SYLLABUS

GRANDE ÉCOLE ENGINEERING PROGRAMME

FIRST YEAR — L3 LEVEL

ACADEMIC YEAR 2026–2027

English version

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Engineering Programme Syllabus: Grande École Programme

TU Title: Preliminary Design (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Paul Stief (Metz)*		*Year of Study:* Level L3
TU COSI	*Language of Instruction: French and/or English*	*Type: UEI Mandatory*	*Cycle: 1A*
ECTS credits: 4	*Student workload per TU (hours): 100*	*Including face-to-face teaching (hours): 60*	*Semester: GIE1*
Keywords: functional analysis, product architecture, CAD.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	X
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	X
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	X
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	X
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	X
	4.4 Designing	X
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	X
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X			

Specific prerequisites



- Identify the functions of a system.
- Identify the flows of matter, information and energy through the system.
- Analyse technical documents (documentation, 2D and 3D representations, etc.).
- Identify the mobility of a mechanism and understand kinematic joints.

General teaching methods

Knowledge inputs, tutorials and project-based teaching, all contextualised through examples drawn from the teachers' industrial experience, with an emphasis on digital tools.

Intended learning outcomes

Build and implement a preliminary design process for a manufactured system, from the expression of need through to the preliminary design, integrating technical, economic, environmental and societal constraints (TEDS) in order to deliver an innovative, sustainable solution suited to current challenges.

ILO 1. Draw up specifications using functional analysis tools.
- Students must be able to translate a need into a set of functions and characterise them in functional specifications.

ILO 2. Apply an innovation and solution-search approach, together with value analysis.
- Students must be able to identify concepts and solutions, combine them in relation to specifications, then rank them in order to select the most relevant.

ILO 3. Analyse existing systems and the main technological solutions, and model mechanisms (e.g. kinematic representations, SADT, block diagrams, SysML).
- Using assembly drawings, CAD models or an existing system, students must be able to analyse, describe and model the internal operation of the system and the environment with which it interacts.

ILO 4. Define architectures and the associated preliminary sizing (motor/load matching, guidance architecture, etc.).
- Students must be able to define relevant architectures, estimate orders of magnitude and correctly use theoretical tools (statics, kinematics, dynamics, strength of materials).

ILO 5. Model mechanical components using a collaborative solid modeller.
- Students must be able to use basic CAD functions to model parts, skeletons and assemblies, and to produce assembly and detail drawings in a simple collaborative environment.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Individual assessment (written case study): based on the expression of a customer need, produce functional specifications.	- Follow a standardised approach. - Reformulate the need. - Write service functions and constraints appropriately. - Characterise service functions and constraints appropriately. - Identify a substantial number of varied functions.
2	In teams of 3 to 5 students: write a report presenting the solution-search process from the supplied specifications through to the solutions selected.	- Propose a wide range of concepts and solutions. - Define relevant weighted assessment criteria. - Assess the proposed solution architectures. - Follow the method and formalism of the tools used (e.g. FAST, value analysis).
3	Individual assessment (written case study):	- Identify input/output interfaces, flows and functions.

	based on assembly drawings and 3D representations, model how the system operates.	- Propose a model suited to a given engineering problem. - Follow the methodology and syntax of the representation tools used.
4	In teams of 2 to 5 students: write a report presenting the proposed architectures and preliminary sizing approach.	- Propose relevant architectures. - For each preliminary sizing stage: - Define the governing load cases. - Define the sizing model and assess its limitations in relation to the theoretical assumptions. - Provide consistent numerical values and identify their range of validity.
5	Individual computer-based assessment using an existing system (technical file including detail drawings, assembly drawings and 3D models).	- Model and modify 3D models. - Assemble components. - Produce assembly and detail drawings including selected dimensions. - Produce a robust model (e.g. constraints, sketches, functional assembly, model structure).

Bibliographic resources

- BOISSEAU Philippe. La conception mécanique : méthodologie et optimisation. Dunod, 2016 (ebook).
- FANCHON Jean-Louis. Guide pratique des sciences et technologies industrielles. AFNOR, Nathan. 2020.
- AUBLIN Michel, BONCOMPAIN René, BOULATON Michel et al. Systèmes mécaniques : théorie et dimensionnement. Dunod, 2020.
- DEJEAN Pierre-Henri. Introduction à la conception de produits. Techniques de l'ingénieur, 2020.



Engineering Programme Syllabus: Grande École Programme

TU Title: Electronics, Electrical Engineering and Automation (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Florian HUET (Aix-en-Provence)*		*Year of Study:* Level L3
TU EEAI	*Language of Instruction: French and/or English*	*Type: UEF Mandatory*	*Cycle: 1A*
ECTS credits: 6	*Student workload per TU (hours): 150*	*Including face-to-face teaching (hours): 75*	*Semester: GIE1*
Keywords: electrical machines, power electronics, sensors and instrumentation, power grids.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	X
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	X
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	X
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	X
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
	X		

Specific prerequisites



- Models and operation of basic passive electrical components under DC and AC conditions.
- Basic laws of circuit theory.
- Complex numbers for solving problems under sinusoidal steady-state conditions.

General teaching methods

Lectures, tutorials and practical work.

Intended learning outcomes

Analyse, model and size electrical systems operating under steady-state conditions while taking environmental issues into account.

ILO 1. Master the physical principles governing the operation of the main fundamental devices used in electrical engineering (e.g. power electronic converters, rotating electrical machines, transformers and power grids).

- Students must be able to understand and explain the fundamental laws of electrical systems (Kirchhoff, Maxwell, energy conversion) and justify the operation of electrical devices under steady-state conditions.

ILO 2. Model, simulate and verify the sizing of electrical devices in order to characterise their behaviour under steady-state sinusoidal conditions (grids, synchronous and asynchronous electrical machines, transformers) and non-sinusoidal conditions (power electronic converters).

- Students must be able to establish accurate mathematical models of electrical devices under steady-state conditions. They must be able to use simulation tools to study their behaviour, interpret the results and compare them with the expected performance.

ILO 3. Analyse and compare the performance of a device using analytical and experimental techniques in a current industrial context.

- Students must be able to assess the performance of an electrical device using analytical and experimental methods (efficiency measurement, losses, power quality). They must be able to interpret these results in relation to current industrial challenges.

ILO 4. Select a data acquisition chain for analysing the performance of an industrial system.

- Understand, select and analyse the performance (measurement range, linearity, bandwidth, conditioning, analogue filtering, signal processing, etc.) of the main components of a data acquisition chain for a physical quantity.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Combined assessment of ILOs 1, 2 and 3: oral and/or written assessment during practical sessions (group) + written test (individual).	Understand how fundamental devices operate.
2	Combined assessment of ILOs 1, 2 and 3: oral and/or written assessment during practical sessions (group) + written test (individual).	- Analyse a situation involving fundamental electrical-engineering components. - Model fundamental electrical-engineering components.
3	Combined assessment of ILOs 1, 2 and 3: oral and/or written assessment during practical sessions (group) + written test (individual).	- Set up experimental situations to obtain data on the system studied. - Analyse analytically calculated results and experimental tests.
4	Oral and/or written assessment during practical sessions (group) + written test (individual).	- Use technical documentation to understand the operation and performance of the components of a data acquisition chain. - Implement a measurement system suited to specifications (conditioning, filtering, acquisition). - Implement signal-processing techniques suited to specifications. - Analyse the quality of the measurements obtained by assessing measurement uncertainty.



Source : Wikimedia Commons

Bibliographic resources

- WILDI Theodore, SYBILLE Gilbert. Électrotechnique. 4ed. Presses de l'Université Laval, 2005.
- BOLDEA Ion. Variable Speed Generators. 2ed. CRC Press, 2015 (e-book).
- SINCLAIR Ian. Sensors and Transducers. Newnes, 2001.
- WEBSTER John G, EREN Halit. Measurement, instrumentation, and sensors handbook spatial, mechanical, thermal, and radiation measurement. 2ed. CRC Press, 2014. (e-book).
- DE SILVA Clarence W. Sensors and Actuators: Engineering System Instrumentation. 2ed. CRC Press, 2014.(e-book).
- Georges Asch et coll. Les capteurs en instrumentation industrielle, Dunod, 2010.
- Georges Asch et coll. Acquisition de données, Dunod, 2011.
- Gérard Blanchet, Maurice Charbit. Traitement numérique du signal. Hermes, 1998.
- F. Baudoin, M. Lavabre. Capteurs : principes et utilisations, Casteilla, 2008.
- Pascal Dassonvalle. Les capteurs 62 exercices et problèmes corrigés. Dunod, 2013.



Engineering Programme Syllabus: Grande École Programme

TU Title: Energy (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Jean-Christophe BATSALE (Bordeaux)*		*Year of Study:* Level L3
TU ENGI	*Language of Instruction: French and/or English*	*Type: UEF Mandatory*	*Cycle: 1A*
ECTS credits: 5	*Student workload per TU (hours): 125*	*Including face-to-face teaching (hours): 65*	*Semester: GIE1*
Keywords: Fluid mechanics, heat transfer.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	X
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	X
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	X
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	X
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
	X		

Specific prerequisites



- Linear algebra (vector calculus, matrix calculus, eigenvalues/eigenvectors and diagonalisation).
- Integral calculus and differential equations.
- Thermodynamics: first and second laws.
- Mechanics: particle kinematics and dynamics.

