

## School of Engineering Department of Industrial and Systems Engineering

### Industry Guidelines for Final Year Projects 2025

#### 1. INTRODUCTION

As part of the pre-requisites for the bachelor's degree in Industrial Engineering, final year students are required to complete an engineering project in which they apply fundamental industrial engineering knowledge and skills. The project, executed over two semesters from February to October each year, forms an essential part of the training and industry exposure of Industrial Engineering students at the University of Pretoria. The project carries a total of 40 credits or 400 learning hours, equivalent to approximately 2.5 months of full-time work. Industry support is essential to identify and oversee suitable projects and to support students in executing their projects.

**The aim of this document is to provide students and companies:**

- 1) An overview of the modules and deliverables, and the competencies students must demonstrate with the projects.
- 2) Guidelines for nominating and overseeing projects.
- 3) The policy of the University with respect to copyright and ownership of intellectual property.

**Pertinent to project definition, the following documents or websites are useful:**

- 1) Previous years project topics: <https://www.up.ac.za/industrial-and-systems-engineering/article/3198035/2023-ie-final-year-project-titles-top-three-posters>
- 2) Policies from the Engineering Council of South Africa (ECSA, 2023).
- 3) Ethical clearance website: <https://www.up.ac.za/faculty-of-engineering-built-environment-it/article/15815/faculty-committee-for-research-ethics-integrity>.

**Availing practical training preceding the final year project:**

Besides sponsoring a final year project, industry is also requested to avail vacation work to our students. All engineering students must complete practical training at an approved organisation, during or at the end of their second and third study years. This entails a *30 working days* period *per year of study* with a total of twelve weeks. On completion of each training period, a student must submit a report that is evaluated by the university. *We encourage students to use their engagement with industry, during practical training, to identify a suitable final year project topic.*

**Guidelines for practical training are available via:**

<https://www.up.ac.za/industrial-and-systems-engineering/article/45689/practical-training>

## 2. PHASES AND MODULES

The project is executed sequentially over two semesters in two modules, referred to as BPJ 410 and BPJ 420. schedule.

**Table 1** lists the phases, deliverables and **tentative schedule**.

**Table 1 Overview of BPJ410 and BPJ420**

Module	Phase	Deliverable	Schedule Due Dates
BPJ 410	0	Project Topic/Project Definition	4 March (Tue)
	1	Project Proposal	Early-April (TBD)
	2	Preliminary Project Report	Mid-May (TBD)
		Reflection on Learning	
BPJ 420	1	Interim Project Report	<b>Second semester</b> To be published in the BPJ 420 study guide
	2	Final Project Report	
	3	Poster	
		Oral Presentation (with Questioning)	

## 3. MODULE COORDINATION

Industry partners are welcome to contact the following module coordinator with any queries regarding the final year projects:

**Table 2 Coordinator**

Name	Telephone No	e-mail
Prof Marné de Vries	012-420-2038	marne.devries@up.ac.za

Each year, the department appoints a lecturer/specialist to supervise the students. Students are required to discuss their proposed projects, also those sponsored by industry, with a potential study leader before submitting the Phase 0 deliverable.

## 4. MODULE OUTCOMES

The purpose of the final year project (BPJ 410 and BPJ 420) is to provide a student with an opportunity to demonstrate:

- 1) Competence in certain Graduate Attributes (GAs) specified by ECSA and
- 2) Compliance to the requirements prescribed by the University to be awarded the B. Eng. Degree.

The following outcomes stipulated by the Engineering Council of SA (ECSA) apply to BPJ 410 and/or BPJ 420. The implication is that a project must provide a student with opportunities to demonstrate these competencies, where we used italics to indicate the 2023 changes made to the range statements:

**GA 1: Problem solving.** Identify, formulate, *research literature* and analyse complex engineering problems *reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development*.

**GA 2: Application of scientific and engineering knowledge.** Apply knowledge of mathematics, natural science, *computing* and engineering fundamentals, and an engineering specialisation *to develop solutions* to complex engineering problems.

