. Oxford University Press.
- Weiss, Joseph W. (latest edition). Business Ethics: A Stakeholder and Issues Management Approach. Berrett-Koehler Publishers. [eBook available]

Additional Reading

- Bird, F.B. Waters, J.A. Managers' Moral Muteness. California Management Review (1989), Vol. XXXI, 73-88.
- Boatright, John R. (2014). Ethics in Finance. (3rd edn). John Wiley & Sons. Blackwell. [eBook available]
- Boatright, John R. (2014). Ethics and the Conduct of Business. (7th edn). Pearson Education.
- Bowie, Norman E. & Werhane, Patricia H. (2005). Management Ethics. Malden & Oxford, Blackwell.
- Carroll, Archie B. & Buchholtz, Ann K. (2011). Business & Society. (8th edn). Manson, Thomson.
- Crane, Andrew, Matten, Dirk & Moon, Jeremy. (2008) Corporations and Citizenship. Cambridge, Cambridge University Press. [eBook available]
- Rossouw, Deon & Stückelberger, Chrisoph. (2012). Global Survey of Business Ethics in Training, Teaching and Research. Basel:Globethics.net. Download available at: http://www.globethics.net/web/ge/library/libraries-home
- Sethi, Prakash S (2003). Setting Global Standards. Hoboken: John Wiley & Sons. [eBook available]
- Stiglitz, Joseph E.(2007). Making Globalization Work. New York: W. W. Norton & Company.
- Valasquez, Manuel G. (2011). Business Ethics: Concepts and Cases. (7th edn). Upper Saddle River: Prentice Hall.

Internet Resources:
www.csr-news.net - www.ethicalcorp.com - www.novethic.fr (a comprehensive site, but in French only), www.unglobalcompact.org (with a large data bank on corporate CSR activities). You will find more links on these websites

Note: This information is non-binding and can be subject to change

Competitive Strategy				
Year: 2021-22		**Programme:** MANAGEMENT		
Class code: HFRCS-512EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS**: 3
Lecturer: **Dr. Suela** BYLYKBASHI				

Pre-requisites:

None

Learning outcomes:

At the end of the course, the student should be able to:
1. Conduct a strategic management diagnosis to identify a competitive advantage.
2. Formulate decisions and strategic choices.
3. Elaborate the process of implementing the strategic choices.

Course description:

The focus of this module is on Strategic Analysis on competitive and dynamic markets. This module deals mainly with two goals: (1) To increase the students' understanding of what managers must do to make a business sustainable and performant in the long term; and (2) to develop the student's ability to lead a Strategic Analysis of a firm on highly competitive and dynamic markets.

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	15
Practical activities	12
Independent study	
Estimated personal workload	93
Total student workload	**120 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Group	Work in class	40%
Other assignments		
Final written report	1	60%
Project evaluation		
Total		**100%**

Recommended reading:

- Barney, J.B. (2013). Gaining and Sustaining Competitive Advantage. (4th edn). Boston: Pearson (eBook available).
- Choudary, Sangeet P., Van Alstyne, Marshall W., Parker, Geoffrey G. (2016). Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You. WW Norton & Co / Chapter 10 .Link will be provided on Moodle.
- Fleisher, C. S., & Bensoussan, B. E. (2015). Business and competitive analysis: effective application of new and classic methods. FT Press.
- Oster, S. M. (1994). Modern competitive analysis. (2nd edn). OUP Catalogue.

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Articles on Strategy & Competitive Advantage

- Porter, M. E. 1996. What is a strategy? Harvard Business Review (November-December): 61-78.
- Collins, J. C., & Porras, J. I. (1996). Building your company's vision. Harvard Business Review, 74(5), 65.
- Porter M, E. (2008). The five competitive forces that shape strategy. Harvard Business Review, 86(1), 2-17. - Courtney, H., Kirkland, J., & Viguerie, P. (1997).Strategy under uncertainty. Harvard Business Review, 75(6), 6779.

Internet Resources:

Competitive strategy in the age of platforms

- Eisenmann, Parker & Van Alstyne, 2011. “Platform Envelopment.” *Strategic Management Journal*, 32, no. 12 (December): 1270–1285. Link: https://papers.ssrn.com /sol3/papers.cfm?abstract_id=1496336
- Choudary, S. 2014. “Building the Next WhatsApp or Instagram: The Network Effect Playbook.” *Wired*, March.Link: https://www.wired.com/insights/2014/03/building-next-whatsapp-instagram-network-effect-playbook/
- "What Killed Michael Porter's Monitor Group" by Steve Denning (2012) *Forbes*; Nov. 20. Link: https://www. forbes.com/sites/stevedenning/2012/11/20/what-killed-michael-porters-monitor-group-the-one-force-that-reallymatters/#22dd5a94747b

Note: This information is non-binding and can be subject to change

Project Management				
Year: 2021-2022		**Programme:** MANAGEMENT		
Class code: HFRPM-512EN				
Level: Master	**Year: 2**	**Period: Fall**	**Language of instruction:** English	**ECTS:** 3
Lecturer: Patrick HUBERT				

Pre-requisites:

Students should be familiar with the various departments of a company. They should have sufficient computer skills to use Microsoft Project or similar software.

Learning outcomes:

At the end of the course, the student should be able to:

- Explain and assess project requirements (and evaluate the associated techniques)
- Analyze project quality and project risks (and evaluate associated techniques)
- Explain the alternative options - traditional or agile - to plan, monitor and control a project
- Explain the purpose of performance management in projects (and evaluate the associated techniques)
- Apply generic project tools (and evaluate the associated techniques)
- Explain the nature of project information and communication (and evaluate the associated techniques)

Course description:

This module teaches students why projects matter in a changing business environment, their impact on organizations, how they are created, managed and implemented, how students will be involved as individuals, team members and managers, and how performance relates to projects. The goal is to teach the students how to effectively organize and run a structured project in various environments and positions. The topics range from the global transitions causing projects to key success factors and include major issues such as the project environment, project management methods, project team management and risk management.

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	15
Practical activities	12
Independent study	
Estimated personal workload	93
Total student workload	**120 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Group	Work in class	30%
Other assignments		
Final written report	1	70%
Project evaluation		
Total		**100%**

Recommended reading:

. Kerzner, (Latest Edition) Project management: a system approach to planning, scheduling, and controlling. John Wiley & Sons.

Additional Reading

- Kendrick, T. (2012). Results without Authority. Amacom. [eBook available]
- Lock D. (2013) Project management. (10th edn), Gower. [eBook available]
- Meredith J. R., Mantel S. J. (2015) Project Management: a managerial approach. (9th edn). John Wiley & Sons.
- Nicholas J. M. (1990) Managing business & engineering projects, Prentice Hall
- Yourdon E. (2004) Death march, 2nd edition, Prentice Hall

Internet Resources:
www.pmi.org www.projectsmart.co.uk
www.agilealliance.org/

Note: This information is non-binding and can be subject to change

Digital Technology & Sustainability				
Year: 2020-21		**Programme:** MANAGEMENT		
Class code: MANSU-003EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** S1/S2	**Language of instruction:** English	**ECTS:** 3
Lecturer: Mr. Rivière				

Pre-requisites:
None.
Learning outcomes:

At the end of the course, the student should be able to:

- list the main types of digital technologies used in OECD countries,
- describe the general relationships between digital technologies and sustainable development,
- apply a multi-criteria analysis to digital technologies,
- evaluate the environmental, social and economic direct and indirect consequences of a specific digital technology
- Critically examine an opinion-oriented article on digital technologies.