General teaching methods

Lectures, tutorials and practical work.

Intended learning outcomes

Understand and apply the physical principles governing fluid flow and heat transfer in order to understand the operation and size an energy system, taking energy efficiency and environmental impacts into account.

ILO 1. Know the main physical properties involved in fluid-flow and heat-transfer energy systems, together with the associated orders of magnitude.

- Students identify and interpret the fundamental physical properties (viscosity, thermal conductivity, heat capacity, etc.) involved in the operation of energy systems. They are able to analyse their influence on energy and environmental performance in different contexts (e.g. buildings, engines, electronic circuits).

ILO 2. Distinguish between the different modes of heat transfer and the different flow regimes in energy systems.

- Students distinguish between the different modes of heat transfer (conduction, convection, radiation) and flow regimes (laminar, turbulent, transient) and apply them to energy systems (buildings, electronic components, heat exchangers, heat engines). They analyse their effects on energy performance within a sustainable-development approach.

ILO 3. Set up energy, mass and momentum balances. Understand local and global equations and the physical meaning of their terms. Use dimensional analysis to estimate the order of magnitude of these terms.

- Students master mass, momentum and energy balances. They understand the physical meaning of the associated equations and can apply them to fluid and thermal systems. They use dimensional analysis to estimate the orders of magnitude of the different terms.

ILO 4. Move from a real system to a simplified model in order to carry out preliminary sizing of an energy-system component (hydraulic circuit, heat exchanger, etc.) using balances, similarity laws or correlations. Verify that the model provides a relevant representation of the real system.

- Students must be able to justify the transition from a real problem to a simplified model, including the assumptions adopted. They carry out analytical or numerical preliminary sizing of an energy-system component using balances, similarity laws or correlations, and assess the validity of the model by comparison with the real system.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Combined assessment of ILOs 1, 2 and 3: 3-hour individual written test + 6 practical sessions (3 in heat transfer + 3 in fluid mechanics).	- Ability to explain physical properties and their role in an energy system. - Ability to relate these properties to system performance. - Relevant application of knowledge to a practical case.
2	Combined assessment of ILOs 1, 2 and 3: 3-hour individual written test + 6 practical sessions (3 in heat transfer + 3 in fluid mechanics).	- Ability to identify and distinguish heat-transfer modes and flow regimes. - Understanding of the interactions between these modes. - Application of knowledge to solve a simple problem. - Accuracy of the orders of magnitude used.
3	Combined assessment of ILOs 1, 2 and 3: 3-hour	- Ability to identify the inputs and outputs of an energy system.



	individual written test + 6 practical sessions (3 in heat transfer + 3 in fluid mechanics).	- Ability to produce a coherent overall energy balance. - Well-reasoned and realistic comparison of energy or power values. - Understanding of how energy balances affect system energy efficiency.
4	Case study followed by a 1-hour individual in-person test.	- Ability to analyse a real energy system and derive a relevant model in relation to current issues (sustainable development, environmental impact). - Mastery of the assumptions required for modelling and of the associated analytical or numerical calculation. - Ability to interpret results and provide a critical analysis based on orders of magnitude. - Ability to compare model results with the real system and draw a critical analysis from the comparison.

Bibliographic resources

- ÇENGEL Yunus A., CIMBALA John. M. Fondements et applications. De Boeck, 2017.
- GUYON Etienne, HULIN Jean-Pierre, PETIT Luc. Hydrodynamique physique. EDP Sciences, 2012.
- OUZIAUX Roger, PERRIER Jean. Mécanique des fluides appliquée. Dunod, 2004.
- COMOLET Raymond. Mécanique expérimentale fluides. Tomes 1, 2 et 3. Dunod, 2002, 2006 et 2003.
- BATTAGLIA Jean-Luc, AMIROUDINE Sakir. Mécanique des fluides. Dunod, 2014.
- SACADURA Jean-François. Transferts thermiques : Initiation et approfondissement. Lavoisier, 2015.
- TAINE Jean, ENGUEHARD Franck, IACONA Estelle. Transferts thermiques : Introduction aux transferts d'énergie. Dunod, 2014.



Engineering Programme Syllabus: Grande École Programme

TU Title: Mathematics and Computing (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Mathias Kleiner (Aix-en-Provence)*		*Year of Study:* Level L3
TU MINI	*Language of Instruction: French and/or English*	*Type: UEF Mandatory*	*Cycle: 1A*
ECTS credits: 4	*Student workload per TU (hours): 100*	*Including face-to-face teaching (hours): 40*	*Semester: GIE1*
Keywords: symbolic computation, numerical methods, programming.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	X
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	X
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	X
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	X
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	X
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X	X	X	

Specific prerequisites

- Fundamentals of scientific computing and numerical solution methods.
- Fundamentals of algorithms and programming.
- Operation of a simple computer system.

General teaching methods

Lectures, tutorials and practical work.

Intended learning outcomes

Understand and develop a program for data processing and the mathematical solution of an engineering problem.

ILO 1. Select and implement numerical and/or symbolic methods suited to solving a system of equations modelling a physical problem.

- Students must be able to identify the mathematical model underlying a given physical problem, formulate the associated system of equations and select the appropriate solution method (symbolic analysis or numerical method). They must also implement these methods using computing tools and interpret the results while taking the limitations and approximations of the model into account.

ILO 2. Design and implement a program that meets a functional requirement described in software application specifications.

- Students must be able to load, select and process data in order to address an engineering problem. In particular, they must be able to analyse a functional requirement expressed in specifications and design one or more algorithms that address the problem. They must then implement the algorithm(s) in an appropriate programming language (Python, C++, etc.), test correct operation and document their work clearly and in a usable form.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	- Individual and/or group practical assessment (practical work or projects). - Individual assessment in the form of a test (written or computer-based where technically possible).	- Accuracy of the modelling (correct identification of equations and assumptions). - Relevance of the numerical method selected (rigorous justification of the choice). - Quality of implementation (working code, documentation, algorithm efficiency). - Critical analysis of results (consideration of model limitations and consistency of the values obtained).
2	- Individual and/or group practical assessment (practical work or projects). - Individual assessment in the form of a test (written or computer-based where technically possible).	- Compliance with the specifications (constraints and requirements taken into account). - Ability to implement the digital processing chain from data through to visualisation. - Consistency and efficiency of the solution architecture (choice of data structures, optimisation). - Functionality and robustness of the code (absence of bugs, modularity). - Code readability and comments.

Bibliographic resources

- BOUCHENY Vincent. Apprendre la programmation orientée objet avec Python . 2Ed. ENI (e-book).



- CORRIOU Jean-Pierre. Méthodes numériques et optimisation : Théorie et pratique pour l'ingénieur. Lavoisier, 2010.
- GRIVET Jean Philippe. Méthodes numériques appliquées pour le scientifique et l'ingénieur. EDP sciences, 2013. (Ebook).
- KIUSALAAS Jaan. Numerical methods in engineering with Python 3. Cambridge University Press, 2013. (E-book).



Engineering Programme Syllabus: Grande École Programme

TU Title: Industrial Management and Operations Control (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Thecle ALIX (Bordeaux)*		*Year of Study:* Level L3
TU GIPI (ex ORHI)	*Language of Instruction: French and/or English*	*Type: UEI Mandatory*	*Cycle: 1A*
ECTS credits: 2	*Student workload per TU (hours): 50*	*Including face-to-face teaching (hours): 20*	*Semester: GIE1*
Keywords: implementation, flow management.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	X
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	X
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X	X	X	

Specific prerequisites



None.

General teaching methods

Knowledge inputs, tutorials and project-based teaching, all contextualised through examples drawn from the teachers' industrial experience, with an emphasis on digital tools.

Intended learning outcomes

Classify the main principles of industrial organisation and production management.

ILO 1. Describe production types and strategies.

- Students must be able to identify and explain the main production types (one-off, batch, continuous, make-to-stock, make-to-order, just-in-time) and understand their impact on performance. They must also analyse production strategies (postponement, lean, mass customisation, agile production) and assess their suitability in relation to competitiveness, flexibility, resource-management and environmental-impact issues.

ILO 2. Manage the physical and information flows associated with a production system.

- Students must understand and analyse all physical flows (raw materials, work in progress, finished products) and information flows (production orders, inventory management, indicator monitoring) within a production system. They must be able to diagnose malfunctions and propose improvement actions.

ILO 3. Plan production, capacity and required supplies over short-, medium- and long-term horizons using computer-aided production management in order to meet market demand.

- Students must be able to develop a production plan taking into account capacity constraints, inventories, supplier lead times and market demand (known or forecast). They must be able to use production-management software to schedule operations, simulate different planning strategies and make decisions based on cost/quality/lead-time objectives and inventory strategies (economic order quantity, economic order interval, safety stock, etc.).

