

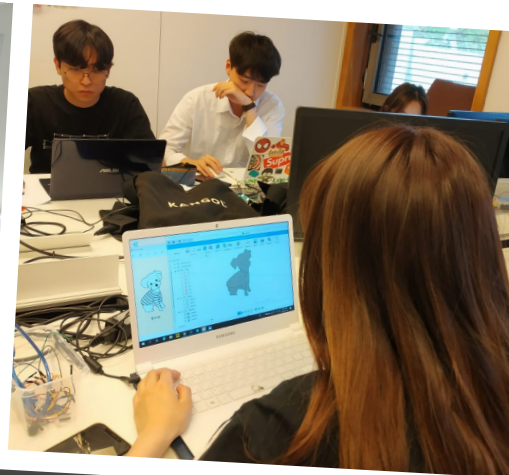
EPITECH.

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EPITECH - SCHOOL OF IT & INNOVATION

Courses offered in English (2021-2022)

SPRING SEMESTER 2022



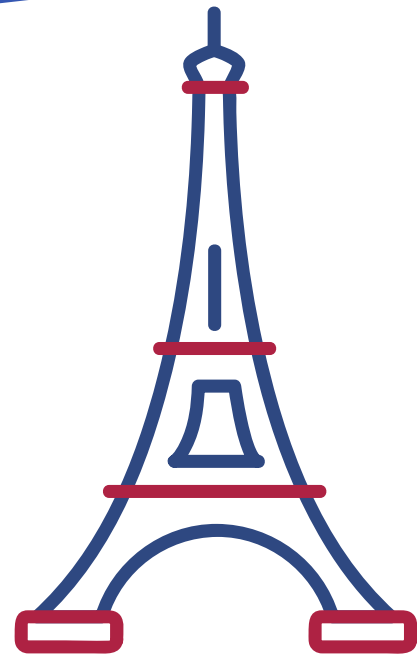
EPITECH.

- Epitech as the largest French IT school
- Based on 15 campuses in France
- Also on 5 international campuses (Spain, Germany, Belgium, Albania and Benin)

- Full project-based learning method implemented
- Bachelor level courses fully in English
- French language courses offered



Contact us on international-relations@epitech.eu





International Bachelor Spring Semester 2022

Second-year modules

Program aim:

- Acquire an understanding of object-oriented programming via C++ language
- Expand your technical panorama by learning

Learning outcome:

- Deepen and broaden your knowledge and skills of tools to be autonomous and adaptable.

Prerequisites:

- Advanced knowledge of C language
- English language proficiency: TOEFL IBT: 65/IELTS:5.5/TOEIC:600 or English test of your own home institution equivalent to B2

Code	Course	Credit (ECTS)
B-CPP-300	C++ Seminar	5
B-CNA-410	Computer Numerical Analysis - Trading	2
B-CCP-400	Concurrent Programming	2
B-SEC-400	Web Security	2
B-FUN-400	Functional Programming	4
B-MAT-400	Mathematics	3
B-NWP-400	Network Programming	4
B-OOP-400	Object-Oriented Programming	4
B-SHL-400	Shell Scripting	1
B-PSU-402	Unix Programming - Instrumentation	3
B-PSU-400	Unix Programming - Memory	3
B-ASM-400	x86-64 Assembly	2
B-YEP-400	Year-End-Project – Indie Studio	4
B-YEP-410	Year-End-Project - Zappy	4



B-INN-000	Guided Project – Innovation Hub	6
B-FRE-000	French Language course	2

[B-CPP-300] C++ Seminar

C++ Seminar (or Pool) is a key moment at Epitech. Like the C-Seminar module, it represents an intensive module and it is highly instructive.

The students learn about object-oriented programming through the fundamental elements of the C++ language. Classes, instances and methods are part of the module.

Skills to be acquired

- Correct usage of the C++ language and its special features in relation to C.
- Ability to produce a basic C++ program in Unix.
- Ability to be punctual and work regularly
- Ability to be precise in the reading, and comprehension, of one's code.

Teaching methods

All the materials are available online. Academic mentors help the students to go through. In addition to the knowledge and skills the students acquire additional skills in time management/team work as if they would be in a company. The module teaches the basic knowledge. Throughout, the students create hypotheses, runs tests while collaborating and sharing ideas between each other.

Credit value

5 ECTS

Assessments

Online project submission

Project Example

Name: Rush

Subject: Basic principles of C++ language

Aim: Train student to overcome the stress and pressure inherent to crunch time (important amount of work in a short period of time. Here, 2 days)

[B-CNA-410] Computer Numerical Analysis - Trading

Computer Numerical Analysis- Trading introduces to the use of programming and mathematical tools in the field of trading.

Skills to be acquired

- Research professional tools and how to implement them.
- Develop a custom algorithm
- Interface with an existing platform
- Algorithm optimization and live editing



Teaching methods

The students work on two projects for a total duration of 18 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project.

