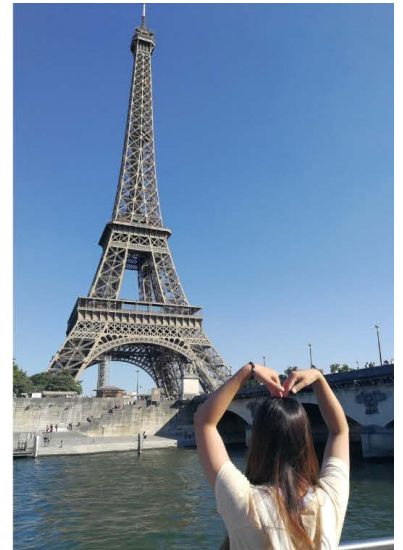


{EPITECH}

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EPITECH - SCHOOL OF IT & INNOVATION

Courses offered in English (2023-2024)



COURSE CATALOGUE 2023/2024

September 2023 to July 2024

Epitech First year program

Program aim:

Introducing students to the basics of programming with C language as a main tool.

Learning outcomes:

- Strong knowledge in C
- Strong basis of programming
- Basics of Graphic programming

Prerequisites:

- Basic knowledge of programming
- English language proficiency equivalent to B2

Courses list:

<u>Code</u>	<u>Course</u>	<u>ECTS</u>	<u>Semester</u>
B-CPE-100 B1	Unix & C Lab Seminar I	5	Fall
B-CPE-101 B1	Unix & C Lab Seminar II	4	Fall
B-CPE-110 B1	Elementary Programming in C	7	Fall
B-MUL-100 B1	C Graphical Programming	7	Fall
B-MAT-100 B1	Mathematics	3	Fall
B- PSU- 100 B1	Unix System Programming	7	Fall
B-PMP- 100 B1	Project management	1	Fall
B-NSA -100 B1	Network and System Administration	3	Fall
B-INN-000 B0	Guided Project - Innovation Hub	6	Fall
M-FLE-000 B1	French language course I	2	Fall



B-SEC-200	B2	Introduction to Cyber security	3	Spring
B-CPE-200	B2	Elementary Programming in C	12	Spring
B-PSU-200	B2	Shell Programming	12	Spring
B-MUL-200	B2	Graphical Programming	8	Spring
B-AIA-200	B2	Introduction to Artificial Intelligence	4	Spring
B-WEB-200	B2	Introduction to Web Development	3	Spring
B-DOP-200	B2	Introduction to DevOps	3	Spring
B-MAT-200	B2	Mathematics	3	Spring
B-PMP-200	B2	Project management	3	Spring
B-INN-000	B0	Guided project - Innovation Hub	6	Spring
M-FLE-000	B2	French Language course	2	Spring

Courses description

Fall semester

[B-CPE-100] B1 - Unix & C Lab Seminar I

The C Pool is the core module in the Epitech curriculum. **Unix & C Lab Seminar I** is the first part.

It will enable the students to implement the initial concepts acquired, and especially will enable them to state their own hypotheses and to run tests in order to find the solutions. In addition to the projects, you will work on "Rush"- a type of mini-project to be completed in small groups and in a limited amount of time.

Skills to be acquired

- UNIX shell
- C language
- Basics of UNIX system use
- Fundamental elements of C language
- Makefiles
- Data structures

Teaching methods

All the materials are available online. Academic mentors help you to go through the module. **Unix & C Lab Seminar I** represent a key module at Epitech. In addition to the knowledge and skills you will acquire, you will get additional skills in time management/team work as if you would be in a company. The module sets up 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. For this project, it is equivalent to 2 days)

[B-CPE-101] B1 - Unix & C Lab Seminar II

The C Pool is the foundation of the Epitech curriculum. **Unix & C Lab Seminar II** is the second part.

It will enable the students to implement the initial concepts acquired and put it into practice in the exercise of `my_printf`.