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Individual written assessment (case study, implementation of a method); one individual assessment and one group assessment.	- The analysis and action plan draw on industrial engineering principles. - Additional information is researched. - The request is correctly understood. - The response to the specifications is supported by sound reasoning. - Proposals in the case study are clear. - The tools and techniques used are appropriate and justified. - The approach is structured. - The limitations of the approach are addressed. - Methods taught or covered in class are implemented. - Ability to synthesise and present results. - CSR is integrated into the approach.
2	Individual written assessment (case study, implementation of a method); one individual assessment and one group assessment.	- The analysis and action plan draw on industrial engineering principles. - Additional information is researched. - The request is correctly understood. - The response to the specifications is supported by sound reasoning. - Proposals in the case study are clear. - The tools and techniques used are appropriate and justified. - The approach is structured. - The limitations of the approach are addressed. - Methods taught or covered in class are implemented. - Ability to synthesise and present results. - CSR is integrated into the approach.
3	Individual written assessment (case study, implementation of a method); one individual	- The analysis and action plan draw on industrial engineering principles. - Additional information is researched.



	assessment and one group assessment.	- The request is correctly understood. - The response to the specifications is supported by sound reasoning. - Proposals in the case study are clear. - The tools and techniques used are appropriate and justified. - The approach is structured. - The limitations of the approach are addressed. - Methods taught or covered in class are implemented. - Ability to synthesise and present results. - CSR is integrated into the approach.

Bibliographic resources

- PILLET, MARTIN-BONNEFOUS, BONNEFOUS, et al. Gestion de production : Les fondamentaux et les bonnes pratiques. Eyrolles, 2020 (ebook).
- JAVEL. Organisation et gestion de la production : cours avec exercices corrigés. Dunod, 2010 (ebook).
- AIM. L'essentiel de la gestion de projet. Gualino, 2020 (ebook).
- DOLGUI, PROTH. Les systèmes de production modernes. Tome 1 : Conception, gestion et optimisation et Tome 2 : Outils et corrigés des exercices Hermès, 2006.



Engineering Programme Syllabus: Grande École Programme

TU Title: Secondary Mechanical Manufacturing Processes (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Julien ARTOZOUL (Angers)*		*Year of Study:* Level L3
TU RESI	*Language of Instruction: French and/or English*	*Type: UEI Mandatory*	*Cycle: 1A*
ECTS credits: 4	*Student workload per TU (hours): 100*	*Including face-to-face teaching (hours): 50*	*Semester: GIE1*
Keywords: physical principles, manufacturing technologies.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	X
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	X
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	X
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X	X	X	

Specific prerequisites



- Read technical drawings.
- Technical vocabulary related to mechanical-part drawings.

General teaching methods

Lectures, tutorials and practical work.

Intended learning outcomes

Understand, implement and then classify secondary manufacturing and inspection processes.

ILO 1. Explain the physical principles of secondary processes and identify their main parameters.

- Students must be able to explain the physical principles of secondary processes and identify the main operating parameters associated with them.

ILO 2. Analyse geometrical specifications, and select and implement inspection technologies.

- Students must be able to explain the principles and technologies used for inspection. They must be able to interpret the specifications shown on a detail drawing and select and implement the inspection method suited to the need.

ILO 3. Identify and select production resources according to their technical, economic and environmental performance.

- Students must identify the key elements of production systems: machines, tools, automation, actuators and instrumentation. They must be able to select the resources best suited to a defined production process on technical, economic and environmental grounds.

ILO 4. Operate production resources safely and determine suitable operating parameters in order to obtain a compliant product.

- Under supervision, students must operate production resources while complying with the appropriate safety rules. They must be able to determine suitable operating parameters for a production process and communicate technically with production operators in order to set up the equipment. They must be able to identify the main defects and propose corrective action.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	- Industrial case studies (written, individual; one study for each process covered during the semester): students are given an industrial context describing a product-process pairing for a given material. (a) - Pre-session assessment (individual written test). (b) - Practical work on the ELF Cell (written group assessment). (c)	- Mastery of physical and technological principles. (a) - Ability to identify process operating parameters. (a) - Theoretical knowledge. (b) - Description of the physical phenomena encountered during implementation. (c)
2	Industrial case studies (written, individual; one study for each process covered during the semester): students are given an industrial context describing a product-process pairing for a given material.	- Mastery of the physical and technological principles of inspection methods. - Interpretation of the geometrical specifications shown on a detail drawing. - Selection of the most suitable inspection method.
3	- Industrial case studies (written, individual; one study for each process covered during the semester): students are given an industrial context describing a product-process pairing for a given material. (a) - Practical work on the ELF Cell (individual oral	- Relevance of the justification for selecting a process on technical, economic and environmental criteria. (a) - Suitability of the selected resource for the specifications. (a) - Justification of the relevance of tooling geometry on technical, economic and environmental criteria (tooling proposed by the student or supplied). (a)



	assessment). (b)	- Verification that a production resource is suitable for the manufacturing process of a given product. (b)
4	- Industrial case studies (written, individual; one study for each process covered during the semester): students are given an industrial context describing a product-process pairing for a given material. (a) - Practical work on the ELF Cell (individual oral assessment). (b) - Practical work on the ELF Cell (written group assessment). (c)	- Determination of operating parameters and their impact on part quality. (a) - Ability to analyse and interpret inspection results. (a) - Proposal of corrective actions when a defect is detected. (a) - Professional attitude and engagement. (b) - Compliance with safety instructions. (b) - Quality of technical communication during implementation. (b) - Relevance of operating-parameter settings. (b) - Formalisation of an operating procedure. (c)

Bibliographic resources

- Barlier, Claude, et Luc Ceppetelli. Mémotech Méthodes et production en usinage. DELAGRAVE, 2013.
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- Handbook of plastics, elastomers & composites, McGraw-Hill Handbooks, 2002.
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- Machining. ASM Handbook Vol. 16. ASM International, 1989.
- Padilla, Pierre, et André Thély. Guide des fabrications mécaniques. Dunod, 1978.
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- Welding Fundamentals and Processes. ASM Handbook Vol. 6A. ASM International, 2011.



Engineering Programme Syllabus: Grande École Programme

TU Title: Materials (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Charles MAREAU (Angers)*		*Year of Study:* Level L3
TU MATI	*Language of Instruction: French and/or English*	*Type: UEF Mandatory*	*Cycle: 1A*
ECTS credits: 4	*Student workload per TU (hours): 100*	*Including face-to-face teaching (hours): 40*	*Semester: GIM1*
Keywords: Structure of matter, phase transformations, characterisation.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	X
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	X
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	X
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	X
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	X
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X			

Specific prerequisites

- Atomic and molecular physics.
- Chemistry (chemical bonds).
- Thermodynamics (equilibrium, first and second laws).

General teaching methods

Lectures, tutorials and practical work.

Intended learning outcomes

Relate the type of material to its macroscopic, microscopic, physical and mechanical properties.

ILO 1. Classify materials according to their microstructure and properties.

- Students must be able to classify materials into different categories (metal alloys, polymers, ceramics or composites) based on their microstructural characteristics and physical properties.

ILO 2. Select an experimental technique and characterise a material using macroscopic and microscopic tests.

- Students must know the main mechanical-testing and microstructural-observation techniques. They must be able to interpret the results obtained, draw conclusions about material characteristics and select an experimental technique suited to a given need.

ILO 3. Identify the physical phenomena (diffusion, plasticity) occurring during material processing and characterise equilibrium metallurgical phases.

- Students must be able to identify the physical phenomena (diffusion, plasticity) occurring during material processing. They must be able to characterise and quantify metallurgical phases using an equilibrium phase diagram.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Individual written test.	- Ability to classify materials correctly (structure and properties). - Ability to explain material properties through their structure. - Mastery of orders of magnitude for common physical properties.
2	Practical work with group assessment and an individual written test.	- Justify the choice of experimental techniques. - Mastery of testing techniques (ability to perform tests and experiments correctly). - Accuracy in analysing results (correct interpretation of experimental data). - Clarity and rigour in presenting results.
3	Individual written Q&A and practical work or a group case study.	- Ability to read and interpret a phase diagram (accuracy of analysis). - Link between heat treatment and microstructure (ability to predict phases formed after slow cooling). - Identify physical phenomena during material processing.

Bibliographic resources

- ASHBY Michael F., JONES David R. H. Matériaux 1 : Propriétés, applications et conception. Dunod, 2020.
- ASHBY Michael F., JONES David R. H. Matériaux 2 : Microstructures et procédés de mise en œuvre. Dunod, 2014.
- DORLOT Jean-Marie, BAILON Jean-Paul. Des Matériaux. École Polytechnique de Montréal, 2002.
- MAEDER Gérard, BARRALIS Jean. Précis de métallurgie. AFNOR, Nathan, 2005.
- GOURGUES-LORENZON Anne-Françoise, HAUDIN Jean-Marc. Matériaux pour l'ingénieur. Presses des Mines, 2010 (ebook).



Engineering Programme Syllabus: Grande École Programme

TU Title: Mechanics of Deformable Solids (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Olivier THOMAS (Lille)*		*Year of Study:* Level L3
TU MDSI	*Language of Instruction: French and/or English*	*Type: UEF Mandatory*	*Cycle: 1A*
ECTS credits: 6	*Student workload per TU (hours): 150*	*Including face-to-face teaching (hours): 80*	*Semester: GIM1*
Keywords: mechanics of solids.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	X
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	X
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	X
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	X
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X			

Specific prerequisites



- Linear algebra (vector calculus, matrix calculus, diagonalisation).
- Integral calculus and differential equations.
- Mechanism theory (joint wrench, isostatic/hyperstatic systems).
- Rigid-body mechanics, geometrical properties, centre of gravity, kinetic and potential energy.

General teaching methods

Lectures, tutorials and practical work.

Intended learning outcomes

Size a deformable system in linear statics and/or buckling, with performance suited to technological, societal and environmental issues, by selecting the appropriate solution method (analytical and/or numerical) according to the stage of the study and validating the results against experimental measurements.