Course description:

This class will cover the following topics:

- Digital technologies: an introduction
    - Digital technologies in our modern societies
    - The digital revolution in a globalised world
- Understanding the impacts of digital technologies
    - Introduction to multi-criteria analysis
    - Environmental concerns: digital tech for green and green for digital tech
    - Social impacts: reconfigurations of work
    - Digital Economics: innovation, information and the networked economy
- Case study analyses:
    - Autonomous driving in European Union.
    - Artificial intelligence and Big Data uses.
    - Internet of Things: a sustainability analysis
- Low tech movement.

Course structure and workload:

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	15
Independent study	
Team project	15
Estimated personal workload	15
Total student workload	**45 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Other assignments		
Team presentation	1	40%
Final exam	1	50%
Total		**100%**

Recommended reading:

- Fing (2019). *L'agenda pour un futur numérique et écologique.* Available at: *http://www.transitions2.net/catalogue/view/13270/lagenda-pour-un-futur-numerique-et-ecologique-2019 [in French]*
- Stuermer, Abu-Tayeh & Myrach (2017). Digital sustainability: basic conditions for sustainable digital artifacts and their ecosystems. *Sustain Sci* ***12,*** *247–262*. Available at: https://doi.org/10.1007/s11625-016-0412-2

Internet Resources

- Hodgson, Christopher (2015). Can the digital revolution be environmentally sustainable? *The Guardian.* Available at: https://www.theguardian.com/global/blog/2015/nov/13/digital-revolution-environmental-sustainable
- Rifkin, J. (2018). The Third Industrial Revolution: a Radical new sharing economy, *Vice, YouTube.* Available at: https://www.youtube.com/watch?v=QX3M8Ka9vUA
- Sustainability in the Digital Age: https://sustainabilitydigitalage.org/

Note: This information is non-binding and can be subject to change

ISEN Yncréa Ouest

FRENCH LANGUAGE & CULTURE CLASSES

FOR INTERNATIONAL EXCHANGE STUDENTS

Fall and Spring Semester every year

These courses are available at both the Brest and Nantes campuses

French Language

French Civilisation

Cross-cultural skills

French Language – Beginner A1				
Year: 2021-22	**Programme:** HUMANITIES			
Class code: HFRLA-000FR				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Fall/Sring	**Language of instruction:** French	**ECTS:** 3
Lecturer: Mr. Stéphane Méar				

Pre-requisites: No previous knowledge of French is required

Learning outcomes*:* At the end of the course, the student should be able to reach the European A1 level with the basic foundations of communication skills and to

- Express him/herself effectively and accurately in simple French about him/herself and his/her surroundings
- Construct simple sentences in French using accurate vocabulary and grammar
- Write short paragraphs on simple topics, e.g. (daily routines, shopping, health, accommodation, etc…)
- Demonstrate an elementary knowledge of French sentence structure through speaking and writing
- Pronounce French reasonably well
- Read French at an elementary level
- Listen to basic spoken French and demonstrate understanding by writing and/or responding appropriately

Course description: The course is an introduction to oral and written French through role play and in-class use corresponding to everyday language needs. The students learn to understand and use simple language that can be transferred to the everyday situations which they meet as soon as they arrive in France.

The topics covered in this class are:

- French pronunciation, numbers, spelling
- Basic greetings and politeness words
- Introducing oneself, one's family and country
- Regular oral expression using vocabulary (environment, everyday life etc..)
- Grammar and tenses (present and past)
- Regular listening comprehension exercises

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	22
Lectures	
Practical activities	3
Independent study	
Estimated personal workload	35
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		30%
Participation	Ongoing in all classes	10%
Other assignments		
Presentation		20%
Final evaluation		50%
Total		**100%**

Recommended reading:
Easy learning French grammar & practice, Collins, 2011
Compétences, compréhension orale 1 -Niveau A1/A2, Michèle Barféty, Patricia Beaujoin, CLÉ International

Internet Resources:
https://apprendre.tv5monde.com/fr
https://www.bonjourdefrance.com/

Note: This information is non-binding and can be subject to change

French Language – Intermediate (B1)				
Year: 2021-22	Programme: HUMANITIES			
Class code: HFRLA-002FR				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Fall/Sring	**Language of instruction:** French	**ECTS: 3**
Lecturer: Mr. Stéphane Méar				

Pre-requisites: A2 (CERCL - Common European Framework of Reference for Languages)
The course is intended to serve a mix of profiles and learning backgrounds for a more diverse international learning experience
Learning outcomes*:* At the end of the course, the student should be able to reach the European B1 level and to:

- understand key points when clear and commonplace language is used, particularly while discussing general situations at work, school or connected to hobbies, etc.
- cope with usual situations (e.g. daily life or during a trip) and participate in a discussion connected with the environment
- maintain a simple and coherent conversation concerning their fields of interest
- describe a project using relevant tenses and vocabulary/expressions
- write an email or a coherent text on personal matters, and describe feelings and experiences.

Course description: The topics covered in this class are:

- themes: gastronomy - the media - advertising – cinema etc…
- grammatical structures: past tenses, subjunctive, conditional, pronouns, adjectives, complex questions, adverbs
- vocabulary in context, idiomatic expressions
- oral skills: describing a situation - reviewing restaurants, films, understanding the news, presentation and short debates
- writing: a short email/an essay/a story/a review using appropriate vocabulary and idiomatic expressions
- listening comprehension (radio, the news, short videos)

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	22
Lectures	
Practical activities	3
Independent study	
Estimated personal workload	35
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		30%
Participation	Ongoing in all classes	10%
Other assignments		
Presentation		20%
Final evaluation		50%
Total		**100%**

Recommended reading . Maïa Grégoire, Odile Thiévenaz, Grammaire Progressive du Français, Intermédiaire, Paris, CLE International, 2017.

Internet Resources: https://apprendre.tv5monde.com/fr

https://www.bonjourdefrance.com/

Note: This information is non-binding and can be subject to change

French Civilisation				
Year: 2021-22		**Programme:** HUMANITIES		
Class code: HFRCI-003FR				
Level: : Bachelor/Master	**Year:** 3/1	**Period:** Fall or Spring	**Language of instruction:** French	**ECTS:** 3
Lecturer: Mr. Stéphane Méar				

Pre-requisites: Level A2/B1 (CERCL - Common European Framework of Reference for Languages).

The course is intended to serve a mix of profiles and learning backgrounds for a more diverse international learning experience.