Credit value

2 ECTS

Assessments

Online project submission

Project Example

Name: Trade

Subject: Elaborate your own algorithm in a simulated trading environment

[B-CCP-400] Concurrent Programming

Concurrent Programming teaches the concept of concurrent accesses in programming.

Skills to be acquired

- Threads and mutexes
- IPC (semaphores, message queues, etc.)

Teaching methods

The students work on one project for a total duration of 4 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project. The project is to be worked in groups of 2 to 4 students.

Credit value

2 ECTS

Assessments

Online project submission

Project Example

Name: The Piazza

Subject: Create a program that handle a pizzeria capable of scaling by opening multiple kitchen and multiple cooks per kitchen.

[B-SEC-400] Web Security

Web Security teaches the students to succeed in exploiting weaknesses and in obtaining privileges or information on websites.

Skills to be acquired

- Learn how to handle web tools, navigator, proxy, web services, command line tools, scripts
- Learn how to discover, to understand and to exploit client and server weaknesses
- Learn how to use simple cryptographic tools; x509 certificate, SSL/TLS

Teaching methods

The module covers several subjects:



- Study the vulnerabilities linked to the development of web applications
- Non-exhaustive list of domains
- Authentication, ACL, configuration, cryptography, encoding, error management, protocols, synchronization, language traps, web services, injections

Throughout the module, you will participate in security-centered events and short talks/workshops.

Besides, the students work on one project called SHODAN. The goal is to exploit the weaknesses and to obtain privileges or information on the websites set up for the project. It is a platform on which the groups of students will compete against the other teams to obtain the highest score. Before starting the project, a call for papers will be organized to organize short talks and workshops which will be led by the students.

The student will be evaluated on different criteria:

- Web pentest environment
- Bruteforce technique, developing simple operations
- Client security: XSS/CSRF/Phishing
- Various injections: headers HTTP, SQL, URL, code, file, command

General knowledge of the detection and operation of these criteria will be a condition to the validation of the module.

Credit value

2 ECTS

Assessments

Online project submission

[B-FUN-400] Functional Programming

Functional Programming focuses on introducing the functional paradigm of programming.

Skills to be acquired

- Recursive functions
- Lists
- Pattern matching and pattern guards
- Partial application
- Modules
- Project management with Stack
- Input/Output
- Monads

Teaching methods

The students work on two projects for a total duration of 7 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project.

The second project is to be worked in pairs.

Credit value

4 ECTS

Assessments

Online project submission



Project Example

Name:

Subject:

Aim:

- [B-MAT-400] B4 – Mathematics

Mathematics focuses on Probability and Statistics.

This unit is the continuation of the previous modules Mathematics. The students must take the required modules to attend the course. The students learn to create algorithms by using mathematical methods and to use graphic tools (plotting different kinds of curves).

Skills to be acquired

- Probability
- Statistics

Teaching methods

The students work on nine mini-projects of 2 weeks each for a total duration of 18 weeks of work on this unit. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project.

The students work on each project alone or by two.

Credit value

3 ECTS

Assessment

Online project submission.

Project example

Name: 202unsold

Subject: Compute the features of random variables defined by their mutual probability law.

[B-MAT-400] Mathematics

Mathematics focuses on probability and statistics.

Requirements

- Able to create algorithms by using mathematical methods
- Know about the graphic tools (plotting different kind of curves)

Skills to be acquired

- Able to master more complex scientific computing algorithms (formula decoding, combinatorial computing analysis without intermediate storage in memory, etc.)
- Able to manage complicated numerical calculations, which require a good, preexisting comprehension and intelligent implementation (descriptive statistics parameters, correlation parameters, expected value and variance with numerical integration, etc.)
- Know about the fundamentals of probabilities
- Master statistic methods

Teaching methods

The module consists of two sections:

- 5 courses about probability with subjects: random experience, events, probability, random variables and discrete and continuous variable laws.



- 5 courses about statistic with subjects: descriptive statistics, statistic adjustments, correlation, survey sampling.

Credit value

3 ECTS

Assessment

Online project submission

Evaluation based on the completion of 10 mini projects.

[B-NWP-400] Network Programming

Network programming is specifically designed to introduce the following concepts:

- Network communication
- Data packets

Skills to be acquired

- Multi-client programming
- Communication protocol implementing
- Documentation reading and understanding

Teaching methods

The students work on three projects for a total duration of 8 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team information about the completion of each project. The first two projects are solo project. The third project is in pairs.

Credit value

4 ECTS

Assessments

Online project submission

Project Example

Name: FTPServer

Subject: Create a server respecting the FTP protocol

Aim: Know how to read an RFC and introduction to TCP sockets.