Skills to be acquired

- C Language
- Project management

Teaching methods

Following the first part of the module, the students work on a stumper – project done by pairs of students with tight deadline and without external help-. This module is important since it works as a logical continuity with the first part of the module.

It aims at giving the students the tools to get started at Epitech.

Credit value

4 ECTS

Assessment

Online project submission

Project example

Name: `my_printf`

Subject: Reproduce the famous `printf` functions

Aim: Test students on C language skills acquired during the Pool in a small as well as introducing the concept of `va_arg`. The students will learn how to think efficiently and how to implement the well-known algorithms to solve the given problem.



[B-CPE-110] B1 - Elementary Programming in C

Elementary Programming in C covers the common programming aspects such as simple data structures (arrays, linked lists, stacks) in different scenarios (data sorting, identifying holes in grid maps).

Skills to be acquired

- Be capable of showing accuracy: reading a subject correctly, respecting a coding style to have a clear and logical code, following the rendering's instructions...
- Demonstrate the ability to correctly employ the language: syntax and simple data structures
- Demonstrate the ability to solve simple problems by using simple algorithms
- Make at least one functional rendering

Teaching methods

The students work on two projects for a total duration of 9 weeks of work. Each project is evaluated individually with automated tests which give the students and the academic team the information on the completion of each project.

Both projects are to be completed on their own.

Credit value

7 ECTS

Assessment

Online project submission

Project example

Name: pushswap

Subject: Creating an algorithm to order a list of numbers using a limited set of operations

Aim: Manipulate data structures and explore existing sort algorithms.

[B-MUL-100] B1-C Graphical Programming

C Graphical Programming consists in creating images/animations and scenes management using algorithms and graphical resources.

The unit aims at introducing event management, use of mathematical formula and creation of a graphical interface to the students?

Skills to be acquired

Gaming projects

- Resources, Event, and Windows management.
- Persistent data storing (e.g. highscore, or progression)
- Simple starting and pause menus
- Implementation of gameplay mechanics
- Implementation of simple game physics mechanics
- Common visual effects (e.g. parallax)



Mathematics

- Frames and windows management
- Drawing (simple and complex) shapes with a pixel drawing function.
- Implementation of simple tricks to render complex visual effects.
- Entity management
- Implementation of simple collision algorithm (hitbox)
- Optimization techniques to render and manage large numbers of entities.

Teaching methods

The students work on two projects for 8 weeks of work. Each project is evaluated individually by someone who manually tests the project and give the students the information on the completion of each project. Each project is to be completed on their own.

Credit value

7 ECTS

Assessment

Online project submission.

Project examples

Name: MyHunter

Subject: Game with a fixed camera, in which the player can shoot in some moving elements.

[B-MAT-100] B1 - Mathematics

Mathematics focuses on the mathematical tools. The unit is a complementary introduction to programming (reviewing some of the Pool's elements) and is also an introduction to scientific programming.

Skills to be acquired

- Linear algebra: vector analysis, matrix calculus
- Geometry: geometric transformations and coordinate systems
- Nonlinear equation solving

Teaching methods

The students work on five mini-projects of two weeks each for a total duration of 11 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 students work on each project alone or in pairs.

Credit value

3 ECTS

Assessmt

Online project submission.

Project example

Name: 102architect

Subject: Compute transformation matrix that have been created using homogeneous coordinates. Aim: Test the student ability to implement the mathematical concept of transformation matrix and use them in a computer software.



[B-PSU-100] B1–Unix System Programming

Unix System Programming covers all the fundamental elements of UNIX programming.

In this first part, we cover the advanced management of terminals and argument lists.

Skills to be acquired

- Understand and interact with the UNIX operating system
- Get a good level in C programming
- Learning how to make system calls
- Solve algorithmic problems
- Understand logic process
- Understand FileSystem
- Learn how to handle signals

Teaching methods

The students work on two mini-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 the information about the completion of each project.