Learning outcomes*:* At the end of the course, the student should be familiar with key aspects of French civilisation and daily life, including food & drink, geography and history

Course description: The aim of this course is to provide students with useful information about their host country and to make the most of their semester in France. Cultural visits will be included in the course as well as food tasting.

The topics covered are:

- A rich and varied history: key events (the French Revolution, Age of the Enlightenment etc)
- Geography: overview of French natural and geographical diversity (regions and "départements")
- The importance of food and drink: "French cuisine"/meals/cooking/wines/cheese/recipes
- French society today (current events)
- A vibrant cultural heritage : French Art, music and literature. Museums, places of cultural interest, eg. the Loire Valley Castles

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	22
Lectures	
Practical activities	3
Independent study	
Estimated personal workload	35
Total student workload	**60 hours**

Assessment:

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		30%
Participation	Ongoing in all classes	10%
Other assignments		
Presentation		20%
Final evaluation		50%
Total		**100%**

Recommended reading: *Savoir-vivre avec les Français*, Hachette

Note: This information is non-binding and can be subject to change

How to work effectively with the French: a cross-cultural approach				
Year: 2021-22		**Programme:** HUMANITIES		
Class code: HFRXW-323EN				
Level: : Bachelor/Master	**Year:** 3/1	**Period:** Fall or Spring	**Language of instruction:** English	**ECTS:** 3
Lecturer: Ms Lynn ANDREWS				

Pre-requisites:
This course is open to international students from all academic backgrounds who wish to develop an understanding of the principles of cross cultural communication, with particular emphasis on France. No prerequisite study is required and it is not necessary to have any knowledge of the French language. All course materials will be in English.
Note: This course provides a useful complement to the course entitled 'Cross-cultural Engagement Project for International Exchange Students'.

Learning outcomes:
At the end of the course, international students should be able to:

- Demonstrate a clear understanding of the role of cross-cultural matters in today's globalised working environment
- Acquire a sharper understanding of their own culture and how it impacts their behaviour in a multicultural setting
- Demonstrate awareness of the key cultural values and etiquette that underpin the way the French work, interact and communicate
- Interpret the behaviour, attitudes and communication styles of French people correctly, particularly in the working environment
- Develop practical strategies for working effectively with French counterparts in cross-cultural contexts

Course description:
In today's globalised, hyper-connected business world, the ability to work and communicate effectively in culturally diverse settings (trans-national team projects, meetings, negotiations etc.) is an essential skill for all future graduate engineers and digital technology specialists. This course provides ISEN's international students with an intellectual and experiential forum for developing the intercultural communication skills necessary for working effectively with French counterparts.

Using a variety of interactive exercises, and with reference to some of the standard cross-cultural theories, students will learn to identify the key cultural codes, values and attitudes which underpin the ways in which French people work, communicate and interact. To facilitate students' ability to understand and adapt to the French mindset, we will draw extensively on their personal experiences as international students living in France. This will enable participants to identify the characteristics of their own national culture, and provide the insight necessary to anticipate and overcome potential cultural misunderstandings between their compatriots and French colleagues in the cross-cultural workplace.

The following topics will be covered:

- Key geographical, historical and economic factors which impact French cultural attitudes
- French communication styles: addressing others, non-verbal and verbal communication, formality, reserve, eye contact and the importance of debate
- The social status and role of an '*Ingénieur*' (Engineer) in France

- Key French cultural values and attitudes in the workplace: centralisation, individualism, uncertainty avoidance and privacy
- French working practices: structure and hierarchy, the decision making process, punctuality, scheduling and deadlines
- Business and social etiquette; strategies for building relationships with the French

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Interactive lectures	**30**
Independent study	
Team project	**25**
Estimated personal workload	**20**
Total student workload	**75 hours**

Assessment:
There will be 3 assessment components. Further details will be given during the first class**.**

- **Participation 10%:** Active contribution to class discussions and activities
- **Final exam 50%:** There will be an end of semester exam based on the theoretical components of the course content and an analysis of a cross-cultural incident (multiple choice and short answer questions)
- **Team project 40%:**
  Working in pairs, students will prepare an information manual for employees from their home culture(s) who have recently learnt that they will soon be working on a project involving colleagues in France.

  The information manual will be based on cross-cultural concepts discussed in class and must be tailored to the cultural environment of France. Teams are encouraged to supplement these concepts with their own practical experience obtained during their exchange student semester.

  The objective is for teams to produce a manual that helps their compatriots to understand and overcome the cross-cultural challenges that they are likely to encounter when working with the French (remotely and/or during business visits or stays in France).

  The project report should be written in English and be between 5 and 7 pages in length (Font: Arial, 11; Line Spacing 1.5). It should be presented in the format of an information manual for use within a company.

Recommended reading:

French, R. (2015). *Cross-cultural management in work organisations*. Kogan Page Publishers.

Note: This information is non-binding and can be subject to change

Cross-cultural Engagement Project for International Students				
Year: 2021-22		**Programme:** HUMANITIES		
Class code: HFRXE-003EN				
Level: : Bachelor/Master	**Year:** 3/1	**Period:** Fall or Spring	**Language of instruction:** English	**ECTS:** 5
Lecturer: Ms Lynn ANDREWS				

Pre-requisites:
This project module seeks to enable international students to engage more fully with the surrounding French community during their semester of study abroad. Although no previous knowledge is required, students enrolled in the project class must also be enrolled in the cross-cultural training module: '*How to work effectively with the French' (course code:* HFRXW-313EN*)*. In this way exchange students can gain the academic knowledge and insights necessary to help them carry out their project in a culturally sensitive manner.

A willingness to actively make contact with the local French community is essential. Participants will be responsible for creating and implementing an extra-curricular activity intended to foster greater cross-cultural understanding between themselves and the French participants.

Students who speak French will be encouraged to find ways of engaging with local community groups, whereas students who do not speak French will work with ISEN students in English, usually within the context of a student club or association.

Learning outcomes:
By the end of the project, international students should be able to:

- Demonstrate a clear understanding of the workings of a French local community group and/or student association
- Demonstrate awareness of the key cultural values and etiquette that underpin the way the French work, interact and communicate
- Demonstrate the ability to interact in a culturally sensitive manner with local French citizens or students within the association or community group
- Acquire a sharper understanding of their own culture and how it impacts their behaviour in a multicultural setting
- Analyse and recount the cultural insights acquired during the project, in particular by making the connection between hands-on experience *in situ* and concepts covered in the theoretical class '*How to work effectively with the French'*
- Develop greater self-confidence and more effective interpersonal skills in multicultural contexts

Course description:
This is a tutored project in which students will have 2 initial workshop sessions followed by regular timetabled sessions to work on the project. Each team will be able to fix appointments with the tutor to discuss progress and ask for advice in implementing its project. The first two in-class sessions will be devoted to defining the scope of the project and determining the kind of projects which students wish to develop. International students will be introduced to the various student clubs and be given information about local community groups. Each project must be realistically feasible and must be completed by the end of the semester. Students will work in multicultural pairs or groups of 3 (students must not work with others from the same home culture).

