

## CU 5.2: IT, STATISTICS

**Director of studies: Denise CHOFFEL**

### General CU objectives:

#### Engineers work in complex digital and informational environments.

The aim is to bring engineering students to:

- use digital technology by integrating ethics and security aspects,
- recognise the need for information, determine the nature (legal, scientific, technical, civil) and extent of the information needed, critically evaluate the source and the information effectively and efficiently,
- use the relevant information collected, present new knowledge in the form of a bibliography that respects ethical rules and best practices.

#### Engineers need to process simple or complex digital information and data.

The aim is to bring engineering students to:

- Model and structure data in a spreadsheet,
- Pose and analyse a problem, translate it into an algorithm,
- Argue about the limits of tools, choose the most appropriate one(s) to solve the problem posed,
- Design and implement the problem-solving and optimisation algorithm.

#### Statistics remain a fundamental part of engineering sciences.

The aim is to be able to:

- describe the basic concepts of statistical data analysis,
- classify the statistical methods for the engineer, whatever the application: production, quality, mechanical, thermal, etc.
- use IT tools to implement the methods discussed,
- present the mathematical and statistical foundations necessary for the implementation of experimental plans.

#### The pedagogical practices implemented in this CU allow engineering students to work on organisational and relational skills (project management).

The aim is to be able to:

- Describe the structure and fundamentals of a project,
- Know how to establish the specifications of a project by including all stakeholders (QQOQCCP), the provisional GANTT of a project, prioritise the different tasks, manage priorities, create the project model.

### Consists of:

- Module 1: The digital and informational environment
- Module 2: Algorithmic, optimisation and data processing
- Module 3: Statistics and data interpretation
- Industrial assessment: Internship project

### Hourly volume

<i>In-person</i>	<i>Self-directed study</i>
<b>16.00 H Lectures</b>	<b>50.00 H</b>
<b>18.00 H Tutorials</b>	
<b>18.00 H Practicals</b>	

### Positioning of the CU in the School reference system:

### Units of skills

In accordance with the RNCP sheet

## CU 5.2: IT, STATISTICS

Module 1: The digital and informational environment	Coefficient 3
<b>Session leaders:</b> Denise CHOFFEL, Béatrice AUGIER	
<b>Teaching assistants:</b> none	
<b>Prerequisites:</b> none	
<b>Teaching materials:</b> Course notes – Presentation slides – Reading list – Arche page – Tutorials	
<b>Assessment methods:</b> individual and peers Class assignments– Homework– Online tests– Portfolio– Minutes– CU work 5.3 M3	

Learning outcomes	Description	Number of student hours (in-person)		
		Lecture s	Tutorial s	Practica ls
<p>Integrate into an organisation from a digital perspective.</p> <p>Have general knowledge of computer science, handle and administer the ENT (Digital Workspace).</p> <p>Use document research tools to collect relevant information.</p> <p>Know the editorial chain of a scientific publication.</p> <p>Know the professional standards and ethics of a bibliographic study or a literature review.</p> <p>Use office automation tools, present work in digital format, create report and presentation templates.</p> <p>Organise and process data, prepare user interfaces, present the results of processing.</p> <p>Use review and collaborative work tools to deliver relevant and French-language working documents.</p>	<p>Presentation of the CU and of IT to ENSTIB and UL (material and human resources, security, society, etc.).</p>	2.75		
	<p>The ENT: digital work and learning environment, access and use:</p> <ul style="list-style-type: none"> <li>– Directory /Student file/ADE agenda</li> <li>– Arche online course management platform</li> <li>– Zimbra messaging, filtering/mailboxes</li> <li>– FileSender transfer of heavy files</li> <li>– Format a text document (styles, bullets, table of contents, footnotes, etc.)</li> <li>– Design presentation slides with template: portfolio mindset</li> </ul>			5.00
	<p>Presentation of paper and digital tools and resources. Visit of the ENSTIB BU site.</p> <p>Types of documents (standards, patents, internship or research and development project reports, articles, books, etc.).</p> <p>Search engines: of the UL, Google Scholar, Arche– ENSTIB BU.</p> <p>Citation formats and bibliographic references.</p> <p>Spreadsheet, formulas, forms and charts.</p> <p>Implementation of a methodology for research, selection and retrieval of information.</p>			5.00
		<b>2.75</b>	<b>0.00</b>	<b>10.00</b>

## CU 5.2: IT, STATISTICS

Module 2: Algorithmic, optimisation and data processing	Coefficient 6
<b>Session leaders:</b> Patrick CHARPENTIER, Denise CHOFFEL, Yinling LIU	
<b>Teaching assistants:</b> none	
<b>Prerequisites:</b> none	
<b>Teaching materials:</b> Course notes – Presentation slides – Arche page– - Reference book - Tutorials	
<b>Assessment methods:</b> individual	
Class assignment– Computer assignment– Online tests	