ILO 1. Explain the concepts of continuum mechanics (strain, stress, constitutive law, equilibrium), apply them to problem analysis and calculation, and solve simple cases analytically.

- Students must be able to define and explain the fundamental concepts of stress and strain in a solid continuum, understand the assumptions underlying these tools, and apply the concepts to the analysis and solution of simple mechanical problems for homogeneous isotropic materials in the linear elastic range.

ILO 2. Justify the assumptions used to move to a thin or slender-medium model (continuum kinematics, generalised forces), apply them to problem analysis and calculation, and solve simple beam problems analytically.

- Students must be able to define a beam model, its generalised forces and its kinematics (Euler-Bernoulli, Timoshenko), based on the simplifying assumptions of beam models and with an understanding of the limits of those assumptions. They must be able to formulate mechanical equilibrium and identify possible static indeterminacy. Taking technological, societal and environmental issues into account, they must be able to size a beam analytically for strength and stiffness under simple and combined loading. They must also be able to solve simple statically indeterminate systems analytically. Finally, they must master the concepts of elastic instability and be able to calculate analytically the critical buckling load of a linear elastic beam using Euler's method.

ILO 3. Perform a numerical structural calculation using the finite element method with an existing tool, while critically assessing the results. Move from the real structure to an appropriate mechanical model (beam, plate, 3D).

- Students must be able to translate a simplified industrial mechanical problem into an appropriate numerical model, carry out a finite element calculation using existing software and critically analyse the results obtained.

ILO 4. Use structural instrumentation to verify sizing under static conditions, while critically assessing the results obtained.

- Students must be able to use measurements taken on mechanical structures with instrumentation sensors (such as strain gauges, extensometers or other suitable measurement devices). They must be able to interpret results obtained under static conditions, compare them with calculation assumptions and theoretical sizing results, and critically assess any discrepancies (measurement uncertainty, model limitations, installation errors, etc.).

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Individual analytical study of one or more simple mechanical problems.	- Accuracy of the explanation of concepts (correct and clear definitions, appropriate use of terminology). - Understanding of the physical meaning of quantities. - Consistency in applying the concepts to the problem (relevant choice of assumptions and equations). - Accuracy of analytical calculations (command of the mathematical relationships and solutions). - Relevance of the conclusions (ability to interpret the results and provide a critical analysis).
2	Individual analytical study of one or more simple mechanical problems.	- Mastery of assumptions, methods and their limitations. - Mastery of the implementation of solution methods. - Consistency and accuracy of the approach, results and orders of

		magnitude. - Relevance of the interpretation of results and ability to provide critical analysis.
3	Individual analytical study of a simple model with one or two 1D elements (bar or beam) or a 2D model (plane model) + software-based case study: applications to beam, plate or 3D cases in small groups.	- Selection and justification of the numerical model (beam, plate, 3D), interpolation-function order and mesh size. - Selection and justification of boundary conditions. - Ability to use a calculation tool. - Ability to analyse results (relevant interpretation of displacements, strains and stresses). - Identification of model limitations and ability to recommend improvements.
4	Experimental study on an instrumented structure using measurements of mechanical quantities, followed by presentation and interpretation of the results and comparison with an analytical or numerical calculation, in the form of a written technical report or small-group oral technical presentation.	- Quality and reliability of measurements (usable, reproducible data, taking uncertainties or sources of error into account). - Ability to compare experimental results with the model (correctly relate measurements to theoretical or numerical calculations and explain any differences). - Critical assessment of results (ability to question discrepancies and consider explanatory hypotheses such as model limitations, measurement errors, assembly conditions, etc.). - Clarity and rigour of the presentation (structured presentation, command of technical vocabulary, good written or oral communication, compliance with expected formats).

Bibliographic resources

- FREY François. Analyse des structures et milieux continus. Presses polytechniques et universitaires romandes, 1998-2015. (Traité de génie civil de l'École polytechnique fédérale de Lausanne; volume 1,2,3).
- COIRIER Jean, NADOT-MARTIN Carole. Mécanique des milieux continus : cours et exercices corrigés. Dunod, 2020.
- CUILLIERE Jean-Christophe. Introduction à la méthode des éléments finis : cours et exercices corrigés. Dunod, 2016. (Ebook).



Engineering Programme Syllabus: Grande École Programme

TU Title: Industrial Management and Design (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Thècle ALIX (Bordeaux)*		*Year of Study:* Level L3
TU GICI (ex OREI)	*Language of Instruction: French and/or English*	*Type: UEI Mandatory*	*Cycle: 1A*
ECTS credits: 2	*Student workload per TU (hours): 50*	*Including face-to-face teaching (hours): 20*	*Semester: GIM1*
Keywords: implementation, flow management.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	X
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	X
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
		X	

Specific prerequisites



None.

General teaching methods

Knowledge inputs, tutorials and project-based teaching, all contextualised through examples drawn from the teachers' industrial experience, with an emphasis on digital tools.

Intended learning outcomes

Configure and size a production system in relation to demand: learn to observe, analyse and critically assess an initial work situation. Initiate a continuous-improvement approach by applying balancing principles based on factual data. Justify a layout or technology choices in terms of the cost/performance/impact trade-off, simulation results or the need.

ILO 1. Understand the principles of line balancing, time study and continuous improvement.

- Students must master work-observation and work-analysis methods (time study, line balancing) and continuous-improvement concepts in order to optimise production-system performance.

ILO 2. Know the main technologies used in production-system design (robots, cobots, conveyors, AGVs, storage, etc.) and their performance in terms of time, economics and energy.

- Students must be able to identify and analyse technologies used in modern production systems. They must compare their performance in terms of time, cost and energy efficiency, as well as their effects on working conditions.

ILO 3. Design a production process and system, and size and lay out a high-performance industrial system (modelling, sizing, configuration, production-system dynamics).

- Students must be able to model a production system while taking technical and economic constraints into account. They must be able to model and configure a production process according to industrial needs.

ILO 4. Apply project-analysis methods: MPM or PERT, precedence relationships, earliest and latest dates, floats and critical path(s) to be monitored.

- Students must be able to analyse and manage an industrial project using planning and scheduling methods (MPM, PERT, critical path).

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Individual written assessment (case study, implementation of a method); one individual assessment and one group assessment.	- The analysis and action plan draw on industrial engineering principles. - Additional information is researched. - The request is correctly understood. - The response to the specifications is supported by sound reasoning. - Proposals in the case study are clear. - The tools and techniques used are appropriate and justified. - The approach is structured. - The limitations of the approach are addressed. - Methods taught or covered in class are implemented. - Ability to synthesise and present results. - CSR is integrated into the approach.
2	Individual written assessment (case study, implementation of a method); one individual assessment and one group assessment.	- The analysis and action plan draw on industrial engineering principles. - Additional information is researched. - The request is correctly understood. - The response to the specifications is supported by sound reasoning. - Proposals in the case study are clear. - The tools and techniques used are appropriate and justified. - The approach is structured. - The limitations of the approach are addressed. - Methods taught or covered in class are implemented.



		- Ability to synthesise and present results. - CSR is integrated into the approach.
3	Individual written assessment (case study, implementation of a method); one individual assessment and one group assessment.	- The analysis and action plan draw on industrial engineering principles. - Additional information is researched. - The request is correctly understood. - The response to the specifications is supported by sound reasoning. - Proposals in the case study are clear. - The tools and techniques used are appropriate and justified. - The approach is structured. - The limitations of the approach are addressed. - Methods taught or covered in class are implemented. - Ability to synthesise and present results. - CSR is integrated into the approach.
4	Individual written assessment (case study, implementation of a method); one individual assessment and one group assessment.	- The analysis and action plan draw on industrial engineering principles. - Additional information is researched. - The request is correctly understood. - The response to the specifications is supported by sound reasoning. - Proposals in the case study are clear. - The tools and techniques used are appropriate and justified. - The approach is structured. - The limitations of the approach are addressed. - Methods taught or covered in class are implemented. - Ability to synthesise and present results. - CSR is integrated into the approach.

Bibliographic resources

- DOLGUI A., J.M. PROTH, Les systèmes de production modernes. Tome 1 : Conception, gestion et optimisation et Tome 2 : Outils et corrigés des exercices Hermès, 2006.
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- ARNOLD J.R. Tony, Introduction to Materials Management, 7th Edition, 2010 et BEUNON Yves, SECHET Bruno, Manager la performance industrielle, Gereso, 2019 (e-book).
- HAMROUNI Anis , JLASSI Nejib , Management de la qualité en industrie, Afnor Éditions, 2019(E-book).
- Club des Pilotes de Processus, Guide la gestion des processus, Afnor Editions, 2019 (E-book).
- JULIEN Nathalie, MARTIN Éric, L'usine du futur : stratégies et déploiement : industrie 4.0, De l'IOT aux jumeaux numériques, Dunod, 2018 (e-book).
- VALENTIN Michael, Hyper-manufacturing: l'après lean, Dunod, 2020 (e-book).
- BEUNON Yves, SECHET Bruno, Manager la performance industrielle, Gereso, 2019 (e-book).