Credit Value

7 ECTS

Assessment

Online submission

Project example

Name: my_ls

Subject: Create your own version of the 'ls' binary to display list of files.

Aim: Know how to programmatically interact with the filesystem.

[B-PMP-100] B1 – Project Management

Project Management is evaluated during the reviews and defense of each project of the other unit.

The unit contains session in which student can learn about project management and the skills they can apply for their projects.

Skills to be acquired

- Planning a project
- Working in a group
- Lead a team

Credit value

1 ECTS

Assessment

Online project submission



[B-NSA-100] – Network and System Administration

Network and System Administration teaches the students to master your Unix exploitation system.

Skills to be acquired

- Install and configure an exploitation system on the command line
- Manage users and their rights and permission
- Configure a graphic environment

Teaching methods

The students work on one project for a total duration of 3 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

Assessment

Online project submission

Project example

Name: my_web

Subject: Install a small environment of VM with various services

Aim: Know how to make a dual boot installation and basic network configurations

[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. The module starts with an introductory session with all the international students.

Skills to be acquired

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

Teaching methods

Guided project with monthly follow-ups supervised by the Epitech Innovation Center Team. In parallel, the students must attend several activities of his choice in topics of IT offered by the Innovation Center to validate the module.

Credit value 6 ECTS

Assessment Project submission



[M-FLE-000] French I Language Course

The **French** module teaches the students French (writing, listening, speaking) from the beginning level

Credit value

2 ECTS

Assessments

Class attendance and final exam

Spring semester (only for students having completed Fall semester)

[B-SEC-200] B2 –Introduction to Cyber Security

Introduction to Cyber Security focuses on the basics of cyber security. It introduce the fields of forensics using Capture The Flag style challenges.

Skills to be acquired

- Usage of tools to help exploit web application breaches
- Understanding and exploiting breaches such as XSS, CSRF, include...
- Understanding some unix concept and how to exploit them (ssh, ftp, nmap)

Teaching methods

The unit is made of a Capture The Flag tournament in which the students must complete security challenges.

Credit value

3 ECTS

Assessment

The evaluation is based on the number of points and challenges validated on the CTF platform and a theoretical evaluation.



[B-CPE-200] B2 – Elementary Programming in C

Elementary Programming in C covers common programming aspects such as algorithms and data structures in different scenarios (pathfinding, graphs, ...).

Skills to be acquired

- Be capable of showing accuracy: reading a subject correctly, respecting a coding style to have a clear and logical code, following the rendering's instructions...
- Demonstrate the ability to correctly employ the language: syntax and simple data structures
- Demonstrate the ability to solve simple problems by using simple algorithms
- Make at least one functional rendering
- Data structures (linked lists, arrays)
- Loops and conditioning systems
- Job scheduler problems

Teaching methods

The students work on two projects for a total duration of 12 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.

A project is to be made with a group of up to 2 students. The second one requires a group of 3 to 4 students.

Credit value

12 ECTS

Assessment

Online project submission

Project example

Name: Dante's star

Subject: Generate and resolve labyrinths

Aim: Pathfinding algorithms

[B-PMP-200] B2 – Project Management

Project Management is evaluated during the reviews and defense of each projects of the other units.

The unit contains session in which student can learn about project management and things they can put in place for their projects.

Skills to be acquired

- Planning a project
- Working in a group
- Lead a team

Credit value 3 ECTS

Assessment Oral presentation

[B-PSU-210] B2–Shell Programming



Shell Programming focuses on more advanced aspects of programming of your own shell.

Skills to be acquired

- Correctly program in C
- Understand and interact with the operating system
- Calmly understand a big project
- Manage a long-term group project

Teaching methods

The students work on two projects for a total duration of 11 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 Minishell1 is a solo project, the minishell2 is to be made in groups of 2 and the 42sh in a group of 4 to 5 students.

