PROVISIONAL COMPETENCY FORM - MECHANICAL ENGINEERING

Note: Throughout this document, the masculine gender is used generically to refer to any person, regardless of their gender.

Student: Last name: …… First Name: ……

Year – Spec.: **5th year Mech. Eng.** **Internship Dates**: from …… to……

Host Organization: ……

Internship Subject: ……

……

……

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Professional Supervisor: ……

Dept. / Position: ……

Email: …… Phone: ……

Academic Advisor: ……

Email: …… Phone: ……

Student's signature and date:	Professional Supervisor's signature and date:	Academic Advisor's signature and date:

Form to be returned by email to the academic supervisor as soon as possible, and no later than at the time of signing the internship agreement, for validation. The sooner your academic supervisor is informed of your internship topic and expected competencies; the sooner you will receive a decision on the validity of the proposed internship.

This document is designed to enable the intern and their host organization supervisor to **jointly define, on a provisional basis before the start of the internship, the elements of the competency framework (competencies and associated key learnings**, see Appendix on the last page**) that will be utilized and assessed during the internship.**

For each competency developed during the internship (a minimum of 1 out of the 4 competencies C1-C4 of the framework), the tables should be completed as follows:

- **Table 1**: *Competency addressed during the internship*: in the left-hand column, please check the box only if the competency will be utilized and developed during the internship. *Student's Self-Perceived Competency*: in the right-hand columns, the student should indicate their current self-assessment regarding this competency and its key components. A guide to help with positioning across the different levels is available in the appendix (cf. Last page).
- **Table 2** - *Key learnings for the internship*: for each selected competency, also check the associated key learnings that will be utilized during the internship to allow the competency to be exercised in context, based on the objectives and tasks constituting the internship program.

Example - If the internship aims to develop, among others, Competency C1 "Develop advanced programming tools in mechanical engineering":
Table 1: the competency is checked in the left-hand column.
Table 2: The student and the supervisor jointly select the key learnings for Competency C1 that are planned to be utilized during the internship.

Table 1: competencies and key components

↓ Check this box if the competency will be developed during the internship	
	Competency **C1**: **Develop advanced programming tools in mechanical engineering**
↓ Check this box if the key component will be developed during the internship	
	... by relying on the consistent laws of physics,
	... in accordance with the client's requirements and/or technical specifications,
	... by selecting appropriate programming tools,
	... by implementing a relevant, efficient, and suitable numerical strategy,
	... by providing critical, scientific, and technical justifications,
	... by communicating in a clear and concise manner, adapted to the target audience, including in a foreign language,
	... by working effectively both independently and as part of a team.

Table 2: key learnings

	↓ Check the boxes corresponding to the key learnings utilized during the internship
Level 1	Choose appropriate programming tools and scientific computing methods to solve a simple mechanical problem
	Develop a basic scientific computing program
	Use basic features of industrial simulation software
	Validate the implemented digital tools on benchmark problems
	Analyze computational results
	Model a simple thermo-mechanical problem using appropriate equations

↓ *Check this box if the competency will be developed during the internship*	
	Competency **C1**: **Develop advanced programming tools in mechanical engineering**

↓ *Check this box if the key component will be developed during the internship*	
	... by relying on the consistent laws of physics,
	... in accordance with the client's requirements and/or technical specifications,
	... by selecting appropriate programming tools,
	... by implementing a relevant, efficient, and suitable numerical strategy,
	... by providing critical, scientific, and technical justifications,
	... by communicating in a clear and concise manner, adapted to the target audience, including in a foreign language,
	... by working effectively both independently and as part of a team.

	↓ *Check the boxes corresponding to the key learnings utilized during the internship*	
Level 1		Choose appropriate programming tools and scientific computing methods to solve a simple mechanical problem
		Develop a basic scientific computing program
		Use basic features of industrial simulation software
		Validate the implemented digital tools on benchmark problems
		Analyze computational results
Level 2		Model a simple thermo-mechanical problem using appropriate equations
		Implement a model in an efficient programming tool
		Design a programming strategy suited to solving mechanical problems
		Develop scientific computing programs using an object-oriented programming paradigm
Level 3		Develop a dedicated programming strategy to solve complex mechanical problems
		Develop parallelized simulation codes
		Use advanced features of industrial simulation software to solve realistic problems
		Report on a project, including the numerical methods used/developed, the results obtained, and their analysis

Comments

↓ *Check this box if the competency will be developed during the internship*	
	Competency **C2**: **Model physical phenomena for a mechanical system**
↓ *Check this box if the key component will be developed during the internship*	
	... in accordance with the client's requirements and/or technical specifications,
	... by taking into account the physical laws relevant to the problem to be solved,
	... by selecting appropriate computational tools to solve the resulting equations,
	... by using the results of a model to define a control and/or optimization strategy for the system's physical phenomena,
	... by ensuring the model's optimality and reproducibility,
	... by working effectively both independently and as part of a team,
	... by communicating in a clear and concise manner, adapted to the target audience, including in a foreign language,
	... by providing critical, scientific, and technical justifications.