Engineering Programme Syllabus: Grande École Programme

TU Title: Primary Mechanical Manufacturing Processes (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Nicolas BONNET (Metz)*		*Year of Study:* Level L3
TU REPI	*Language of Instruction: French and/or English*	*Type: UEI Mandatory*	*Cycle: 1A*
ECTS credits: 4	*Student workload per TU (hours): 100*	*Including face-to-face teaching (hours): 50*	*Semester: GIM1*
Keywords: physical principles, manufacturing technologies.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	X
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	X
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	X
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X	X	X	

Specific prerequisites



- Read technical drawings.
- Technical vocabulary related to mechanical-part drawings.

General teaching methods

Lectures, tutorials and practical work.

Intended learning outcomes

Understand, implement and then classify primary manufacturing processes while integrating material-product-process interactions.

ILO 1. Explain the physical principles of primary processes and identify their main parameters.

- Students must be able to explain the physical principles of primary processes and identify the main operating parameters associated with them.

ILO 2. Understand the effects of processes on materials and the concept of product manufacturability.

- Students must be able to analyse the influence of processes on the mechanical properties of materials. They must be able to propose a part geometry that takes the technical, economic and environmental requirements of the process into account.

ILO 3. Identify and select production resources according to their technical, economic and environmental performance.

- Students must identify the key elements of production systems: machines, tools, automation, actuators and instrumentation. They must be able to select the resources best suited to a defined production process on technical, economic and environmental grounds.

ILO 4. Operate production resources safely and determine suitable operating parameters in order to obtain a compliant product.

- Under supervision, students must operate production resources while complying with the appropriate safety rules. They must be able to determine suitable operating parameters for a production process and communicate technically with production operators in order to set up the equipment. They must be able to identify the main defects, implement measurement and inspection methods, and propose corrective action.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	- Industrial case studies (written, individual, 1-hour case study for each process family covered during the semester): students are given an industrial context describing a product-process pairing for a given material. (a) - Assessment at the start of a session (10-minute individual written test). (b) - Practical work on the ELF Cell (written group assessment). (c)	- Mastery of physical and technological principles. (a) - Ability to identify process operating parameters. (a) - Theoretical knowledge. (b) - Description of the physical phenomena encountered during implementation. (c)
2	Industrial case studies (written, individual, 1-hour case study for each process family covered during the semester): students are given an industrial context describing a product-process pairing for a given material.	- Ability to analyse the impact on manufacturability (forming constraints and final properties taken into account). - Relevance of the proposed blank geometry in relation to the supplied detail drawing (functional surfaces, material, etc.). - Suitability of the proposed solution for the blank material.
3	- Industrial case studies (written, individual, 1-hour case study for each process family covered during the semester): students are given an industrial context describing a product-process pairing for a given material. (a) - Practical work on the ELF Cell (individual oral	- Relevance of the justification for selecting a process on technical, economic and environmental criteria. (a) - Suitability of the selected resource for the specifications. (a) - Justification of the relevance of tooling geometry on technical, economic and environmental criteria (tooling proposed by the student or supplied). (a)

	assessment). (b)	- Verification that a production resource is suitable for the manufacturing process of a given product. (b)
4	- Industrial case studies (written, individual, 1-hour case study for each process family covered during the semester): students are given an industrial context describing a product-process pairing for a given material. (a) - Practical work on the ELF Cell (individual oral assessment). (b) - Practical work on the ELF Cell (written group assessment). (c)	- Determination of operating parameters and their impact on part quality. (a) - Ability to analyse and interpret inspection results. (a) - Proposal of corrective actions when a defect is detected. (a) - Professional attitude and engagement. (b) - Compliance with safety instructions. (b) - Quality of technical communication during implementation. (b) - Relevance of operating-parameter settings. (b) - Formalisation of an operating procedure. (c)

Bibliographic resources

- Casting. ASM Handbook Vol. 15. ASM International, 2008.
- Fundamentals of Modern Manufacturing: Materials, Processes, and Systems. Groover, Mikell P. Wiley, 2020.
- Manufacturing Engineering and Technology, Global Edition. Kalpakjian et All. Pearson International, 2022.
- Metalworking: Bulk Forming. ASM Handbook Vol. 14A. ASM International, 2005.
- Metalworking: Sheet Forming. ASM Handbook Vol. 14B. ASM International, 2006.
- Guide des fabrications mécaniques. Padilla, Pierre, et André Thély. Dunod, 1978.
- Précis de construction mécanique - Tome 2. Trotignon, Jean-Pierre, T. Coorevits, J. M. David, et al. Nathan, 2006.
- Handbook of plastics, elastomers & composites, McGraw-Hill Handbooks, 2002.
- Manufacturing – Engineering and Technology – SI Edition - Pearson Education Orphans, 2016.
- Design, les procédés de fabrication. Rob Thompson. Ed. Vial, 2012
- Aide-mémoire Fonderie. Gilles Dour. l'Usine Nouvelle, Dunod, 2004



Engineering Programme Syllabus: Grande École Programme

TU Title: Management Sciences in Society (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Agnès BOURG (Cluny)*		*Year of Study:* Level L3
TU SGSI	*Language of Instruction: French and/or English*	*Type: UEF Mandatory*	*Cycle: 1A*
ECTS credits: 5	*Student workload per TU (hours): 125*	*Including face-to-face teaching (hours): 60*	*Semester: GIM1*
Keywords: Economics, political economy, business management, employment contract law, occupational health and safety, interpersonal communication, cognitive biases, critical thinking, forward thinking, argumentation.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	X
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	X
	3.2 Communications	X
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	X
	4.2 Enterprise and business context	X
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
			X



Specific prerequisites

None

General teaching methods

Methods specified by each lecturer at the beginning of the TU.
THE MODULES AS A WHOLE MUST NOT EXCEED 60 HOURS OF FACE-TO-FACE TEACHING, DISTRIBUTED AS FOLLOWS:
- Module Économie et société : 12h à 16h.
- Module Sciences humaines et sociales : 16h à 20h.
- Module G

Intended learning outcomes

Position oneself in the future role of a responsible engineer within a company, by drawing on tools, methods and concepts from the humanities, social sciences and management sciences, in order to act in an informed and committed manner in a world undergoing transitions, particularly in response to the challenges of the ecological transition and sustainable development (TEDS).

ILO 1. Economics and society: Interpret socio-economic facts in their multiple dimensions.

- Students must be able to analyse socio-economic dynamics influencing modes of production, draw on approaches from political economy, and assess the impact of macroeconomic and political phenomena on the real economy in a world undergoing transition (ecological transition and sustainable development, etc.).

ILO 2. Humanities and social sciences: Communicate with discernment in interactions in general.

- Students must be able to adopt a reflective, critical and ethical stance in interactions in general, from a social responsibility perspective, by drawing on appropriate cognitive, systemic and communication frameworks.

ILO 3. Business management: Diagnose a management situation in light of the company's context.

- Students must be able to identify, interpret and analyse the information available in financial statements (balance sheet, income statement and intermediate management balances), in terms of robustness, profitability and financing capacity, taking into account the company's situation in its environment.

ILO 4. Employment law and occupational health and safety: Identify the legal arrangements for formalising an employment situation and the procedures and issues relating to occupational health and safety.

- Students must be able to analyse the main rules governing employment contracts and occupational health and safety that apply within a company, and understand how to position themselves in relation to these rules in a professional environment.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Individual written test + one assignment with an oral presentation on an economics-related topic.	- Identify socio-economic trends and connect concepts studied in class to analyse ongoing transitions. - Compare global and local situations to interpret interactions across different scales. - Express a straightforward position supported by examples and concepts covered in class (quality of argumentation).
2	Reflective assignment (critical thinking, questioning, forward thinking, etc.) + oral activity (e.g. role-play, simulation) with individual grading.	- Identify and illustrate reflective reference points (biases, systems thinking, ethics, critical thinking, etc.). - Rephrase, interpret and question others' statements in order to contribute to constructive exchanges (active listening, appropriate responses, etc.). - Explain ideas in a structured manner and illustrate them with examples (quality of reasoning and argumentation). - Distinguish one's own ideas from those of others and contextualise one's positions in order to begin developing critical distance (critical and reflective stance).
3	Étude de cas - test écrit individuel.	- Explain the basic concepts covered in class and illustrate their use with



		an example. - Correctly apply the formulas and methods studied in class to solve management cases. - Interpret the results obtained and identify significant elements in order to provide a straightforward reading of the situation.
4	Dispositif « Prévention Sup » de l'INRS, Étude de cas - test écrit individuel.	Droit : - Identify the relevant legal concepts covered in class and relate them to the situation presented. - Express clear and coherent arguments in connection with the legal rules studied. - Organise arguments clearly and progressively to support a straightforward legal position. - Relate contextual elements to the argument in order to formulate a coherent response. - Use appropriate legal terminology. Occupational health and safety: Analyse the situations presented using the concepts covered in the INRS 'Prévention Sup' programme.

Bibliographic resources

- BOSSERELLE Eric. Économie générale. Hachette, 2017.
- DUMALANEDE Eric. Comptabilité générale. Foucher, 2020.
- TATOUX Jean-Jacques. Management. Éditions Ellipses, 2019. (E-book).
- LEPINEUX François, et al. La RSE - La responsabilité sociale des entreprises. Dunod, 2016. (E-book).
- LE BIHAN-GUENOLE Martine. Les Fondamentaux Droit du travail 2020-2021. Hachette Éducation, 2020. (E-book).