Credit value 12 ECTS

Assessment Online project submission

Project example

Name: 42sh

Subject: Create your own shell capable of launching process, handling the environment, use builtins

Aim: Uses process, pipes, parsing.

[B-MUL-200] B2–Graphical Programming

Graphical programming consists in creating images/animations and scenes management using algorithms and graphical resources.

The two core axes "mathematics" and "game" are still existing, added to a new UX/UI-oriented aspect.

Skills to be acquired

- Isometric/parallel projection
- Creation of UI elements (e.g. subwindows, buttons)
- Responsivity of user interactions (animations, color changes, layering)
- In-game balancing (skills, stuff)

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.

Credit value

8 ECTS

Assessment

Online project submission

Project example

Name: MyWorld

Subject: Create a 3D projection of a procedurally generated world



[B-AIA-200] B2 – Introduction to Artificial Intelligence

Introduction to Artificial Intelligence is based on one single project, which consists of simulating an autonomous car.

It aims also at discovering the field of Artificial Intelligence: what is it about? what can we do with it?

Skills to be acquired

- Overview of "Artificial Intelligence" field
- Introduction to research in a state-space
- Awareness of the data structure problems and algorithmic complexity
- Methodical approach to measuring a program's performance

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.

This project is to be done in pairs.

Credit value

4 ECTS

Assessment

Online project submission

Project example

Name: need4stek

Subject: Move a simulated car in an autonomous way across various tracks

Aim: Basics of A.I.

[B-WEB-200] B2– Introduction to Web Development

The **Introduction to Web Development** unit is composed of a single project that consists of creating a REST API that reads and writes to a database.

The goal is to introduce students to the field of web development

Skills to be acquired

- the creation of a database
- understanding the VCM architecture
- the use of different tools (nodejs, npm, express)

Teaching methods

The students work on one project for a total duration of 3 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.

This project is to be in groups of 2 to 3 students.

Credit value

3 ECTS



Assessment

Online project submission

Project example

Name: EpyTodo

Subject: Create a REST API to manage a ToDoList with CRUD operations.

Aim: Discovery of the basics of web development with python

[B-DOP-200] B2 – Introduction to DevOps

The **Introduction to DevOps** unit is composed of two projects whose goal is to introduce the basics of DevOps (an area at the crossroads of IT development and system administration) through Docker and an introduction to CI/CD through Github Actions.

Skills to be acquired

- Build and deploy an existing project using docker and docker-composer
- Implement task automation on a git repository using Github Actions

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.

Credit value

3 ECTS

Assessment

Online project submission

Project example

Name: popeye

Subject: Deploy a project exist thanks to docker and docker-composer.

Aim: Discovery of the use and creation of docker configuration files.

[B-MAT-200] B2 - Mathematics

Mathematics focuses on the mathematical tools. The unit is a complementary introduction to programming (reviewing some of the Pool's elements) and is also an introduction to scientific programming.

Skills to be acquired

- Linear algebra: vector analysis, matrix calculus
- Geometry: geometric transformations and coordinate systems
- Nonlinear equation solving

Teaching methods

The students work on five mini-projects of two weeks each for a total duration of 10 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 students work on each project alone or in pairs.



Credit value

3 ECTS

Assessment

Online project submission.

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

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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.

The module starts with an introductory session with all the international students.

Skills to be acquired

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

Teaching methods

Guided project with monthly follow-ups supervised by the Epitech Innovation Center Team. In parallel, the students must attend several activities of his choice in topics of IT offered by the Innovation Center to validate the module.

