



EPITECH

International Programs

2019-2020

{EPITECH.}



Epitech International Bachelor Program II

Program aim:

- Acquire more advanced computer engineering 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: English language proficiency: TOEFL IBT: 65 / IELTS: 5.5/ TOEIC: 600, or English test of their institution equivalent to B2

Course list:

Code	Course	Credit (ECTS)
B-SEC-500	Security – Cryptography	2
B-NSA-500	Network and System Administration	2
B-MAT-500	Mathematics	3
B-FUN-510	Functional Prog – evalExpr	1
B-FUN-501	Functional Prog – dumbXML	2
B-AIA-500	Artificial Intelligence	2
B-DEV-500	AppDev – Dashboard	2
B-DEV-501	AppDev – Epicture	2
B-CPP-501	Advanced C++ - R-Type	3
B-CPP-500	Advanced C++ - Babel	2
	French as foreign language	2
	Captstone project	



Syllabus:

[B-SEC-500] Security – Cryptography

Security – Cryptography is a module on the ciphers and the encryptions: secure algorithm revealed. The CAESAR project is based on the crypto challenges which the level of difficulty increases step by step. The students start to work on the basics of Xoring and finish the module by breaking real-life cryptography.

The students do not need prior advanced knowledge in mathematics or in cryptography.

Skills to be acquired

- Ciphers
- Encryptions
- Break simple XOR cipher (CAESAR)
- Break repeating key XOR (vigenere)
- Attacks on AES in ECB and CBC mode

Teaching methods

The students start to work on basic project in cryptography and complete the module by getting strong knowledge in cryptography. It requires strong knowledge in programming. The compulsory programming languages to use are python language (strongly advised) or C or C++ language programming (more difficult).

Credit value

2 ECTS

Assessment

Project submission

[B-NSA-500] Network and System Administration

Network and system Administration teaches the students how to set up a computer.

Skills to be acquired

- Virtual machine basics
- Router configuration
- OS set-up
- Network setting (bridge)

Teaching methods

The students will work together in groups of 5 during a supervised workshop.



Credit value

2 ECTS

Assessment

Project submission

Project example

Name: Systems and Networks

Subject: Basic principles of Networking and System Administration

Aim: Cover the basic of sys admin (virtual machine, OS installation and configuration) and networking (LAN network setup, router configuration)

[B-MAT-500] 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

3 ECTS

Assessment

Project submission

[B-FUN-510] Functional Prog – evalExpr



Functional Prog – evalExpr is an introduction to advanced functional concepts. The students work on abstract concepts such as monads or lambdas. It is an introductory module for the module B-FUN-501.

Skills to be acquired

- Advanced functional concepts

Teaching methods

Credit value

1 ECTS

Assessment

Project submission

[B-FUN-501] Functional Prog – dumbXML

Functional prog – dumbXML is an introduction to advanced functional concepts. The students work on abstract concepts such as monads or lambdas.

Skills to be acquired

- Advanced functional concepts

Teaching methods

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Credit value

2 ECT

Assessment

Project submission

[B-AIA-500] Artificial Intelligence

Artificial intelligence is based on the Gomoku project. It focuses on the decision-making process in a two player 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

2 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-DEV-500] AppDev – Dashboard

AppDev – Dashboard 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

Programming languages

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

Tools

- Maven
- JUnit



- NPM
- NuGet

Major Libraries

- Netty
- Protocol Buffers

Teaching methods

Through the module, the students learn the programming languages and tools through the creation and the use of the web service.

Credit value

2 ECTS

Assessment

Project submission

[B-DEV-501] AppDev – Epicture

AppDev – Epicture focuses on the most used programming languages and the most used ecosystems in the today's industry.

Skills to be acquired

- Knowledge of the Android/UWP development environment
- Knowledge of the tools and processes to develop and test projects
- Able to understand and to use APIs through web services
- 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

Major Libraries

- Netty
- Protocol Buffers



Teaching methods

In the module, the students learn about how to create a client application (either mobile application or desktop application) via UWP or Android. It is considered the students to have the required basics of the chosen development stack and to use the specific aspects related to the Android/UWP development.

The project consists of creating a client application for a well-known pictures service using its API.

Credit value

2 ECTS

Assessment

Project submission

[B-CPP-501] Advanced C++ - R-Type

Advanced C++- R-Type teaches the deep aspects of the architecture of a C++ program. It consists of introducing the philosophic difference between UNIX and Windows in order 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

- Able to 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 copy of the R-Type game. 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

3 ECTS

Assessment



Project submission

Project example

Name: R-Type

Subject: Game theory and Architecture as for Scripting

Aim: Develop a well-known retro game called R-Type as an initiation to game development, program architecture and scripting API

[B-CPP-500] Advanced C++ - Babel

Advanced C++ - Babel teaches the deep aspects of the architecture of a C++ program. It consists of introducing the philosophic difference between UNIX and Windows in order 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

- Able to 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 VOIP client/server program such as Skype. 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

2 ECTS

Assessment

Project submission

Project example

Name: Babel

Subject: tiny VoIP software



Aim: Develop VoIP application like Skype through

[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.

Credit value

9 ECTS

Assessment

Project sub