1A FISE	CU 5.2
Semester 5	6 School ECTS

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
- Module 4: Project

Hourly volume

In-person		*Self-directed study*
16.00 H	**Lectures**	**100.00 H**
18.00 H	**Tutorials**	
52.00 H	**Practicals**	

Positioning of the CU in the School reference system:

Units of skills
In accordance with the RNCP sheet

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

Learning outcomes	**Description**	**Number of student hours (in-person)**		
		Lectures	**Tutorials**	**Practicals**
Integrate into an organisation from a digital perspective. Have general knowledge of computer science. Handle and administer the ENT (digital workplace). Use document research tools to collect relevant information. Know the editorial chain of a scientific publication. Know the professional standards and ethics of a bibliographic study or a literature review. Use office automation tools, create report and presentation templates, enhance work in digital format. Organise and process data, prepare user interfaces, present the results of processing. Use review and collaborative work tools to deliver relevant and French-language working documents.	Presentation of the CU and of IT to ENSTIB and UL (material and human resources, security, society, etc.).	2.75		
	The ENT: digital work and learning environment, access and use: – Directory /Student file/ADE agenda – Arche online course management platform – Zimbra messaging, filtering/mailboxes – FileSender transfer of heavy files – Format a text document (styles, bullets, table of contents, footnotes, etc.) – Design presentation slides with template: portfolio mindset			6.00
	Presentation of paper and digital tools and resources. Visit of the ENSTIB BU site. Types of documents (standards, patents, internship or research and development project reports, articles, books, etc.). Search engines: of the UL, Google Scholar, Arche – ENSTIB BU. Citation formats and bibliographic references. Spreadsheet, formulas, forms and charts. Implementation of a methodology for research, selection and retrieval of information.			6.00
		2.75	**0.00**	**12.00**

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Module 2: Algorithmic, optimisation and data processing — Coefficient 6

Session leaders: Patrick CHARPENTIER, Denise CHOFFEL, Yinling LIU

Teaching assistants:

Prerequisites: none

Teaching materials: Course notes – Presentation slides – Arche page– - Reference book - Tutorials

Assessment methods: individual
Class assignment– Computer assignment– Online tests

Learning outcomes	Description	Number of student hours (in-person)		
		Lectures	Tutorials	Practicals
Present an algorithm graphically (flowchart) or literally (pseudo code). Solve numerical problems with algorithms: – understand an algorithm – analyse a problem, formulate it by an algorithm that is understood by others.	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).	1.75	8.00	
Design algorithms for optimisation. Model and structure the data needed to solve a problem or carry out a project.	Analyse an optimisation problem, algorithmic implementation. Application in Excel spreadsheet and xPress.	3.50	2.00	8.00
Translate an algorithm into a programming language to create an efficient and sustainable program, reusable by others. Automate tasks in Excel. Apply good programming practices, make your program accessible.	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.			16.00
		5.25	**10.00**	**24.00**

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

Learning outcomes	Description	Number of student hours (in-person)		
		Lectures	Tutorials	Practicals
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). Descriptive statistics.	8.00	8.00	
	Applications on Excel.			8.00
	Significance tests (Student, Fisher-Snédécor), modelling, Gauss method.			4.00
		8.00	**8.00**	**12.00**

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Module 4: Project	**Coefficient 3**
Session leaders: Denise CHOFFEL, Béatrice AUGIER	
Teaching assistants:	
Prerequisites: module1 (office tools, Excel, document search)– module 2 (algorithmic)– module 3 (statistics).	
Teaching materials: Reading list– Arche Pages– Project– Tutorials– Forum, Web Resources	
Assessment methods: individual and in groups Restitution – Scoping document – XLSM folders – Portfolio – Meeting minutes	

Learning outcomes	**Description**	**Number of student hours (in-person)**		
		Lectures	**Tutorials**	**Practicals**
define the specifications of a project (QQOQCCP). identify the stages of a project, plan it, present it. identify, as progress is made, the information needs, adapt the planning according to the contingencies of the project. argue the choice of tools adapted to the context of the project. model and structure the data needed for the project in a glossary spreadsheet. design the necessary algorithms and implement them in order to meet the specifications. lead a meeting, draft the minutes. present the design/implementation of computer software to a customer.	Group project Project launch: – Introduction to project management – Expectations and deliverables – Tools available Expectations: – expression of needs, expected functions, specifications – data template – software mock-up – project planning – set of tools (Excel, VBA, Gantt, Access, ...) data chart reflection, design of an algorithm. programming the algorithm in VBA. meeting milestones and submission of deliverables.			2.00
promote learning, know-how and skills through a portfolio.	submission of the project in the requested format and answer to questions.			2.00
		0.00	**0.00**	**4.00**

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