Potential project ideas include:

- Developing an international student activity which can be showcased to parents and prospective new students during one of the ISEN Open Days on campus
- Organising an intercultural event showcasing cultural aspects of your home culture to ISEN students (several student teams from different cultures)
- Making a visual, interactive presentation of your home culture and/or home university to ISEN students OR to a local community group
- Becoming involved in a community service project via an ISEN student club (leading an activity or contributing to a team project in direct contact with French classmates and with French people outside the school)…
- Interviewing French students, your host family and/or local community members about French cultural habits and creating a blog, video diary or film showing what you have learned/how this compares with your home culture… (video diary, film etc to be presented to a French audience!)

Assessment:

There will be 3 assessment components. Further details will be given during the first class**.**

- **Participation 20%:** Active contribution to the project
- **The project deliverable 40%:** Students will need to provide evidence of the completion and implementation of their project – a video, a blog, an event description (with photos, illustrations etc). The evidence required will de defined with the tutor during the team's first tutor appointment.
- **Oral presentation and cross-cultural analysis 40%:**
  Working in pairs/threes, students will make a 20-30 minute oral presentation of their project explaining what they have learned from this cross-cultural experience. Each team will present to the tutor and three other student teams. Assessment criteria will be provided during the first class.

Recommended reading:

For this course, it is important to familiarise yourself with all the cross-cultural documents distributed in the theoretical class 'How to work effectively with the French'.

However, in order to interact effectively with the French and to be able to show your interest in their country, you also need to be familiar with the latest cultural trends in French life. The best way to gain up-to date cultural insights is by watching the French national English language TV and online channel France 24. This channel has lively video reports on fascinating aspects of French cultural life and habits. Check these out regularly at https://www.france24.com/en/tag/french-culture/

Note: This information is non-binding and can be subject to change

Laboratory Project – Cross-cultural Debrief for International Students				
Year: 2021-22		**Programme: HUMANITIES**		
Class code: HFRXL-513EN				
Level: Master	**Year:** 2	**Period:** Fall	**Language of instruction:** English	**ECTS: 3**
Lecturer: Ms Lynn Andrews				

Pre-requisites: This tutored project module is available to international students from all scientific specialisms who are also enrolled in a Laboratory Project course at ISEN Yncréa Ouest. No prerequisite study is required and it is not necessary to have any knowledge of the French language. However, an openness towards exploring how cross-cultural differences impact team project work is essential. All reading materials and input information will be in English.

Learning outcomes: At the end of the course, international students should be able to :

- Identify examples of cross-cultural differences which arise in their multicultural team laboratory project work, eg. communication style, time management, decision-making processes, motivation, leadership and team collaboration styles etc.
- Relate the cross-cultural differences identified during their laboratory project experience to the precepts in well-known cross-cultural theories
- Acquire a sharper understanding of their own cultural attitude and approach to project work and assess how this may need to be adapted when working with French colleagues in a project team
- Display an understanding of how this cross-cultural teamworking experience may be useful in their future careers
- Recount their cross-cultural experience of teamworking with French students in a structured and analytical manner in a written report and an oral presentation

Course structure and workload:

Type of pedagogic activity	No. of hours
Face-to-face	
Interactive seminar lecture	3
Tutorial appointments	3
Attendance at final oral presentations	3
Interview with a French student	1
Independent study	
Individual written project	15
Individual oral presentation	30 minutes
Estimated personal workload	20
Total student workload	**45.5 hours**

Assessment:

There will be 3 assessment components. Further details will be given during the first class**.**

- **Participation: 20%:** Active contribution to tutorial sessions and as an attendee at the final oral presentations
- **Written report: 40%:** written in English, between 5 and 7 pages in length (Font: Arial, 11; Line Spacing 1.5).
- **Oral presentation: 40%:** 20 minute PowerPoint presentation and 10 minute discussion with students and the tutor

Recommended reading:

Hofstede, Geert. "Dimensionalizing cultures: The Hofstede model in context." *Online readings in psychology and culture* 2.1 (2011): 8.

Ting-Toomey, Stella, and Tenzin Dorjee. *Communicating across cultures*. Guilford Publications, 2018.

Note: This information is non-binding and can be subject to change

ISEN Yncréa Ouest

NANTES CAMPUS

YEAR 3

CORE CURRICULUM COURSES

Spring Semester 2022

Fall Semester 2023

NANTES CAMPUS: Spring 2022 & Fall 2023: Overview of courses available

Nantes 3rd YEAR SPRING SEMESTER 2022		
INFORMATICS & DIGITAL ELECTRONICS	**Course code**	**ECTS**
Graph Theory, Algorithms and Complexity	INFGT-321EN	3
Graph Theory, Algorithms and Complexity: Project	INFGT-324EN	4,5
Unix administration Tools	INFUA-321EN	3
Introduction to Cybersecurity	INFCS-321EN	2
Linear Programming	INFLP-321EN	4
Python - intermediate	INFPY-321EN	4
Real Time Operating System	DELRT-321EN	2
Nantes 3rd YEAR FALL SEMESTER 2023		
PHYSICS & MATHEMATICAL ANALYSIS TOOLS	**Codes**	**ECTS**
Introduction to Quantum mechanics	PHYQM-311EN	3
Physics of semiconductor devices	PHYSD-311EN	3
Mathematical Analysis Tools	ENTMA-311EN	3
INFORMATICS & DIGITAL ELECTRONICS	**Codes**	**ECTS**
Microcontrollers	DELMC-311EN	3
Introduction to Unix	INFUB-311EN	3
Advanced Networking	INFAN-311EN	3
Databases	INFDB-411EN	3
Artificial Intelligence	INFAI-411EN	3
Web servers	INFWS-311EN	2

ISEN Yncréa Ouest

NANTES CAMPUS

YEAR 3

Informatics and Digital Electronics

Spring Semester 2022

Graph Theory, Algorithms and Complexity				
Year: 2021-22	**Programme: I**NFORMATICS			
Class code: INFGT-321EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Spring	**Language of instruction:** English	**ECTS**: 3
Lecturer: Dr. Leandro MONTERO				

Pre-requisites
No prior knowledge of graph theory is needed, but some basic mathematical maturity is expected. That is, students taking the course should be familiar with basic proof techniques, such as mathematical induction, proof by contradiction, etc. and should be accustomed to developing their own proofs as homework exercises. It also requires basic knowledge about algorithms and computational complexity.

Learning outcomes
At the end of the course, students should be able to develop their knowledge on graph theory notions/algorithms and solve basic exercises. Students should also become able to identify graph theory problems in a natural way even when they appear in a different setting. The main objective is to learn algorithms in graphs and the theory behind.

Course description
The objective of this course is to present the most important algorithms in graph theory (along with their associated computational complexity) and their applications in real life problems.