**GA 3: Engineering design.** *Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs.*

**GA 4: Investigations, experiments and data analysis.** Demonstrate competence to *conduct investigations of complex engineering problems using research methods, including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.*

**GA 5: Use of engineering tools.** Demonstrate competence to *create, select and apply, and recognise limitations of, appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems.*

**GA 6: Professional and technical communication.** Demonstrate competence to communicate *effectively and inclusively on complex engineering activities, both orally and in writing, with the engineering community and society at large, taking into account cultural, language, and learning differences.*

**GA 9: Independent learning ability.** Demonstrate competence to *engage in independent learning through well-developed learning skills.*

## 5. PHASES AND DELIVERABLES

As indicated in Table 1, multiple deliverables are required for the final year project.

### 5.1 First Semester

The first deliverable, is the **Project Topic**. It is the responsibility of the student to acquire a suitable project and an industry sponsor, and to submit a document that describes the project context and main objectives. Students may select their own projects, as long as the project provides sufficient opportunities to apply industrial engineering methods, techniques, tools and skills that will enable the student to demonstrate compliance with ECSA's graduate attributes.

To support students in acquiring a suitable project, *companies are invited* to propose potential projects by e-mailing a **Project Definition** (using the project definition document on the website: <https://www.up.ac.za/industrial-and-systems-engineering/article/2662756/final-year-projects>) to the module coordinator as early as possible, but *by the latest 3 February 2025*, allowing for sufficient time for screening candidates and selecting an appropriate project student. Students need to submit their selected topics already on 4 March 2025.

- The Project Definition should provide sufficient detail to allow: a) a student to select the project based on his/her areas of interest, b) the course coordinator to make a judgement on the suitability of the project, and c) allocation of the project to a project leader with the *necessary expertise*.
- If an industry sponsor offers **multiple final year project topics**, a single UP-mentor will be allocated to supervise these projects, ensuring that the projects do not overlap in scope.
- When proposed project definitions are received, the Department will advertise them on the learning management system ClickUP for the Final Year Project module (BPJ 410), restricting access to only registered students, examiners and administrators, *and hence topics will not be available to the public*. The **project sponsor has to ensure** that no sensitive/confidential information is included in the Project Definition document.
- Students may then apply for a project by following the application process detailed in the Project Definition document by the *Industry Sponsor/Mentor*, typically by submitting a CV and a motivation to the sponsoring company, often followed by interviews and a final selection by the *Industry Sponsor*.
- The industry mentor should also inquire whether a project applicant already applied for other projects, since students often manage their risks by applying for multiple projects.
- Student applicants that were not selected for a project, must search for another project, often under time constraints due to the limited time that may be left before the submission date. It remains the responsibility of each student to find a suitable project.
- Students, when liaising with companies to identify projects, especially companies that collaborate with the Department for the first time, must ensure that the company is aware of the University's policy regarding intellectual property ownership, as discussed in section 7 of this document.

Phase 0 is deemed to be completed when the student submits a **Project Definition** and a completed **Project Industry Mentorship and Permission** form, signed by the industry mentor.

By signing the form, the industry mentor approves of the study undertaken by the student, commits to providing the students with the required support and data to complete the project, and accepts the stipulations regarding intellectual property.

The next deliverable is the **Project Proposal**, which is a more detailed description of the project context, problem(s), motivation, theoretical context, and a broad outline of an envisaged project approach, scope and deliverables based on an initial investigation of the problem or process and an initial literature study.

The first semester concludes with the student submitting two examination deliverables.

- The **Preliminary Project Report** should communicate some background information about the company, industry, process, problem and aim, provide a detailed envisaged project approach and expected deliverables based on a thorough problem or process investigation and a detailed literature study.
- The second deliverable is an appendix to the Preliminary Project Report, i.e. **Reflection on Learning**, that requires student reflection on independent learning and pro-active engagement with stakeholders.

## 5.2 Second Semester

The work initiated by the student during the first semester culminates in the deliverables required for BPJ 420, as listed in Table 1. In the second semester the student must complete the project and, in doing so, fulfil the obligations to the company in terms of expected and agreed-upon deliverables, as initiated in the **Project Definition** and finalised in the **Final Project Report**. These deliverables should include the design tasks, such as evaluating alternative solutions, proposing (not necessary implementing), and validating/demonstrating/evaluating that the preferred solution will fulfil the project requirements, i.e. addressing the stated problem/opportunity.