Credit value 6 ECTS

Assessment Project submission

[M-FLE-000] French Language Course

The French module teaches the students French (writing, listening, speaking) from the beginning level

Credit value

2 ECTS

Assessments

Class attendance and final exam



EPITECH Second-Year program

Only Spring semester available

from January to July

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

Courses list:

<u>Code</u>		<u>Course</u>	<u>ECTS</u>	<u>Semester</u>
B-CPP-300	B3	Paradigm Seminar	7	Spring
B-CNA-410	B4	Computer Numerical Analysis – Trading	3	Spring
B-CCP-400	B4	Concurrent Programming	5	Spring
B-FUN-400	B4	Functional Programming	5	Spring
B-MAT-400	B4	Mathematics	4	Spring
B-DOP-400	B4	DevOps	3	Spring
B-NWP-400	B4	Network Programming	7	Spring
B-OOP-400	B4	Object-Oriented Programming	8	Spring
B-MET-400	B4	Project management	4	Spring
B-PSU-402	B4	Unix Programming - Instrumentation	7	Spring
B-ASM-400	B4	x86-64 Assembly	3	Spring



B-YEP-400	B4	Year - end - project	7	Spring
B-SEC-400	B4	Cyber Security	3	Spring
B-INN-000	B0	Guided project - Innovation Hub	2	Spring
M-FLE-000		French language course	2	Spring

Courses description:

[B-CPP-300] B3 Paradigm Seminar

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

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

Skills to be acquired

- Correct usage of the C++ language and its special features in relation to C.
- Correct usage of the Haskell language
- 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

7 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] B4 – 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 8 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: Trade

Subject: Elaborate your own algorithm in a simulated trading environment

[B-CCP-400] B4 – 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 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. One solo project and one project in groups of 2 to 3 students.

Credit value

5 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-FUN-400] B4 – 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 5 ECTS

Assessments Online project submission

Project Example

Name: Wolfram

Subject: Implement Wolfram's elementary cellular automaton in the terminal

[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 method

The students work on 9 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 4 ECTS

Assessment Online project submission.

Project example

Name: 202unsold

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



[B-DOP-400] B4 – DevOps

The **DevOps** unit is composed of two projects whose goal is to go further into DevOps practices (an area at the crossroads of IT development and system administration).

Skills to be acquired

- Creating and managing a set of Docker images and containers using Dockerfiles and Docker Compose
- Setting up a Jenkins instance for Continuous Integration and various automation tasks (such as automated testing) using Jenkins Configuration as Code and Jenkins Job DSL

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.

Credit value

3 ECTS

Assessment

Online project submission

Project example

Name: my_marvin

Subject: Setup a jenkins instance using configuration-as-code.

[B-NWP-400] B4 – 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 9 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

7 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] B4 – 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 three projects for a total duration of 12 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 8 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-MET-400] B4 – Project management

Project Management is evaluated during the reviews and defense of each projects of the other units.

The unit contains session in which student can learn about project management and things they can put in place for their projects

Skills to be acquired

- Planning a project
- Working in a group
- Lead a team

Credit value 4 ECTS

Assessment Oral presentation

[B-PSU-402] B4 – 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;
- Understand the structure of a binary (ELF) file format
- 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 9 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

7 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-ASM-400] B4 – 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 3 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

3 ECTS

Assessments

Online project submission

Project Example

Name: minilibc

Subject: Create your own miniature version of the LibC

[B-YEP-400] B4 – Year-End-Project

Year-End-Project is the final project of the second year. It summarizes several concepts such as network programming (using TCP sockets), Object-Oriented Programming and Concurrency.

Skills to be acquired

- Network programming
- GUI
- Basic artificial intelligence

Teaching methods

The students work on one project 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. The project is to be done in groups of 4 to 5 students.

Credit value 7 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-SEC-400] B4 – Cyber Security

The Cyber Security unit introduces students to new notions regarding Cyber Security. It is a follow-up to the first year unit.

Skills to be acquired

- Usage of steganography tools
- Understanding and exploiting of binaries (buffer overflow, ...)

Teaching methods

A "Capture The Flag" tournament in which students are asked to take on security challenges, demonstrating their skills.