Engineering Programme Syllabus: Grande École Programme

TU Title: Tools for Oral Communication in English 1A 1/2			
Last updated: March 2026	*National TU Coordinator: Virginie VERCOLLIER (Châlons-en-Champagne)*		*Year of Study:* Level L3
TU AN5	*Language of Instruction: French and/or English*	*Type: UEL Mandatory*	*Cycle: 1A*
ECTS credits: 2	*Student workload per TU (hours): 50*	*Including face-to-face teaching (hours): 20*	*Semester: S5*
Keywords: professional integration, international environment.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	*Learning Outcomes*	*TU-targeted Outcomes*
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	
	2.4 Attitudes, thought and learning	X
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	X
	3.2 Communications	X
	3.3 Communications in foreign languages	X
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	*Energy Engineering*	*Industrial Engineering*	*Management*
			X

Specific prerequisites



- Common European Framework of Reference for Languages: B1.

General teaching methods

- Études dirigées (groupes de 24).
- Work as a whole class, in small groups (4 to 6 students), or individually, depending on the learning objectives.
- Role-playing and simulation of professional situations (e.g. meetings, recruitment).

Intended learning outcomes

Communicate information in English in a professional manner.

ILO 1. Deliver oral presentations to an audience confidently and fluently.

- Students must be able to structure and deliver an oral presentation in English clearly and fluently, adapting it to the audience. They must manage speaking time, intonation and body language, and interact effectively with the audience. They must also be able to answer questions and create visual aids suited to the context.

ILO 2. Interact in a group using English as the working language.

- Students must be able to participate actively in a group activity in English, speaking fluently and in a structured manner, presenting arguments and responding to contributions from other participants.

ILO 3. Develop their career plan and prepare to enter the world of work in France or abroad.

- In the context of a job or internship application, students must be able to describe their studies, experience and future goals.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Oral presentation (individual or group), with 5 to 10 minutes of speaking time per student. Individual grades.	- Clarity and structure of the presentation. - Fluency of oral expression. - Aisance face à l'auditoire (posture, regard, voix). - Interaction with the audience (answers to questions, handling unexpected situations). - Justesse grammaticale et syntaxique (B1). - Usage du vocabulaire adapté.
2	Group activity (debate, information exchange) with 5 to 10 minutes of individual speaking time.	- Language proficiency (B1): ability to express oneself in English with fluency and accuracy. - Quality of interaction: taking account of others' contributions and rephrasing where necessary. - Organisation of ideas: coherent and logical presentation of the points discussed.
3	Communication and writing activities in the context of an application. Formative assessment with precise, individual feedback from the lecturer.	- Ability to express one's skills and experience in order to develop a career plan. - Use of vocabulary (precise terms appropriate to the context).

Bibliographic resources

- Ressources transmises par l'intervenant.



Engineering Programme Syllabus: Grande École Programme

TU Title: Detailed Design (Intermediate)			
Last updated: March 2026	*National TU Coordinator: Sylvain Bigot (Lille)*		*Year of Study:* Level L3
TU COPI	*Language of Instruction: French and/or English*	*Type: UEI Mandatory*	*Cycle: 1A*
ECTS credits: 4	*Student workload per TU (hours): 100*	*Including face-to-face teaching (hours): 60*	*Semester: GIM1*
Keywords: sizing, integration, CAD.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	X
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	X
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	X
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	X
	2.3 System thinking	
	2.4 Attitudes, thought and learning	
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	X
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	X
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X	X	X	

Specific prerequisites



- Identify the flows of matter, information and energy through the system.
- Analyse technical documents (documentation, 2D and 3D representations, etc.).
- Identify the mobility of a mechanism and understand kinematic joints.

General teaching methods

Knowledge inputs, tutorials and project-based teaching, all contextualised through examples drawn from the teachers' industrial experience, with an emphasis on digital tools.

Intended learning outcomes

Develop and implement a detailed design process for a manufactured system based on its preliminary design, integrating technical, economic, environmental and societal constraints (TEDS) in order to deliver an optimised, sustainable and ethical solution.

ILO 1. List and describe the main technological solutions used in existing systems.

- Students must be able to identify technological solutions commonly used in mechanical systems and know their characteristics.

ILO 2. Select, size, represent and integrate structural elements (e.g. shafts, frames) and components for power transmission (e.g. flexible drives, gears), guidance (e.g. bearings, bushings), motion conversion (e.g. cams, crank-and-connecting-rod mechanisms) and complete joints (e.g. expanding hubs, screws).

- Based on a schematic representation and/or model of technological solutions, students must be able to apply standard sizing criteria (mechanical strength, deformation, PV factor, service life, Hertz theory, environmental footprint and economic criteria) in order to select standard components for a mechanical system, size non-standard components and structural elements using a standardised approach, and, where relevant, preselect suitable material-process combinations. This applies to motion-conversion, power-transmission, guidance and complete-joint components.

ILO 3. Define the relationship between the functions of a part and its functional dimensioning and tolerancing (tolerances/fits/tolerance chains).

- Students must be able to define functional specifications (fits, functional dimensions, surface finish) in relation to the functional requirements of a mechanical system and indicate them on standardised drawings.

ILO 4. Model mechanical components using a collaborative solid modeller.

- Students must be able to use basic CAD functions to model parts, skeletons and assemblies, and to produce assembly and detail drawings in a simple collaborative environment.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Individual assessment (written case study): using assembly drawings and, where applicable, 3D representations, identify and characterise the technological solutions used in a mechanism.	- List solutions from the main families of standard components. - Qualifier les aptitudes de composants standards. - Formulate the constraints involved in integrating standard components into a mechanism.
2	Team assignment for 2 to 5 students, including individual components: write a report presenting the approach and calculation notes for the different system components.	- Implement and follow the standardised approach(es). - Formulate and justify assumptions (e.g. load cases, friction coefficients). - Size and select standard components using supplier catalogues. - Define the dimensions of non-standard structural components.
3	Team assignment for 2 to 5 students, including individual components: produce detail drawings including functional surface specifications.	- Identifier les surfaces fonctionnelles. - Use the relevant type of specification (fit, functional dimension, surface finish). - Determine values for dimensional specifications and surface finishes. - Correctly indicate the corresponding specifications on standardised drawings.
4	Individual computer-based assessment using an existing system (technical dossier including detail drawings, assembly drawings and 3D	- Model and modify 3D models. - Assemble components. - Produce assembly and detail drawings including selected dimensions.



	models).	- Produce a robust model (e.g. constraints, sketches, functional assembly, model structure).

Bibliographic resources

- BOISSEAU Philippe. La conception mécanique : méthodologie et optimisation. Dunod, 2016 (ebook).
- FANCHON Jean-Louis. Guide pratique des sciences et technologies industrielles. AFNOR, Nathan. 2020.
- AUBLIN Michel, BONCOMPAIN René, BOULATON Michel et al. Systèmes mécaniques : théorie et dimensionnement. Dunod, 2020.
- DEJEAN Pierre-Henri. Introduction à la conception de produits. Techniques de l'ingénieur, 2020.



Engineering Programme Syllabus: Grande École Programme

TU Title: Student Career Guidance 1A 1/2			
Last updated: March 2026	*National TU Coordinator: Bertrand KRAUSER (Metz)*		*Year of Study:* Level L3
TU APE5	*Language of Instruction: French and/or English*	*Type: UEA Mandatory*	*Cycle: 1A*
ECTS credits: 1	*Student workload per TU (hours): 25*	*Including face-to-face teaching (hours): 13*	*Semester: S5*
Keywords: professional identity, career plan, professional integration.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	
	2.4 Attitudes, thought and learning	X
	2.5 Ethics, professional conduct and professional responsibilities	X
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	X
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	X
	4.2 Enterprise and business context	X
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
			X

Specific prerequisites

- Presentation of student career guidance by the campus APE coordinator (purpose, areas of work, progression, syllabus, framework, charter, quality approach).
- Introduction to the Career Plan Radar and Career Logbook.
- Contractualisation.

General teaching methods

- 12 hours of group sessions with approximately 25 students + 1 hour of individual interview.
- External lecturers use facilitation techniques drawn from professional practice, with an emphasis on interaction.

Intended learning outcomes

Develop an initial understanding of possible career paths.

ILO 1. Research and organise information on occupations, companies and industrial sectors, with an emphasis on exchanges with professionals.

- Be able to make career-orientation decisions. Understand the engineering profession.

ILO 2. Adopter une posture professionnelle.

- Adopt the behaviour expected of an engineer and apply it in everyday situations.

ILO 3. Assess oneself and identify areas for improvement.

- Be able to introduce oneself and explain the motivations and criteria that led to choosing an engineering pathway.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Discussions during individual interviews; group practical work: individual reports.	- Ability to collect and synthesise information on a job role and sector of activity from a range of sources. - Ability to project oneself into a professional future.
2	Active participation in the activities organised, compliance with commitments and appointments, and communication with professionals based on a career survey prepared in groups during collective sessions and reviewed during an individual interview (interviews + research).	- Level of commitment and involvement, and ability to adopt appropriate professional behaviour. - Comply with the Charter signed at the beginning of the year.
3	Formalise conclusions about one's pathway and career plan following the individual interview.	Ability to self-assess and identify possible actions and expected outcomes.