NOTE: Care should be taken not to make implementation part of the agreed-upon deliverables, unless all variables that could affect implementation *are within the control of the student*.

## 6. KEY RESPONSIBILITIES OF INDUSTRY PROJECT MENTORS

The involved company is requested to appoint a project mentor, which is the key contact within the company that should be able to provide the best guidance on the project and is most likely to gain from the success of the project. The project mentor has the following important responsibilities:

1. Selecting a suitable student/candidate to conduct the project.
2. Confirm his/her role as project mentor, duly authorised by the company by signing the **Project Industry Mentorship and Permission** form. Multiple *mentors from industry* may be appointed, but is not advised.
3. Ensure that the **Project Definition** adequately describes the project.
4. Review and approve the **Project Proposal**, ensuring that it clearly defines the problem to be investigated by the student, and that the project requirements, scope, deliverables and approach are acceptable.
5. Review and approve the **Final Project Report**, ensuring that information is accurate and the solution addresses the problems and/or design requirements of the defined project.
6. Ensure that sensitive confidential information or intellectual property of the company is not disclosed in the document and/or that the necessary arrangements are made with the Department regarding the handling of the reports.

## 7. INTELLECTUAL PROPERTY OF PROJECT REPORTS

The University of Pretoria has Intellectual Ownership of all outcomes generated by students, including the project documents generated by the student as part of their final year projects. The University may therefore decide to publish a final year project on UPspace (freely available via the Internet).

These publications portray the quality of education at the University, but they have the potential of exposing sensitive company information. It is important that both students and sponsors are aware of such implications. The student must arrange with a company how to address confidential information and ensure that *final deliverables* do not contain any confidential, sensitive or proprietary information of the company.

The following is potential actions that could be taken to protect company sensitive or confidential information:

- Making use of a fictitious name to represent the company, for example, referring to Company ABC.
- Withholding, excluding or adjusting important confidential or sensitive data, such as design drawings or financial information.
- Coding sensitive data, for example, by adding or subtracting a constant from all values.
- Requesting the Department *not to publish* the deliverables on UPSPACE.

The position of the Department Industrial and Systems Engineering is that:

- 1) It remains the responsibility of the student to come to an agreement with the company on handling confidentiality and sensitive data.
- 2) Only a small sample of final project reports are published on UPSPACE. If a company request so, the Department will not publish the involved project report (or any other deliverable) on UPSPACE or any other channel by which it can be accessed by the public.
- 3) All deliverables are made available to the internal and external examiners only through secured means. If the company wishes to exclude certain information from the eyes of the examiners, the student must use the advice contained in the policy statement above. The more information is withheld, the more difficult it becomes to assess the competencies of the student fairly.

## **8. ADDITIONAL INFORMATION**

The Department's web site provides various links to other opportunities for industry to engage with, such as sponsoring projects for Masters and PhD studies.

### **8.1 Ethical implications**

A student must consider the potential social and ethical implications of their projects and, if applicable, apply for ethical clearance. All studies of which human participants are informants (i.e. surveys/questionnaires, interviews, observing humans etc.) require ethical clearance. Guidelines are provided by the Faculty Committee for Research Ethics and Integrity (Faculty of Engineering Built Environment & IT, n.d.).

### **8.2 Plagiarism**

Plagiarism is not tolerated by the University. Students must adhere to the requirements stipulated on the following website: <https://library.up.ac.za/plagiarism>

### **8.3 Professional conduct**

Students are expected to conduct themselves professionally in dealings with sponsors and personnel.

## **9. CONCLUSION**

The Department wishes to thank all companies that collaborated or intend to collaborate with the Department on Final Year Projects, and acknowledges the resulting contributions in educating future industrial engineers.

## **REFERENCES**

- ECSA. (2023). Qualification Standard for Bachelor of Science in Engineering (BSc(Eng))/ Bachelors of Engineering (BEng): NQF Level 8; E-02-PE; Revision No. 7: 24 August 2023.
- Faculty of Engineering Built Environment & IT. (n.d.). Faculty Committee for Research Ethics and Integrity. Retrieved from <https://www.up.ac.za/faculty-of-engineering-built-environment-it/article/15815/faculty-committee-for-research-ethics-integrity>