Credit Value 3 ECTS

Assessments

The evaluation is based on the number of points and challenges validated on the CTF platform and a theoretical evaluation.

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.

The module starts with an introductory session with all the international students.

Skills to be acquired

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

Teaching methods

Guided project with monthly follow-ups supervised by the Epitech Innovation Center Team.

In parallel, the students must attend several activities of his choice in topics of IT offered by the Innovation Center to validate the module.

Credit value 6 ECTS

Assessment Project submission

[M-FLE-000] French Language Course

The French module teaches the students French (writing, listening, speaking) from the beginning level

Credit value 2 ECTS

Assessments Class attendance and final exam



Epitech Third year program

From September 2022 to July 2023

Program aim:

- Acquire more advance computer skills
- Work and manage a middle size group
- Introduction to software architecture and design pattern

Learning outcomes:

Students will be able to tackle more advanced algorithmic problems and build middle to large size software.

Prerequisites:

- C programming language
- C++ programming language
- Object Oriented Programming
- Design pattern (basic knowledge)
- English language proficiency equivalent to B2 (TOEFL IBT: 65 / IELTS: 5.5/ TOEIC: 600, or English test of their institution equivalent to B2

Courses list:

<u>Code</u>		<u>Course</u>	<u>Credit (ECTS)</u>	<u>Semester</u>
B-SEC-500	B5	Advanced Cyper Security	3	Fall
B-DOP-500	B5	Advanced DevOps	4	Fall
B-MAT-500	B5	Mathematics	4	Fall
B-AIA-500	B5	Artificial Intelligence	3	Fall
B-CPP-500	B5	Advanced C++	8	Fall
B-DEV-500	B5	Application development	8	Fall
B-DEV-501	B5	Functional Programming	8	Fall

B-INN-000	Guided Project – Innovation	6	Fall/Spring
M-FLE-000	French Language course	2	Fall

Course description :

[B-SEC-500] B5 – Advanced Cyber Security

Advanced Cyber Security is the follow up to the second year unit. It goes deeper and introduced advanced notions.

Skills to be acquired

- Exploiting Windows and Linux (Kerberos, samba, nfs, ...)
- Pivoting
- Network sniffing (wireshark, ssh tunnelling)

Teaching methods

A "Capture The Flag" tournament in which students are asked to take on security challenges, demonstrating their skills.

Credit value

3 ECTS

Assessment

The evaluation is based on the number of points and challenges validated on the CTF platform and a theoretical evaluation.

[B-DOP-500] B5 – Advanced DevOps

Advanced DevOps teach the students the deeper concepts of DevOps.

Skills to be acquired

- Build and deploy a complete web app using docker and docker-compose
- Deploy and configure a Jenkins instance with CI/CD
- Scale a service over a cluster using docker swarm and treafik



Teaching methods

The students work on 2 mini-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 information about the completion of each project.

Credit value

4 ECTS

Assessment

Project submission

Project example

Name: bernstein

Subject: Deploy a project at scale using Kubernetes

[B-MAT-500] B5 - Mathematics

Mathematics studies the advanced scientific calculation algorithms in operations research. Operation research represents all the methods and models that allow numerous business management and organization issues to be clarified and solved. The objective of the module is to introduce notions of the most important algorithms in scientific calculations which are used in operations research.

Skills to be acquired

- Complexity of algorithms
- Graph theory
- Linear systems
- Program and interpolation

Teaching methods

During the module, the students work on 9 mini-projects. The projects cover three topics:

- Algorithm through projects n°301, n°305, n°307
- Data structures (matrix and graphs) through projects n°302, n°303, n°304, n°306
- Interpolation through projects n°308 and n°309

The module work as an inter-disciplinary module. The students are evaluated also on their professional behavior, detailed and effective work and their involvement.