Bibliographic resources

- Fonds de savoir commun TEAM – Équipe UE APE National.
- ONISEP. Découvrir les métiers (http://www.Onisep.Fr/Decouvrir-les-metiers).
- France Travail - Occupational Profiles: Operational Directory of Occupations and Jobs (https://www.Francetravail.Org/opendata/repertoire-operationnel-des-meti.Html?Type=article).
- SYNTEC INGÉNIERIE (https://www.Syntec-AXingenierie.Fr/).
- AVENIR INGENIERIE (https://avenir-ingenierie.Fr/).
- CONCEPTEURS D'AVENIR (https://www.Concepteursdavenirs.Fr/decouvrir-les-metiers).
- OPIIEC (https://www.Opiiec.Fr/cartographie_des_metiers).
- IESF (https://www.Iesf.Fr/).
- Société des ingénieurs et scientifiques de France - directory.



Engineering Programme Syllabus: Grande École Programme

TU Title: Oral and Written Communication in a Foreign Language 1A 2/2			
Last updated: March 2026	*National TU Coordinator: Lydia Post (Metz)*		*Year of Study:* Level L3
TU LVS5	*Language of Instruction: French and/or selected foreign language*	*Type: UEL Mandatory*	*Cycle: 1A*
ECTS credits: 1	*Student workload per TU (hours): 25*	*Including face-to-face teaching (hours): 20*	*Semester: S5*
Keywords: career development, intercultural environment.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	
	2.4 Attitudes, thought and learning	X
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	X
	3.2 Communications	X
	3.3 Communications in foreign languages	X
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
			X

Specific prerequisites



- Level A, basic user: breakthrough or beginner level (A1) and waystage or elementary level (A2).
- Level B, independent user: threshold or intermediate level (B1) and vantage or upper-intermediate level (B2).
- Niveau C, d'utilisateur expérimenté : autonomie (C1)et maîtrise (C2).

*en fonction du groupe d'affectation.

General teaching methods

- Études dirigées (groupes de 24).
- Work as a whole class, in small groups (4 to 6 students), or individually, depending on the learning objectives.
- Role-playing and simulation of professional situations (e.g. meetings, recruitment).

Intended learning outcomes

Communicate and interact in everyday situations.

ILO 1. Develop autonomy in communication and interaction.

- Express oneself and understand oral and written communication appropriately for one's language level. Participate in discussions about everyday life, write short messages and exchange simple information, depending on the group's level and progression.

ILO 2. Identify the cultural characteristics of countries where the target language is spoken.

- Students must be able to recognise and explain the main cultural differences between France and other countries in personal or professional contexts (communication codes, hierarchy, attitudes to time, etc.), acting as a mediator where appropriate, depending on the group's level.

ILO 3. Present one's personal background in everyday situations.

- Students must be able to introduce themselves clearly and in a structured manner in the second foreign language, both orally and in writing, in a personal context. The aim is to talk about themselves and, where appropriate, their professional background (skills, goals, etc.), depending on the group's level and progression.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	- Oral expression: individual interview (guided conversation) + prepared oral production (3- to 20-minute presentation + answers to questions). - Production écrite : Texte fonctionnel, narratif, argumentatif (ex : courrier, message, rapport, article, note).	Oral assessment criteria: - Intelligibilité. - Lexique. - Grammaire. - Fluidité. - Interaction. Written assessment criteria: - Compliance with the task instructions. - Lexique. - Grammar / spelling. - Coherence / cohesion. - Lisibilité. - Argumentation.
2	- Oral expression: individual interview (guided conversation) + prepared oral production (presentation + answers to questions), 3 to 20 minutes. - Written production: functional, narrative or argumentative text (60 to 300 words).	Oral assessment criteria: - Intelligibilité. - Lexique. - Grammaire. - Fluidité. - Interaction. Written assessment criteria: - Compliance with the task instructions. - Lexique. - Grammar / spelling.



		- Coherence / cohesion. - Lisibilité. - Argumentation.
3	Entretiens simulés, rédaction d'un email qui exige que l'on se présente, etc.	Oral assessment criteria: - Intelligibilité. - Lexique. - Grammaire. - Fluidité. - Interaction. Written assessment criteria: - Compliance with the task instructions. - Lexique. - Grammar / spelling. - Coherence / cohesion. - Lisibilité. - Argumentation, depending on the group's level and progression.

Bibliographic resources

- Ressources transmises par l'intervenant.



Engineering Programme Syllabus: Grande École Programme

TU Title: Project 1A 1/2 (Intermediate)			
Last updated: Sept. 2021	*National TU Coordinator: Anne MOREL (DGAF)*		*Year of Study:* Level L3
TU PJ5	*Language of Instruction: French and/or English*	*Type: UEP Mandatory*	*Cycle: 1A*
ECTS credits: 2	*Student workload per TU (hours): 50*	*Including face-to-face teaching (hours): 18*	*Semester: S5*
Keywords: project lifecycle management: execute, monitor, control.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	X
	2.4 Attitudes, thought and learning	X
	2.5 Ethics, professional conduct and professional responsibilities	X
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	X
	3.2 Communications	X
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X	X	X	X

Specific prerequisites



None

General teaching methods

Group-based student scenarios.

Intended learning outcomes

Carry out one or more phases of a project as a group, applying one or more disciplinary fields.

ILO 1. Understand the project's need, objectives and constraints.
ILO 2. Carry out the planned tasks, monitor progress and make adjustments in the event of deviations by implementing corrective actions.
ILO 3. Present the results of the task(s) completed.

Teaching unit (TU) description:
- The project will be carried out over the semester as autonomous team-based work, proposed and supervised by the teaching team.
- TU PJ5 may be organised as the first part of work that will continue in TU PJ6.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1		
2		

Assessment by the teaching team:
- Management of the execution of the tasks to be carried out.
- Overall conduct of the TU during dedicated sessions and operation of the team (e.g. attendance, perseverance, autonomy, allocation of roles).
- Application within the project of academic knowledge and the technical or scientific approach adopted.
- Rapport de projet.
- Soutenance de projet.

Bibliographic resources

- A Guide to the Project Management Body of Knowledge (PMBOK Guide) - (ISBN 978-1933890654), Chapters 2 and 4.
- Project Management. Techniques de l'Ingénieur, reference T7700 Vx, January 1997.



Engineering Programme Syllabus: Grande École Programme

TU Title: Tools for Oral Communication in English 1A 2/2			
Last updated: March 2026	*National TU Coordinator: Virginie VERCOLLIER (Châlons-en-Champagne)*		*Year of Study:* Level L3
TU AN6	*Language of Instruction: French and/or English*	*Type: UEL Mandatory*	*Cycle: 1A*
ECTS credits: 2	*Student workload per TU (hours): 50*	*Including face-to-face teaching (hours): 20*	*Semester: S6*
Keywords: professional integration, international environment.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	
	2.4 Attitudes, thought and learning	X
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	X
	3.2 Communications	X
	3.3 Communications in foreign languages	X
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
			X

Specific prerequisites



- Common European Framework of Reference for Languages: B1.

General teaching methods

- Études dirigées (groupes de 24).
- Work as a whole class, in small groups (4 to 6 students), or individually, depending on the learning objectives.
- Role-playing and simulation of professional situations (e.g. meetings, recruitment).

Intended learning outcomes

Interact in an international work environment.

ILO 1. Dialoguer dans un environnement professionnel multiculturel.

- Students must be able to structure and deliver an oral presentation in English clearly and fluently, adapting it to the audience. They must manage speaking time, intonation and body language, and interact effectively with the audience. They must also be able to answer questions and create visual aids suited to the context.

ILO 2. Interact in a group using English as the working language.

- Students must be able to work as a team on a project (presentation, report, case study, meeting).

ILO 3. Continue developing their career plan in preparation for entering the world of work in France or abroad.

- Before the operator-level internship, students must be able to identify their skills and reflect on the company's expectations.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Group oral presentation, including discussion time with the audience. Speaking time of 5 to 10 minutes per student. Individual grades.	- Clarity and structure of the presentation. - Fluency of oral expression and confidence in front of the audience (posture, eye contact, voice). - Interaction with the audience (answers to questions, handling unexpected situations). - Justesse grammaticale et syntaxique (B1+). - Usage du vocabulaire adapté.
2	Group activity (debate, information exchange, or presentation of group work) with 5 to 10 minutes of individual speaking time.	- Language proficiency (B1+): ability to express oneself in English with fluency and accuracy. - Qualité de l'interaction : Prise en compte des interventions des autres et reformulation si nécessaire. - Organisation of ideas: coherent and logical presentation of the points discussed.
3	Communication and writing activities in the context of an application. Formative assessment with precise, individual feedback from the lecturer.	- Ability to express one's skills and experience in order to develop a career plan. - Use of vocabulary (precise terms appropriate to the context).

Bibliographic resources

- Ressources transmises par l'intervenant.



Engineering Programme Syllabus: Grande École Programme

TU Title: Student Career Guidance 1A 2/2			
Last updated: March 2026	*National TU Coordinator: Bertrand KRAUSER (Metz)*		*Year of Study:* Level L3
TU APE6	*Language of Instruction: French and/or English*	*Type: UEA Mandatory*	*Cycle: 1A*
ECTS credits: 1	*Student workload per TU (hours): 25*	*Including face-to-face teaching (hours): 13*	*Semester: S6*
Keywords: professional identity, career plan, professional integration.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	
	2.4 Attitudes, thought and learning	X
	2.5 Ethics, professional conduct and professional responsibilities	X
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	
	3.2 Communications	X
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	X
	4.2 Enterprise and business context	X
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
			X

Specific prerequisites



- UE APE5.
- Contractualisation.