Course contents:
We will cover in particular the following subjects:

- Graph transversals (Breadth-First Search, Depth-First Search)
- Minimum spanning trees (Prim, Kruskal)
- Shortest paths (Dijkstra, Bellman-Ford, Floyd-Warshall)
- Network flows (Ford-Fulkerson, Edmonds-Karp)

To accomplish this, we will also give the basic concepts, definitions, etc, on graph theory/complexity, with the most-used proof techniques in the area such as, proving by construction, induction, contrapositive, contradiction, etc.

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	20
Tutorials	25
Independent study	
Team project	
Estimated personal workload	20
Total student workload	**65 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Mid term exam	5	30%
Final exam	7	50%
Participation	Ongoing in all classes	20%
Other assignments		
Team written report		
Total		**100%**

Recommended reading

- J. A. Bondy and U. S. R. Murty (1985). *Graph Theory with Applications*, North Holland.
- Cormen, Thomas H.; Leiserson, Charles E., Rivest, Ronald L. (1990). "*Introduction to Algorithms*". MIT Press and McGraw-Hill.
- Aho, J. Hopcraft and J. Ullman (1974). *The Design and Analysis of Algorithms*, Addison-Wesley.

Note: This information is non-binding and can be subject to change

Graph Theory, Algorithms and Complexity, project				
Year: 2021-22	**Programme:** INFORMATICS			
Class code: INFGT-324EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Spring	**Language of instruction:** English	**ECTS:** 4,5
Lecturer: Dr. Leandro MONTERO				

Pre-requisites
Students must have taken the « Graph Theory, Algorithms and Complexity » course.

Learning outcomes
At the end of the project, students should be able to model real-life problems with graphs, and develop and compare different algorithms to solve them.

Course description
The objective of this project is to develop several kinds of algorithms to solve a real-life NP-Hard problem and compare their efficiency in terms of time and quality of solutions.

Course contents:
The project will be based in the following types of algorithms.

- Exact algorithms (brute force with improvements).
- Constructive heuristics.
- Local search heuristics.
- Metaheuristics (GRASP, Tabu Search, Ant Colony, Simulated Annealing, Genetic algorithms, etc).

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	
Tutorials	
Independent study	
Team project	90
Estimated personal workload	30
Total student workload	**120 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Mid term exam		
Final exam		
Participation		
Other assignments		
Team written report	**1**	100%
Total		**100%**

Recommended reading

- J. A. Bondy and U. S. R. Murty (1985). *Graph Theory with Applications*, North Holland.
- Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L. (1990). *Introduction to Algorithms*. MIT Press and McGraw-Hill.
- Aho, J. Hopcraft and J. Ullman (1974). *The Design and Analysis of Algorithms*, Addison-Wesley, 1974.

Note: This information is non-binding and can be subject to change

Unix administration Tools				
Year: 2021-22	**Programme:** INFORMATICS			
Class code: INFUA-321EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Spring	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Emmanuel DRUON				

Pre-requisites:

Basic UNIX/Linux command line experience

- Basic shell commands
- User rights
- File system organization

Learning outcomes

At the end of the course, the student should be able to:

- Identify the basic UNIX tools available for advanced users and administrators
- Find help in the UNIX online man pages
- Write basic scripts in both bash and awk
- Understand and use standard UNIX filtering tools
- Use standard command line file editing tools used in system administration
- Select the best available tools to write automation scripts
- Be flexible in the way they use standard UNIX tools

Course description:

This course is designed to provide students with the basic tools needed to take advantage of the power of the UNIX environment. Labs will help students master the concepts and the use of the standard tools found in most UNIX flavors. The mini project, organized as a team effort, will combine the acquired skills in a complete real-life oriented challenge.

The following topics will be covered in this course:

- Reminders
  - File system basics
  - User management
- Standard UNIX commands of interest
  - To search for information concerning users, ids & files
  - To manipulate rights
  - To display file content
- Searching tools
  - Searching the file system for files based on different attributes: the *find* command
  - Searching the file system for files containing specific patterns: the *grep* command
    - Introduction to regular expressions
- Files & Text manipulation tools
  - Tools to cut, paste, sort data stored in text files
  - The stream editor: *sed*
  - The Swiss knife of UNIX advanced users: *awk*
- Understanding UNIX processes
  - Processes life cycle
  - Commands to handle processes
- Shell scripting basics

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	8
Labs	12
Project class time	10
Independent study	
Team project	25
Estimated personal workload	15
Total student workload	**70 hours**

Assessment:

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Lab exam	1	50%
Team Project	1	40%
Total		**100%**

Recommended reading

- Brian W. Kernighan and Rob Pike (1983). *The Unix Programming Environment* **-** Brian W. Kernighan and Rob Pike - Prentice-Hall Software Series.
- Dale Dougherty and Arnold Robbins (1997). *Sed & Awk, Second Edition* **-** O'Reilly Media.

Note: This information is non-binding and can be subject to change

Introduction to Cybersecurity				
Year: 2021-22		**Program:** INFORMATICS		
Class code: INFCS-321EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Spring	**Language of instruction:** English	**ECTS:** 2
Lecturer: Dr Emmanuel DRUON				

Pre-requisites

- Basic UNIX/Linux command line experience
- Basic network knowledge (OSI Model, Ethernet, TCP/IP, TCP, UDP)

Learning outcomes

At the end of the course, the student should be able to:

- Explain why cybersecurity is so complex
- Analyze and explain basic cyberattacks
- Understand what the CIA triad is
- Explain the main steps in a cyberattack
- Identify services running on a system
- Protect standard services with a firewall
- Understand the security issues with unencrypted services
- Extract information from unencrypted traffic
- Use basic UNIX tools to locate and hash-sign sensitive programs
- Understand the concept of brute-forcing services

Use certificate-based authentication to protect remote access services

Course description

This course is an introduction to cybersecurity for students interested in computer science. After the analysis of different real life and “scripted” scenarios, a more detailed study of the nuts and bolts of cybersecurity will be presented.

The second part of the course will be conducted in a “Red Team” (attack team) vs. “Blue Team” (defense team) approach and different real life cases will be studied. A professional cyberrange (training platform) will used for the Labs to allow students to experiment in real environments.

A short team project will also be proposed to students to help them get a more global view of cybersecurity.

Course contents:

The following topics will be covered in this course:

- Cybersecurity:
  - What are the risks?
  - Why is it so complex?
  - What is to be protected: the CIA triad
- The different steps of a standard cyberattack
- Case studies with a “Red Team – Blue Team” approach
  - Network services
  - Traffic encryption
  - Protecting services against brute-force attacks
  - Sensitive programs in UNIX Servers: how to identify and protect them

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	4
Labs	8
Project class time	3
Independent study	
Team project	10
Estimated personal workload	10
Total student workload	**35 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Lab exam	1	50%
Team Project	1	40%
Total		**100%**

Recommended reading

- *Cisco Netacad Cybersecurity essential course*
- Laura Chappell and Gerald Combs (2012). Wireshark Network Analysis (Second Edition): *The Official Wireshark Certified Network Analyst Study Guide*, Chappell University.

