**Complex Systems Toolkit - Guidance for submitting a teaching activity**

* **Case studies**

**Research**

You may develop the case in any way you see fit, but you should mimic the length, style, and tone of existing case studies found in the [EPC’s Ethics Toolkit](https://epc.ac.uk/resources/toolkit/ethics-toolkit/)and [Sustainability Toolkit](https://epc.ac.uk/resources/toolkit/sustainability-toolkit/sustainability-toolkit-teaching-tools/#anchor-case-studies). While complex systems cases may not have the same learning outcomes, the format and approach should be similar. Remember that the audience for these case studies is educators seeking to embed complex systems within their engineering teaching.

You may find the [current research on good practice in writing case studies](https://epc.ac.uk/resources/toolkit/ethics-toolkit/ethics-toolkit-case-studies/best-practice-in-teaching-engineering-ethics-through-case-studies/) to be helpful as you develop your case. The [Recipe for Creating an Ethics Case Study](https://epc.ac.uk/toolkit/a-recipe-for-creating-a-case-study-in-engineering-ethics/) provides guidance that could be applied to complex systems cases *The guidance for complex systems cases will be available soon.*

**Overview**

The case study should be presented as a narrative about a complex systems issue in engineering. This issue should allow students to grapple with the technical challenge as well as resulting broader concerns.

**Authenticity**

Case studies are most effective when they feel like they are realistic, with characters that you can identify or empathise with, and with situations that do not feel fake or staged. Giving characters names and backgrounds, including emotional responses, and referencing real-life experiences help to increase authenticity.

**Complexity of issue**

Many cases are either overly complicated so that they become overwhelming, or so straightforward that they can be “solved” quickly. A good strategy is to try to develop multiple dimensions of a case, but not too many that it becomes unwieldy. Additionally, complexity can be added through different parts of the case so that instructors can choose a simpler or more complicated version depending on what they need in their educational context.

**Activities and resources**

You should provide a variety of suggestions for activities to engage learners as well as resources to both help educators prepare and to enhance students’ learning.

**Educational level**

When writing your case study, you should consider which level it is aimed at. A Beginner-level case is aimed at learners who have not had much experience in engaging with a complex problem, and usually focuses on only one or two dimensions of a challenge. An Advanced-level case is aimed at learners who have had previous practice in engaging with complex systems, and often addresses multiple challenges. An Intermediate case is somewhere in between.

**Assessment**

If possible, suggest assessment opportunities for activities within the case, such as marking rubrics or example answers.

**Format**

The case study should follow the following format:

* Learning and teaching notes: This is an overview of the case and its dilemma, and how it relates to [AHEP’s themes](https://www.engc.org.uk/media/3464/ahep-fourth-edition.pdf).
* Learning and teaching resources: You should provide a list of reliable, authoritative open-source online resources that relate to the case and its issue(s). These can be from a variety of sources, such as academic institutions, journals, news websites, business, and so on. We suggest a minimum of five sources that help to provide context to the case and its issues. You may want to flag up certain resources as suggested pre-reading for certain parts of the case, if you feel that this will enrich the learning experience.
* Summary: This sets out the case’s initial situation and characters.
* Issue – Part one: This elaborates on the case and provides a dilemma for the character.
* Questions and activities: This is where you provide suggestions for discussions and activities related to the case and the dilemma.
* Further issues: Some case studies are sufficiently complex at one dilemma, but if the case requires it you can provide further parts (up to a maximum of three).
* Further questions and activities: After each part, you should provide further suggestions for discussions and activities related to the case and the issues.
* If possible, suggest assessment opportunities for activities within the case, such as marking rubrics or example answers.

**Before you submit, review this checklist:**

* Does it follow the correct format?
* Is there a strong narrative to the case?
* Can the topic be addressed at both a large and small scale?
* Are there places where technical topics could be integrated?
* Does the case have authentic characters and situations?
* Is there a clear dilemma in the case?
* Does the case provide enough complexity to challenge users, but not so much that people might avoid engaging with it?
* Are there sufficient activities and resources suggested?
* **Other teaching resources**

**Purpose and Outcomes**

* Teaching Tools are intended to support educators’ ability to apply and embed complex systems concepts within their engineering teaching.
* Educators need to quickly and easily find help with:
	+ Adapting and integrating existing complex systems resources to their disciplinary context;
	+ Implementing new and different pedagogies that support complex systems learning;
	+ Structuring lessons, modules, and programmes so that complex systems skills and outcomes are central themes.
* Thus, these teaching tools will provide crucial guidance for those who may be teaching complex systems-related material for the ﬁrst time, or who are looking for new and diﬀerent ways to integrate complex systems concepts into their teaching.
* They may take the form of learning activities, discussion prompts, debate or role play scripts, technical content related to complex systems, worksheets, slides, or other similar teaching materials.
* Before you begin, you should familiarise yourself with [content that has been created to complement case studies](https://epc.ac.uk/resources/toolkit/ethics-toolkit/ethics-toolkit-activities/) in our Ethics Toolkit and [teaching tools in our Sustainability Toolkit](https://epc.ac.uk/resources/toolkit/sustainability-toolkit/sustainability-toolkit-teaching-tools/) since we want these resources to be produced in a similar style and format.

**Purpose**

* Imagine that you are an engineering educator who is new to teaching complex systems concepts. You turn to this teaching tool to help you apply and embed these in your module.
	+ Does this resource help introduce or develop concepts related to complex systems or systems thinking so that learners can engage with these topics in the context of engineering?
	+ If not, what is needed to make this possible?

**Presentation and Clarity**

* Depending on the resource, you may choose to provide worksheets, slides, problem sets, or narrative prompts.
	+ Is the resource explained in such a way that someone new to teaching complex systems could understand how to use it?
	+ Is the material clearly introduced and described?

**Resources and Guidance**

* Depending on the topic, educators may need additional resources or guidance to support their use of the material. For instance, background information may be required or a technical topic explained.
	+ Have you provided sufficient material so that educators can easily employ the resource?
	+ Do references use [Harvard referencing](https://www.open.ac.uk/library/referencing-and-plagiarism/quick-guide-to-harvard-referencing-cite-them-right)?

**Format**

The teaching tool should follow this format:

* Overview
	+ Short description of what the resource is and what it aims to do.
	+ States how it is related to complex systems or systems thinking, referring to external content such as [INCOSE Competencies](https://www.incose.org/docs/default-source/competency-guide/systems_engineering_competency_framework_2nd_edition.xlsx?sfvrsn=499250c7_1) and [AHEP 4](https://www.engc.org.uk/media/3464/ahep-fourth-edition.pdf).
	+ Provides an overview of the activity, suggesting how it might be implemented and in what contexts, how long it might take, and any other relevant delivery information.
* Details any speciﬁc materials or software required for the activity, as well as any modelling or simulation tools to be used.
* Lists any learning and teaching resources recommended in order to undertake the activity, including suggested pre-reading or other references.
* Explains the activity in as much detail as is required (this will vary depending on the type of material the resource addresses.)
* If relevant, provides assessment guidance–marking rubrics, sample answers, etc.

**Before you submit, review this checklist:**

* Does this resource help introduce or develop concepts related to complex systems or systems thinking so that learners can engage with these topics in the context of engineering?
* Is the resource explained in such a way that someone new to teaching complex systems could understand how to use it?
* Is the material clearly introduced and described?
* Have you provided sufficient material so that educators can easily employ the resource?
* Do references use [Harvard referencing](https://www.open.ac.uk/library/referencing-and-plagiarism/quick-guide-to-harvard-referencing-cite-them-right)?
* Does it follow the correct format?