Credit value

4 ECTS

Assessment

Project submission



[B-AIA-500] B5 - Artificial Intelligence

Artificial intelligence is based on the Gomoku project. It focuses on the decision-making process in a two players game. The notions of Minimax theory and Monte Carlo methods will be discussed as well as Machine Learning through genetic algorithms and artificial neural network.

Skills to be acquired

- Knowledge representation (how to define and complete an efficient goal-driven data structure)
- Minimax and Monte Carlo methods or equivalent methods (understand the methods usage in a decision process within a two-player strategy and to be able to choose one of them)
- Heuristic thinking and implement a non-static heuristic that efficiently estimate the solutions
- Run test on programs which aim at the best efficiency

Teaching methods

Through the Gomoku project, the students must:

- Formalize the subject matter
- Define efficient structures
- Implement a decisional algorithm
- Create a complete Gomoku AI which is able to deploy and to adapt strategies
- Comply with an existing process

Credit value 3 ECTS

Assessment

Project submission

Project example

Name: Gomoku

Subject: game theory algorithm and basic AI

Aim: Learn and implement basic game theory algorithms like min-max through an easy but challenging game. The game must be developed from scratch



[B-CPP-500] B5 –Advanced C++

Advanced C++ teaches the deep aspects of the architecture of a C++ program. It consists of introducing the philosophic difference between UNIX and Windows to create software abstractions which allow originally portable programs to be developed in all systems. The abstraction focuses on a key concept leading the whole topics: Application Programming Interfaces (API) are elements which are automatically linked to Object Oriented Programming, all programming languages combined.

Skills to be acquired

- understand the differences between Unix and Windows system
- Able to identify the mistakes/attributes of these operating systems
- Able to find and read Windows information: MSDN
- Able to know how to use and to configure Visual Studio, Microsoft's IDE
- Able to know how to use Visual Studio's extraordinary debugger
- Able to know how to create a whole UML class diagram (used by all object languages)
- Able to understand, to use and to design an API
- Able to use an abstract shared library in Windows and UNIX
- Able to use abstract sockets in Windows and UNIX
- Able to use abstract threads in Windows and UNIX

Teaching methods

The students must make a HTTP server program such as a lightweight Apache. The projects are based on an industry use of C++. The purpose of the module is the projects to be built and to run it on Unix as well as on Windows systems.

Credit value

8 ECTS

Assessment

Project submission



[B-FUN-500] B5 – Application Development

Application Development focuses on the most used programming languages and the most used ecosystems in the today's industry.

Skills to be acquired

- Able to understand the concepts of the chosen language
- Able to use build tools and dependency managers used by most companies
- Able to understand how to use and to create a web service
- Able to evaluate and understand the user experience and the user interface through your program developments

Programming languages

- Java
- C#
- .Net
- Javascript (via NodeJS)

Tools

- Maven
- JUnit
- NPM
- NuGet

Teaching methods

In the module, the students learn how to create a full service capable of connecting multiple existing APIs (a IFTTT-like) both front and back-end.

Credit value

10 ECTS

Assessment

Project submission

[B-FUN-500] B5 – Functional Programming

Functional programming is the last unit of this introduction to advanced functional concepts. The students work on abstract concepts such as monads or lambdas.

Skills to be acquired

- Parsing using the functional paradigm
- Usage of AST
- Inferring types
- Code compilation

Teaching methods

The students work on 1 project 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 project is to be done in groups of 3 to 4 students.

Credit value

10 ECTS

Assessment Project submission



[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.

The module starts with an introductory session with all the international students.

Skills to be acquired

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

Teaching methods

Guided project with monthly follow-ups supervised by the Epitech Innovation Center Team.

In parallel, the students must attend several activities of his choice in topics of IT offered by the Innovation Center to validate the module.

Credit value

6 ECTS

Assessment

Project submission

[M-FLE-000] French Language Course

The French module teaches the students French (writing, listening, speaking) from the beginning level

Credit value 2 ECTS

Assessments Class attendance and final exam