Note: This information is non-binding and can be subject to change

Linear Programming				
Year: 2021-22	**Programme:** INFORMATICS			
Class code: INFLP-321EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Spring	**Language of instruction:** English	**ECTS:** 4
Lecturer: Dr. Benoit LARDEUX				

Pre-requisites
This course is settled in between mathematics and computer science. In mathematics especially, the student is expected to have followed courses in linear algebra. Practices of programming languages such as C++, Java or Python and algorithm notions are also required. Knowledge in graph theory and computational complexity are recommended

Learning outcomes
At the end of the course, students should be able to model actual industry problems such as linear programs. They will also master the most useful properties of optimisation models and their dual counterparts. The students will know available tools to solve computationally the linear programs so that they will be able to select and adapt the most appropriate ones.

Course description
The objective of this course is first to be able to mathematically model actual industrial problems from transport, energy, manufacturing such as optimisation programs. Secondly, we will learn to design the most appropriate solution approaches to solve those problems. Simplex, branch and bound algorithms will be reviewed in detail.

Course contents:
We will cover in particular the following subjects:

- Linear programming formulations
- Graphical solution approach
- Simplex algorithm
- Duality theory
- Enumeration algorithms

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	10
Tutorials	5
Independent study	
Team project	15
Estimated personal workload	15
Total student workload	**45 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Labs	2	20%
Final exam	4	40%
Participation	Ongoing along lecture courses	10%
Other assignments		
Team written report	1	30%
Total		**100%**

Recommended reading

- Chvatal, Vasek (1983) *Linear programming,* McGraw-Hill.
- L. Wolsey (1998). *Integer programming*, Wiley.

Note: This information is non-binding and can be subject to change

Python				
Year: 2021-2022	**Programme:** INFORMATICS			
Class code: INFPY-321EN				
Level: Bachelor / Master	**Year: 3&4**	**Period:** Spring	**Language of instruction:** English	**ECTS: 4**
Lecturer: Dr. Benoit LARDEUX				

Prerequisites
The student is expected to have acquired basic knowledge of computer science from previous courses in software engineering and algorithms.

Learning outcomes
At the end of the course, students will be proficient in developing software pieces in Python. They will be familiar with the basic syntax of Python for management of variables and functions. They will be able to select the appropriate data container which suits the application and to perform advanced data management. They will know the object-oriented programming in Python and some advanced algorithms developed in labs.

Course description
The objective of this course is to review basics of Python programming which are required to clearly and concisely develop software. Beyond development in Python, this course addresses best programming practices for any language. We specially focus there in object-oriented programming and human machine interfaces. The course is split almost equally between lectures and practice through exercises and labs.

Course contents
We will review the following topics:

- Introduction to Python: history and specificity
- Variables, functions (passing parameters, decorators, recursion…), Exceptions, In & Out interfaces
- Object-oriented programming: Class, simple and multiple inheritance, polymorphism, magic and operator overloading
- Libraries: e.g: Matplotlib, numpy pulp…
- Algorithms programming: functional programming
- Human machine Interface in Python: Qt, Turtle

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	15
Tutorials	15
Independent study	
Team project	25
Estimated personal workload	25
Total student workload	**80 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Mid term exam	4	20%
Final exam	5	40%
Participation	Ongoing in all classes	10%
Other assignments		
Team written report	1	30%
Total		**100%**

Recommended reading

- L.Ramalho (2015). *Fluent Python: Clear, Concise, and Effective Programming*, O'Reilly.

Note: This information is non-binding and can be subject to change

Real Time Operating System				
Year: 2021-22	**Programme:** DIGITAL ELECTRONICS			
Class code: DELRT-321EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Spring	**Language of instruction:** English	**ECTS:** 2
Lecturer: Mr Jean-Jacques MENEU				

Pre-requisites
These prerequisites are not mandatory but will help to keep up with the pace of the course

- Knowledge in C Programming
- Microcontroller course.

Learning outcomes
At the end of the course, the student should be able to:

- write basic programs using FreeRTOS library
- understand hardware interactions between a microcontroller and surrounding components

Course description
This course is designed to provide fundamental knowledge about a Real Time Operating System: Task, Semaphore, Mutex, Queues

Course contents:
The course will provide instruction on the following topics:
* why an OS is required by some applications
* Basic concepts of an OS:
    - what is a task, how to save context wile witching between tasks
    - synchronization between tasks with semaphores
    - protect critical data thanks to Mutex
    - sharing data between tasks with queues
* project based on a logistics application

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	5
Independent study	
Directed Work	5
Practical Work	5
Estimated personal workload	5
Total student workload	**20 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Other assignments		
Written Exam	1	50%
Practice Exam	1	50%
Total		**100%**

Recommended reading

- Brian W . Kernighan, Dennis Ritchie. *C Programming Language: ANSI C Version*.

Internet resources

- https://freertos.org/

Note: This information is non-binding and can be subject to change

ISEN Yncréa Ouest

NANTES CAMPUS

YEAR 3

CORE CURRICULUM COURSES

Fall Semester 2023

ISEN Yncréa Ouest

NANTES CAMPUS

YEAR 3

Physics and Mathematical Analysis Tools

Fall Semester 2023

Introduction to Quantum Mechanics				
Year: 2022-23		**Programme:** PHYSICS		
Class code: PHYQM-311EN				
Level: Bachelor/Master	**Year:** 3&4	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Jérémy FREIXAS				

Pre-requisites:
Atomic structure, mathematical description of waves, electromagnetism (Gauss Law and electric potential)

Learning outcomes:
At the end of the course, the student should be able to:

- Overview basic quantum physical phenomena
- Manipulate mathematical tools to model some cases studies
- Describe the key concepts of quantum computing

Course description:
The topics covered in this class are:

- Introduction to modern physics
- Schrödinger equation and mathematical formalism
- Basic maths and physics applied to quantum phenomena
- Applications: tunnelling effect, spectroscopy, LASER, quantum computing, quantum cryptography

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	11
Tutorials	13
Laboratory exercices	6
Independent study	
Team project	5
Estimated personal workload	12
Total student workload	**47 hours**

Assessment:

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Short tests	In a regular way during all the semester	10%
Other assignments		
Team project	1	30%
Individual exam	1	60%
Total		**100%**

Recommended reading:

- J. Pade (2018). *Quantum Mechanics for Pedestrians*, Springer.