↓ *Check the boxes corresponding to the key learnings utilized during the internship*		
Level 1		Conduct a scientific and technical state-of-the-art review
		Apply a scientific approach to problem-solving
		Implement an experimental approach to acquire relevant data
		Write a report on numerical and experimental data to validate developed numerical models
		Process and analyze experimental data
		Draw scientific conclusions
Level 2		Select appropriate equations to model the mechanical problem to be solved
		Analyze partial differential equations and the underlying assumptions modeling problems in materials, fluid, and structural mechanics
		Develop one or more scenarios in response to specifications
		Solve simple partial differential equations analytically
		Analyze results from scientific models
		Report on scientific results
Level 3		Formulate simplifying hypotheses to enable solving a mechanics problem
		Integrate physical models and their results within a broader industrial or socio-economic context
		Communicate model results, their interpretation, and validity ranges with various stakeholders
		Analyze the bibliography in an R&D context

Comments

↓ *Check this box if the competency will be developed during the internship*	
	Competency **C3**: **Design a mechanical system**

↓ *Check this box if the key component will be developed during the internship*	
	... in accordance with the client's requirements and/or technical specifications,
	... by using appropriate tools, mathematical assumptions, and numerical models,
	... by communicating clearly and concisely with stakeholders, including in a foreign language,
	... by considering aspects related to eco-design,
	... by working effectively both independently and as part of a team,
	... by providing critical, scientific, and technical reasoning.

↓ *Check the boxes corresponding to the key learnings utilized during the internship*		
Level 1		Synthesize technical and scientific literature in a bibliographic report on the state of the art
		Use programming tools for Computer-Aided Design (CAD)
Level 2		Implement calculation assumptions in appropriate equations
		Select calculation methods suited to the problem to be solved
		Apply calculation methods to determine forces, stresses, and deformations in the mechanical system for its sizing
		Validate calculation results
Level 3		Evaluate optimization possibilities of a mechanical system based on the relevant equations
		Implement methods and technological choices based on optimization results
		Work collaboratively in a team for the design, sizing or optimization of complex mechanical systems
		Present design, sizing or optimization results in an engineering office context

Comments

↓ *Check this box if the competency will be developed during the internship*	
	Competency **C4**: **Lead the development or improvement of a mechanical system**

↓ *Check this box if the key component will be developed during the internship*	
	... by applying an appropriate project management methodology
	... by collaborating effectively with teams and various stakeholders
	... by considering the costs, deadlines, and quality requirements specified in the project brief
	... by taking into account the available material, human, and financial resources
	... by complying with standards relevant to a specific industrial context
	... by following a suitable continuous improvement approach
	... by communicating clearly and concisely with stakeholders, including in a foreign language

↓ *Check the boxes corresponding to the key learnings utilized during the internship*		
Level 1		Identify the scientific, technical, economic, social, environmental, and legal stakes and risks of the project
		Use appropriate project management tools
		Carry out activities using organizational tools
		Self-assess one's progress
		Report on project progress
Level 2		Evaluate the importance and relevance of information to successfully carry out a project
		Plan the major phases of a project
		Write the necessary technical documentation
		Communicate an analysis and a scientific approach
Level 3		Define the project scope (stakeholders and expected deliverables) and objectives
		Implement consultation mechanisms and communicate the necessary information for decision-making
		Implement an eco-design strategy within a design office context

Comments

APPENDIX

Competency-Based Approach and Competency Framework: The Essentials

This Provisional Competency Form is part of the **Competency-Based Approach** (in French: *Approche par Compétences, APC*), an educational methodology designed to assess a future engineer's ability to act effectively in real-world professional situations. This approach relies on a **Competency Framework**, a structured guide defining the key "complex abilities to act" that students must master by the end of their program.

For the Polytech Lyon Mechanical Engineering degree program, this framework consists of **4 Competencies** (C1 to C4), which are representative of a Mechanical Engineer's activities and are linked to the Competency Blocks of the RNCP fiche 39567. The internship offers a prime opportunity for students to mobilize and develop one or more of these competencies in a professional setting.

The main elements of this framework fall into 3 categories:

- **Competency**: this is a "complex ability to act" that enables an individual to perform effectively in a given situation by appropriately mobilizing and combining various resources (knowledge, know-how, soft skills/attitudes). Unlike a simple skill, a competency involves adapting to the specifics of situations and contexts by making justified choices.
- **Key Components**: also known as "performance criteria for a competency," these are the specific criteria that describe the expected quality of action when the competency is implemented. They generally specify the resources to be mobilized, the rules or constraints to be respected, the methodological approaches, communication methods, and the quality of the outcome.
- **Key Learnings**: these are the essential learnings absolutely necessary for the exercise of a competency. They involve mobilizing multidisciplinary resources of various kinds (knowledge, know-how, soft skills/attitudes).