[B-OOP-400] Object-Oriented Programming

Object-Oriented Programming introduces to the Object-Oriented Programming paradigm.

It focuses on modularization and problematic' abstraction by using practical examples such as dynamic libraries.

Skills to be acquired

- Paradigm shift
- Modularization
- Abstraction and generic programming

Teaching methods

The students work on two projects for a total duration of 10 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team information about the completion



of each project.

The first project is a group project for up to 2 students.

The second project is a group project of 2 to 3 students.

Credit value

4 ECTS

Assessments

Online project submission

Project Example

Name: Arcade

Subject: Create an arcade system with a core capable of handling multiple game and multiple display library (terminal, 2D graphics, 3D graphics, ...)

Aim: Architecture a project around modules that can be interchanged.

[B-SHL-400] Shell Scripting

Shell Script introduces the notions and teaches how to use it, with a certain degree of complexity.

The module consists of a project work.

Skills to be acquired

- Fast adaptation and autonomy in shell scripting

Teaching methods

The students work on one project for a total duration of 1 week of work. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project.

Credit value

1 ECTS

Assessments

Online project submission

Project Example

Name: bdsh

Subject: Create a small database using shell script

Aim: Learning the basics of scripting the shell

[B-PSU-402] Unix Programming - Instrumentation

Unix Programming - Instrumentation teaches the students to have a better understanding of ELF files and reverse engineering. It allows the students to understand how debuggers and disassemblers function in UNIX.

Skills to be acquired

- Discern the userland's kernel space;
- Know which information can be retrieved in a process
- Explore the system call concept in greater depth
- Learn how to plot a program's execution
- Become an expert in Unix system programming



- Learn how to decode x86-64 binary instructions

Teaching methods

The students work on two projects for a total duration of 6 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project.

The second project is in pairs.

Credit value

3 ECTS

Assessments

Online project submission

Project Example

Name: strace

Subject: Re-code the strace program

Aim: master the basics of debugging in linux (ptrace)

[B-PSU-400] Unix Programming - Memory

Unix Programming- Memory introduces about memory allocation management in an UNIX environment.

Skills to be acquired

- Understand the mechanisms of memory management (in particular the links between physical memory and virtual memory);
- Understand the structure of a binary (ELF) file format

Teaching methods

The students work on two projects for a total duration of 5 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project.

Credit value

3 ECTS

Assessments

Online project submission

Project Example

Name: malloc

Subject: Create your own version of the function malloc and free

Aim: Learn about memory management using brk()

[B-ASM-400] x86-64 Assembly

x86-64 Assembly introduces the x86-64 assembly and the use of this low-level language for the development of a minimalistic C library.

Skills to be acquired

- Know about x86-64 processor and its instruction set
- Know about memory and stack operation
- Know about address spaces and function calling



Teaching methods

The students work on one project for a total duration of 4 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project.

The project is to be worked in pairs.

Credit value

2 ECTS

Assessments

Online project submission

Project Example

Name: minilibc

Subject: Create your own miniature version of the LibC

[B-YEP-400] Year-End-Project – Indie Studio

Year-End-Project – Indie Studio corresponds to one of the two final projects of the semester. The first project is linked to the understanding of an OOP architectures.

Skills to be acquired

- Go from procedural paradigm to object paradigm
- Modularize a problematic
- Abstract such problematic

Teaching methods

The students work on one big project for a total duration of 6 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team information about the completion of each project. The project is to be done in groups of 4 to 6 students.

Credit value

4 ECTS

Assessments

Online project submission

Project Example

Name: Indie Studio

Subject: As an independent game studio would, re-create a classic Bomberman game.

[B-YEP-410] Year-End-Project - Zappy

Year-End-Project – Zappy is one of the two final projects of the semester. It summarizes several concepts such as network programming (using TCP sockets), Artificial Intelligence and GUI.

Skills to be acquired

- Network programming
- GUI
- Basic artificial intelligence



Teaching methods

The students work on one project for a total duration of 6 weeks of work. Each project is evaluated individually with automated tests giving the student and the academic team the information about the completion of each project. The project is to be done in groups of 4 to 6 students.

Credit value

4 ECTS

Assessments

Online project submission

Project Example

Name: Zappy

Subject: Simulate a world (the TCP server) and it's habitant in a quest to survive and evolve.

[B-INN-000] Guided Project – Innovation Hub

Guided Project teaches the students to practice all their knowledge and skills acquired, in a business environment.

They will be advised and supervised by the Innovation Center of Epitech.

Skills to be acquired

- Project Management
- Ideation and brainstorming
- Prototyping
- Documentation
- Communication and persuasion skills

Teaching methods

Guided project with monthly follows-up supervised by the Epitech Innovation Center Team.

Throughout the course, the students will be participated in workshops on various IT-related topics.

Credit value

6 ECTS

Assessments

Project submission