Note: This information is non-binding and can be subject to change

Physics of Semiconductor Devices				
Year: 2022-23		**Programme:** PHYSICS		
Class code: PHYSD-311EN				
Level: Bachelor/Master	**Year:** 3&4	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr Jérémy FREIXAS				

Pre-requisites:
Atomic structure, mathematical description of waves, electromagnetism (Gauss Law and electric potential), introduction to quantum physics

Learning outcomes:
At the end of the course, the student should be able to:

- Describe in detail the electronic processes occurring in the main semiconductor devices
- Calculate physical quantities related to the properties of these devices
- Explain the principles of common semiconductor devices such as diodes and transistors (eg: I-V characteristic)

Course description:
The topics covered in this class are:

- Conductivity in metals and free electron model
- Semiconductors: intrinsic properties and doping
- Junctions: Schottky diode, PN, bipolar transistors
- MOS transistors, application to logic functions and other devices
- Applications: CCD image sensor, spectral imagery (blue light and retina)

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	11,5
Tutorials	12,5
Laboratory exercices	6
Independent study	
Estimated personal workload	12
Total student workload	**42 hours**

Assessment:

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Short tests	In a regular way during all the semester	15%
Other assignments		
Individual exam	1	85%
Total		**100%**

Recommended reading:

- S.M. Sze Kwok K. Ng *(*2006). *Physics of Semiconductor Devices*, Wiley.

Note: This information is non-binding and can be subject to change

Mathematical Analysis Tools				
Year: 2022-2023	**Programme:** ENGINEER TOOLS			
Class code: ENTMA-311EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Mr. BEGUIN				

Pre-requisites:

- Real analysis, Riemann integration.
- Numerical and taylor series convergence.
- Normed vector spaces and convergence

Learning outcomes:

At the end of the course, the student should be able to:

- Understand fundamental properties of normed or Hilbert spaces, more precisely notions of dot product, orthogonal sets and projections in a Hilbert space
- Know the L2-theory of Fourier series and be aware of the classical theory of Fourier series and other orthogonal expansion
- Work with functions (polynomials, reciprocals, exponential, trigonometric, hyperbolic,etc) of single complex variable and describe mappings in the complex plane
- Determine continuity/differentiability/analyticity of a function and find its derivative
- Compute the residue of a function and use the residue theory to evaluate a contour integral or an integral over the real line;
- Determine convergence and divergence of indefinite integrals, and compute principal values
- Understand convolution with a kernel as a filtering technique
- Know basic concepts of distributions and convolution techniques and understand their application to physics

Course description:

This class will cover the following topics *:*

- Hilbert Space theory: orthonormal bases, projections and applications. Fourier series
- Functions of a complex variable: analytic functions, Taylor and Laurent series, complex integration, residue theorem
- Indefinite Integration: principal value and convolution
- Theory of distributions: test functions, convolution

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	30
Independent study	
Practicum	15
Estimated personal workload	15
Total student workload	**60 hours**

Assessment:
Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Other assignments		
Team homework written report	1	50%
Individual written report	1	50%
Total		**100%**

Recommended reading:

- W. Rudin (1987). *Real and complex analysis*, Third edition.
- R. Strichartz (1994). *A Guide to Distribution Theory and Fourier Transforms.*
- A.H. Zemanian (2003). *Distribution Theory and Transform Analysis: An Introduction to Generalized Functions, With Applications.*
- N. Young (1988). *Introduction to Hilbert Spaces.*

Note: This information is non-binding and can be subject to change

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NANTES CAMPUS

YEAR 3

Informatics & Digital Electronics

Fall Semester 2023

Microcontrollers				
Year: 2021-22	**Programme:** Informatics and Digital Electronics			
Class code: DELMC-311EN				
Level: Bachelor/Master	**Year: 3/1**	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Mr Jean-Jacques MENEU				

Pre-requisites

These prerequisites are not mandatory but will help to keep up with the pace of the course

- Knowledge in C Programming: pointers, struct, difference between preprocessor and compiled instructions, logic instructions (and, or, xor), scope of variables, stacks, masking
- Maths: calculus in binary and hex bases
- Basics in electronics: an embedded programmer configures hardware and needs basic understanding of it: mainly CMOS transistors parameters, open drain and push-pull structures, impact of impedance on current consumption.

Learning outcomes

At the end of the course, the student should be able to:

- choose a microcontroller that fits an application
- Program a microcontroller in C and/or in assembly language
- Have an understanding of hardware interactions between a microcontroller and surrounding components

Course description

This course is designed to provide fundamental knowledge about microcontrollers: hardware architecture, programming in C and assembly language, development tools and market

Course contents:

The course will provide instruction on the following topics:

- Microcontrollers architecture: core (Control Unit, ALU, Registers, Memory Organization…)
- Peripherals of microcontrollers: GPIOs, Timers, ADC, Serial Communication (I2C, SPI, UART)
- C programming practices for embedded application (hardware interrupt, Macros Vs Interrupts, variable declarations…)
- Microcontroller architecture and programming in assembly language
- Memory types
- Microcontrollers market and various cores (suppliers, development tools, applications…)
- Maths: Logic and calculus in various basis
- Documents organization: how to get information

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	24
Independent study	
Directed Work	10
Practical Work	24
Estimated personal workload	12
Total student workload	**70 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Other assignments		
Written Exam	1	50%
Practice Exam	1	50%
Total		**100%**

Recommended reading

- Brian W . Kernighan, Dennis Ritchie *:C Programming Language***:** *ANSI C Version.*

Internet resources

- STM32 Education
- https://www.st.com/content/st_com/en/support/learning/stm32-education.html

Note: This information is non-binding and can be subject to change

Introduction to Unix				
Year: 2022-23	**Programme:** INFORMATICS			
Class code: INFUB-310EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr. Benoit LARDEUX				

Pre-requisites
The student is expected to have acquired basic knowledge of computer science from courses in software engineering and algorithms.

Learning outcomes
At the end of the course, students should be able to know the specificities of UNIX operating system. Basics of Unix command lines will be reviewed during this course as a means to develop first shell programs. The students will therefore be able to install, manage and deal with basics of a GNU Linux operating system

Course description
The objective of this course is to become familiar with Unix-based operating system. We will spend time in understanding Unix architecture and manage user rights, files and processes. A significant part of the course will also be dedicated to practice through exercises and labs

Course contents:
We will cover in particular the following subjects:

- Unix architecture
- File system
- User rights management
- Process management
- Shell programming

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	7
Tutorials	8
Independent study	
Estimated personal workload	20
Total student workload	**30 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Labs	2	30%
Final exam	4	60%
Participation	Ongoing along lectures	10%
Total		**100%**

Recommended reading

- J. Muster (2002). *Introduction to Unix and Linux*– McGraw-Hill.

Note: This information is non-binding and can be subject to change

Advanced Networking				
Year: 2022-23	**Programme:** INFORMATICS			
Class code: INFAN-311EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Fall	**Language of instruction:** English	**ECTS: 3**
Lecturer: Dr Emmanuel DRUON				

Pre-requisites

- Basic network knowledge (OSI Model, Ethernet, IPv4, TCP, UDP, Application Layer protocols, WiFi)
- Advanced network knowledge (IPv6, NAT, Port-redirection, VLAN, Access-Lists, routing protocols)

Learning outcomes

At the end of the course, the student should be able to:

- Design a realistic medium size corporate network architecture
- Identify network traffic types & profiles
- Define Layer 3 security rules
- Configure Cisco routers to filter traffic between networks
- Configure Cisco routers to NAT traffic and perform port redirections
- Configure Cisco switches and routers in a VLAN architecture
- Configure a WiFi controller-based network
- Configure a site-to-site VPN solution based on Cisco routers

Course description

This course is aimed at being a “put it all together” practice course for students with a good network background.