Learning outcomes	Description	Number of student hours (in-person)		
		Lectures	Tutorials	Practicals
<p>Present an algorithm graphically (flowchart) or literally (pseudo code).</p> <p>Solve numerical problems with algorithms: – understand an algorithm – analyse a problem, formulate it by an algorithm that is understood by others.</p> <p>Design algorithms for optimisation.</p> <p>Model and structure the data needed to solve a problem or carry out a project.</p> <p>Translate an algorithm into a programming language to create an efficient and sustainable program, reusable by others.</p> <p>Automate tasks in Excel.</p> <p>Apply good programming practices, make your program accessible.</p>	<p>Break down a complex problem into elementary problems. Express an elementary problem by means of loops and tests. Create a lexicon of the problem to be solved (name the variables, associate them with a type).</p>	1.75	6.00	
	Analyse an optimisation problem, algorithmic implementation. Application in Excel spreadsheet and xPress.	3.50	4.00	
	Industrial project (milestones, portfolio)			2.00
	<p>Excel VBA programming language: – creation of graphical interfaces, – translation of algorithmic into VBA language, – audit of data required, – structuring of the program, – declaration of variables, – renaming of objects, – code indentation, – code comments, – code test and validation.</p>			6.00
		<b>5.25</b>	<b>10.00</b>	<b>8.00</b>

## CU 5.2: IT, STATISTICS

Module 3: Statistics and data interpretation	Coefficient 4
<b>Session leaders:</b> Marc JAFFRES, Yinling LIU	
<b>Teaching assistants:</b> none	
<b>Prerequisites:</b> none	
<b>Teaching materials:</b> Course note – Reading list – Tutorials	
<b>Assessment methods:</b> Individual Class assignment - Tutorial exercises	

Learning outcomes	Description	Number of student hours (in-person)		
		Lecture s	Tutorial s	Practical s
Describe the basic notions of statistics.  Apply statistical methods and techniques for ENSTIB engineers: in production, quality, mechanics, thermal, etc.  know how to model a phenomenon or an experiment following statistical data, know how to perform a hypothesis test (comparison of means., etc.), know how to check the normality of a set of statistical data.  Present the mathematical and statistical foundations necessary for the implementation of experimental plans.  use IT tools to implement the methods discussed.	Random variables, normal distribution, estimation, average and variance, tests, modelling (linear and polynomial regression). Significance tests (Student, Fisher-Snédecor), modelling, Gauss method. The tutorials take place in the computer room for direct application on Excel spreadsheet.	8.00	8.00	
		8.00	8.00	0.00

## CU 5.2: IT, STATISTICS

Industrial assessment: Internship project	Coefficient
<b>Session leaders:</b> Apprenticeship supervisor (in company), Denise CHOFFEL (CU 5.2 supervisor at ENSTIB)	
<b>Teaching assistants:</b>	
<b>Prerequisites:</b> Modules M1, M2 and M3 of CU 5.2	
<b>Teaching materials:</b> Reading list– Arche Pages– Project– Tutorials	
<b>Assessment methods:</b> individual Assessment by the apprenticeship supervisor	

Learning outcomes	Description	Number of student hours (in-person)		
		Lecture s	Tutorial s	Practical s
<p>Have a general digital culture (adaptation to the digital work environment, effective use of office tools, reference to reliable sources of information, IT hygiene and cybersecurity).</p> <p>Know how to use basic numeric concepts to adapt to the company's work environment: effectively use office tools, reference reliable sources of information, apply good IT security practices.</p> <p>Collaborate effectively in groups to carry out a project and communicate regularly on its progress.</p> <p>Define the working methodology of a project, identify its key steps and represent the schedule in graphical form.</p> <p>Justify the choice of tools according to the specific needs of the project and the company's digital environment.</p> <p>Structure the data needed for the project on a spreadsheet by modelling and organising it in a clear and usable way.</p> <p>Develop algorithms and calculations in line with project requirements, and implement them in a spreadsheet.</p> <p>Highlight the project using appropriate media and present it to the various stakeholders.</p> <p>Leverage IT tools to apply statistical analysis methods to project data (if applicable).</p>	<p>Project to be carried out within the company.</p> <p>The company suggests a subject:</p> <ul style="list-style-type: none"> <li>– data to be processed (production data, time, parts management, directory, order data, etc.)</li> <li>– an objective for processing this data (statistics, dashboard, etc.).</li> </ul> <p>Examples:</p> <ul style="list-style-type: none"> <li>*design of a tool for entering working hours by project and estimating time by project typology and complexity.</li> <li>*quality control of timber products (moisture content, dimensions, supplies, etc.). *Pareto analysis of bar stock entries/exits.</li> </ul> <ul style="list-style-type: none"> <li>– QQQCCP reformulation, expression of the specifications</li> <li>– audit of data required, glossary</li> <li>– provisional mock-up estimated date</li> <li>– provisional schedule of the project</li> <li>– Choice of tool(s) for implementation (formulas, advanced spreadsheet functions, macros, programming, etc.)</li> <li>– Expression of the algorithm necessary to meet the specifications (detailed sequence of steps/tasks).</li> <li>– Implementation and testing</li> <li>– Customer satisfaction assessment during and after the project</li> </ul> <p>The apprentice will build their project/skills portfolio which will be assessed by the apprenticeship supervisor</p>			
		0.00	0.00	0.00

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