General teaching methods

- 12 hours of group sessions with approximately 25 students + 1 hour of individual interview.
- External lecturers use facilitation techniques drawn from professional practice, with an emphasis on interaction.

Intended learning outcomes

Develop an initial understanding of one's personal and professional interests and preferences in relation to one's understanding of the professional world.

ILO 1. Develop self-awareness based on an inventory of career interests using psychometric tools.

- Identify one's drivers, motivations, personality, values and skills.

ILO 2. Optimiser sa candidature.

- Prepare for professional situations and optimise an application by updating one's skills portfolio, CV, cover letter, pitch and interview preparation.

ILO 3. Prepare for professional situations.

- Identify the expectations associated with a role and be able to explain one's strengths and areas requiring attention.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	Tests psychométriques (complétude individuelle).	Ability to summarise one's personal profile, strengths and areas requiring attention through a written or oral pitch, CV or cover letter.
2	Active participation in individual and group work during collective sessions and in discussions during the individual interview.	- Draft a CV, cover letter and personal pitch, and develop one's professional identity on social media. - Comply with the Charter signed at the beginning of the year.
3	Group work and updating of the Career Logbook during the dedicated collective session.	Use the information gathered, relate it to one's career plan and prepare for meetings with professionals.

Bibliographic resources

- Fonds de savoir commun TEAM – Équipe UE APE National.
- ONISEP. Découvrir les métiers (http://www.Onisep.Fr/Decouvrir-les-metiers).
- France Travail - Occupational Profiles: Operational Directory of Occupations and Jobs (https://www.Francetravail.Org/opendata/repertoire-operationnel-des-meti.Html?Type=article).
- SYNTEC INGÉNIERIE (https://www.Syntec-AXingenierie.Fr/).
- AVENIR INGENIERIE (https://avenir-ingenierie.Fr/).
- CONCEPTEURS D'AVENIR (https://www.Concepteursdavenirs.Fr/decouvrir-les-metiers).
- OPIIEC (https://www.Opiiec.Fr/cartographie_des_metiers).
- IESF (https://www.Iesf.Fr/).
- Société des ingénieurs et scientifiques de France - directory.



Engineering Programme Syllabus: Grande École Programme

TU Title: Oral and Written Communication in a Foreign Language 1A 2/2			
Last updated: March 2026	*National TU Coordinator: Lydia Post (Metz)*		*Year of Study:* Level L3
TU LVS6	*Language of Instruction: French and/or selected foreign language*	*Type: UEL Mandatory*	*Cycle: 1A*
ECTS credits: 1	*Student workload per TU (hours): 25*	*Including face-to-face teaching (hours): 20*	*Semester: S6*
Keywords: professional integration, international environment.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	
	2.4 Attitudes, thought and learning	X
	2.5 Ethics, professional conduct and professional responsibilities	
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	X
	3.2 Communications	X
	3.3 Communications in foreign languages	X
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
			X

Specific prerequisites



- Level A, basic user: breakthrough or beginner level (A1) and waystage or elementary level (A2).
- Level B, independent user: threshold or intermediate level (B1) and vantage or upper-intermediate level (B2).
- Niveau C, d'utilisateur expérimenté : autonomie (C1)et maîtrise (C2).

*En fonction du groupe d'affectation.

General teaching methods

- Études dirigées (groupes de 24).
- Work as a whole class, in small groups (4 to 6 students), or individually, depending on the learning objectives.
- Role-playing and simulation of professional situations (e.g. meetings, recruitment).

Intended learning outcomes

Communicate and interact in everyday situations.

ILO 1. Further develop autonomy in communication and interaction.

- Express oneself and understand oral and written communication on a socio-cultural topic in a manner appropriate to one's language level and, where the group's level permits, manage an exchange of ideas independently and coherently.

ILO 2. Identify the cultural characteristics of countries where the target language is spoken.

- Students must analyse cultural differences in depth and know how to take them into account in intercultural communication. Where the group's level permits, they must also be able to anticipate and explain intercultural conflicts.

ILO 3. Present one's personal background in everyday situations.

- Students must be able to introduce themselves fluently and engagingly in the second foreign language, both orally and in writing, in a personal context. The aim is to talk about themselves and their professional background (skills, goals, etc.), depending on the group's level and progression.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1	- Oral production: individual interview (guided conversation) + prepared oral production (3- to 20-minute presentation + answers to questions). - Written production: functional, narrative or argumentative text (depending on level) + practical task: letter, message, report, article or note.	Oral assessment criteria: - Intelligibilité. - Lexique. - Grammaire. - Fluidité. - Interaction. Written assessment criteria: - Compliance with the task instructions. - Lexique. - Grammar / spelling. - Coherence / cohesion. - Lisibilité. - Argumentation.
2	- Oral expression: individual interview (guided conversation) + prepared oral production (presentation + answers to questions), 3 to 20 minutes. - Written production: functional, narrative or argumentative text (60 to 300 words).	Oral assessment criteria: - Intelligibilité. - Lexique. - Grammaire. - Fluidité. - Interaction. Written assessment criteria: - Compliance with the task instructions. - Lexique. - Grammar / spelling. - Coherence / cohesion. - Lisibilité.

		- Argumentation.
3	Scenario-based activities encouraging oral and/or written production: role-play, development of a pitch, etc.	Oral assessment criteria: - Intelligibilité. - Lexique. - Grammaire. - Fluidité. - Interaction. Written assessment criteria: - Compliance with the task instructions. - Lexique. - Grammar / spelling. - Coherence / cohesion. - Lisibilité. - Argumentation, depending on the group's level and progression.

Bibliographic resources

- Ressources transmises par l'intervenant.



Engineering Programme Syllabus: Grande École Programme

TU Title: Project 1A 2/2 (Intermediate)			
Last updated: Sept. 2021	*National TU Coordinator: Anne MOREL (DGAF)*		*Year of Study:* Level L3
TU PJ6	*Language of Instruction: French and/or English*	*Type: UEP Mandatory*	*Cycle: 1A*
ECTS credits: 2	*Student workload per TU (hours): 50*	*Including face-to-face teaching (hours): 18*	*Semester: S6*
Keywords: project lifecycle management: plan, execute, monitor, control.			

RNCP 39305 competency blocks linked to this TU

1. Analyse and develop products, systems, goods and services with mechanical, energy and industrial components throughout all stages of their life cycle.	
2. Imagine, design and formalise manufactured products, production systems, and company goods and services.	
3. Manufacture, produce and inspect, within an integrated approach, manufactured products, parts, industrial production systems, and company goods and services.	
4. Organise and optimise industrial production scheduling and management, and the organisation of services.	
5. Foster the development of human, technological, organisational, linguistic and intercultural capabilities, for oneself and one's team, in order to support industrial and socio-environmental changes in organisations.	X

Intended learning outcomes in the CDIO framework

Outcome Group	***Learning Outcomes***	***TU-targeted Outcomes***
Disciplinary knowledge and reasoning	1.1 Knowledge of basic sciences	
	1.2 Core engineering fundamental knowledge	
	1.3 Advanced engineering fundamental knowledge, methods and tools	
Personal and professional skills and attributes	2.1 Analytic reasoning and problem solving	
	2.2 Scientific methods: experimentation, investigation and knowledge discovery	
	2.3 System thinking	X
	2.4 Attitudes, thought and learning	X
	2.5 Ethics, professional conduct and professional responsibilities	X
Interpersonal skills: Teamwork and communication	3.1 Teamwork and collaboration	X
	3.2 Communications	X
	3.3 Communications in foreign languages	
Create, design, implement, operate, innovate and undertake in a Corporate Social Responsibility context	4.1 External, societal and environmental context	
	4.2 Enterprise and business context	
	4.3 Creating: from idea to business plan	
	4.4 Designing	
	4.5 Implementing	
	4.6 Operating	
	4.7 Innovating	
	4.8 Engineering entrepreneurship	

Training Pillars

Mechanical Engineering	***Energy Engineering***	***Industrial Engineering***	***Management***
X	X	X	X

Specific prerequisites



- UE PJ5

General teaching methods

Group-based student scenarios.

Intended learning outcomes

Carry out and complete one or more phases of a project as a group, applying one or more disciplinary fields.

ILO 1. Implement basic project management tools.
ILO 2. Carry out the planned tasks, monitor project progress and make adjustments in the event of deviations by implementing corrective actions.
ILO 3. Complete the project and present its results.

Teaching unit (TU) description:
- TU PJ6 may preferably be organised as a continuation of the work carried out in TU PJ5.
- The project will be carried out over the semester as autonomous team-based work, proposed and supervised by the teaching team.

General assessment methods and criteria

ILO	*Assessment method*	*Assessment criteria*
1		
2		

Assessment by the teaching team:
- Usage des outils.
- Overall conduct of the TU during dedicated sessions and operation of the team (e.g. attendance, perseverance, autonomy, allocation of roles).
- Application within the project of academic knowledge and the technical or scientific approach adopted.
- Rapport de projet.
- Soutenance de projet.

Bibliographic resources

- A Guide to the Project Management Body of Knowledge (PMBOK Guide) - (ISBN 978-1933890654), Chapters 2, 4 and 6.
- Project Management. Techniques de l'Ingénieur, reference T7700 Vx, January 1997.
- Maders H-P. Et alii (2016), Les fiches outils du chef de projet : 100 fiches opérationnelles, Eyrolles.



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