After a brief review of network standard and advanced features, students will work in teams to design a global realistic corporate network architecture. Experiments will be done in simulation as well as with physical Cisco equipment.

Weekly reviews will be presented by the students to identify their progress and help them figure out possible solutions.

Each team will have to present and defend the architecture they designed at the end of the term.

Course contents:

The following topics will be covered in this course:

- Network basic features and services
- Securing network traffic with access lists: what can be done and what are the limits?
- Using VLANs to enforce Level 2 security
- Site-to-site VPN solutions

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	4
Labs	11
Independent study	
Estimated personal workload	25
Total student workload	**40 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Weekly presentation	Ongoing in all classes	50%
Final presentation	1	40%
Total		**100%**

Recommended reading

The following Cisco Netacad network courses will be freely available to all attending students:

- *CCNA R&S: Routing and Switching Essentials.*
- *CCNAv7: Introduction to Networks.*
- *CCNAv7: Switching, Routing, and Wireless Essentials.*

Note: This information is non-binding and can be subject to change

Databases				
Year: 2022-23	**Programme:** INFORMATICS			
Class code: INFDB-411EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr. Benoit LARDEUX				

Pre-requisites:
The students are expected to know the basics of computer science, software engineering and algorithms.

Learning outcomes:
At the end of the course, the student should be able to:

- create, manage, populate and get relevant information from databases. The first outcome concerns the capability to organize and model the data.
- The students will also get input analysis to select to most appropriate database type given the nature of stored data.
- They will finally become familiar with basic SQL requests due to practice of exercises

Course description:
The topics covered in this class are:

- Overview of electric machines and drives
- Fundamentals of electromechanical devices (Flux linkage/current relationships, Energy, co-energy Calculation of forces and torques)
- Fundamentals of power electronics and control theory
- Synchronous machines
- Induction machines
- Brushless DC machines, Switched reluctance Machines
- Industrial applications (motoring and generating mode)

Course contents:
We will cover in particular the following subjects:

- Relational theory
- Modelling databases
- Database management
- Basics of SQL

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	10
Tutorials	5
Independent study	
Estimated personal workload	15
Total student workload	**30 hours**

Assessment

Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Labs	4	30%
Final exam	4	60%
Participation	Ongoing along lectures	10%
Total		**100%**

Recommended reading:

- C.J Date (2013). *Relational Theory for Computer Professionals: What relational databases are really all about*, O'Relly.
- R. Obe & L. Hsu (2012). *PostgreSQL up and running*, O'Reilly.

Note: This information is non-binding and can be subject to change

Artificial Intelligence				
Year: 2022-23	**Programme:** INFORMATICS			
Class code: INFAI-411EN				
Level: Bachelor /Master	**Year:** 3&4	**Period:** Fall	**Language of instruction:** English	**ECTS:** 3
Lecturer: Dr. Ayoub KARINE				

Pre-requisites:
This course needs a strong knowledge on statistics and computer science especially using Python language.

Learning outcomes:
At the end of the course, the student should be able to:

- analyse problems that need artificial intelligence (IA) to extract fruitful information from data.
- For this end, a theorical background of different IA algorithm will be explained.
- Moreover, different labs will be proposed to practice these algorithms using different python libraries such as: sklearn scikit-learn, numpy, pandas, tensorflow and keras

Course description
The objective of this course is to treat the most relevant IA algorithms especially those related to machine learning and their applications in real applications (text analysis, image recognition, …).

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	5
Tutorials	10
Independent study	
Team project	10
Estimated personal workload	15
Total student workload	**40 hours**

Assessment
Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Labs	2	20%
Final exam	4	40%
Participation	Ongoing along lecture courses	10%
Other assignments		
Team written report	1	30%
Total		**100%**

Recommended reading

- K. Warwick. (2011). *Artificial Intelligence: The Basics.*
- Ketkar, N. (2017). *Deep Learning with Python* (Vol. 1). Berkeley, CA: Apress..

Note: This information is non-binding and can be subject to change

WEB SERVERS				
Year: 2022-23		**Program:** INFORMATICS		
Class code: INFWS-311EN				
Level: Bachelor/Master	**Year:** 3/1	**Period:** Fall	**Language of instruction:** English	**ECTS:** 2
Lecturer: Dr Emmanuel DRUON				

Pre-requisites

- Basic UNIX/Linux command line experience
- Basic network knowledge (OSI Model, Ethernet, TCP/IP, TCP, UDP)

Learning outcomes

At the end of the course, the student should be able to:

- Explain what a Web service and a Web server are
- Understand what an RFC is and how the HTTP protocol is officially defined
- Make the difference between server-side and client-side Web applications
- Explain what a daemon is
- Identify the standard Web services
- Describe what a virtual machine is
- Describe what a docker container is
- Install a Web service in the following contexts: local machine, machine in the Cloud, docker container
- Install a “production” Web service in a Cloud service
- Configure a basic Web service so as to limit security risks
- Activate php language in a Web service

Course description

The goal of this course is to present the basic system administration part of a Web server. After a short introduction to make students aware of what a Web server is and the difference between a server and a service, the focus will be given to the installation of a Web service in different contexts. The basic configuration of a Web service will be covered, and different security features will be presented.

Labs will help the students to acquire the proposed skills. They will globally cover two different needs. The standard local installation of a Web service on the local machine to be used in Web development. The standard “production” installation in Cloud services.

Amazon AWS services are usually used for labs involving Cloud technology.

Course contents:
The following topics will be covered in this course:

- Terminology, definitions & standards:
  - Web server vs. web service: between common language and technical truth
  - How is the HTTP protocol defined?
  - Web clients
  - Server-side vs. Client-side approach
- The Web server:
  - Introduction to virtualization
    - VM vs. Containers
  - Comparison of the different Web servers: pros and cons
  - Installation of a Web service in different contexts: physical machine, virtual machine in the Cloud, Docker Container in the Cloud
- Web administration basics
  - Unix reminders
  - The Apache server basic configuration
    - Standard configuration files
    - Virtual hosts
    - Enabling programming languages
- Web server protection
  - Securing the Web service itself
  - Securing the Web server
  - Introduction to security on the Cloud provider side

Course structure and workload

Type of pedagogic activity	No. of hours
Face-to-face	
Lectures	6
Labs	9
Independent study	
Estimated personal workload	20
Total student workload	**35 hours**

Assessment
Assignment details will be provided in the first class

Assessment type	Number of exercises	Percentage of final grade
Continuous assessment		
Participation	Ongoing in all classes	10%
Lab work	5	50%
Lab exam	1	40%
Total		**100%**

Recommended reading

- Rich Bowen, Ken Coar (2008). *Apache Cookbook: Solutions and Examples for Apache Administrators* - O'Reilly Media.

Note: This information is non-binding and can be subject to change