Engineering Ethics Explorer

This document summarises content from the online Engineering Ethics Explorer from the Engineering Professors Council (EPC) and the Royal Academy of Engineering, intended to guide and support educators in delivering ethics training. For more see: engineeringethics.epc.ac.uk/

Why do engineering students need to be taught ethics?

The study of engineering ethics within an engineering course helps students prepare for their professional lives. A specific advantage for engineering students who learn about ethics is that they develop clarity in their understanding and thought about ethical issues and the practice in which they arise.

The study of ethics helps students to develop widely applicable skills in communication, reasoning and reflection. These skills enhance students' abilities and help them engage with other aspects of the engineering programme such as group work and work placements.

Where students are taught about ethics, they will:

- Understand the nature of professional responsibility
- Be able to identify the ethical elements in decisions
- Be able to address and resolve problems arising from questionable practice
- Develop critical thinking skills and professional judgement
- Understand practical difficulties of bringing about change
- Develop a professional ethical identity to carry forward in their working life

Why explore engineering ethics?

This resource is a guide for academics who are interested in teaching ethics to engineering students. It aims to help you see how ethics could be integrated into an undergraduate engineering curriculum. The content in the Explorer is subject to changes in context and should be customised to suit the various forms that an engineering degree can take. It is intended as a non-prescriptive resource – as a way of suggesting to educators how ethics might comprise a distinct theme in an engineering undergraduate degree. This Ethics Explorer is focused on the UK higher education context, but it may be adapted for use in other countries.

Get involved

"When I started to teach ethics, many years ago now, I felt alone. But today we are a community who help and support each other. Together we can make ethics in engineering the core of the way we teach and practice engineering. This is why I would like to invite you to join such a vibrant and inclusive community."

Raffaella Ocone, OBE FREng FRSE
Professor of Chemical Engineering
Institute of GeoEnergy Engineering
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Ethics learning landscape

This table illustrates how ethics could be introduced into the curriculum by providing guidance in four key areas:

- **Learning outcomes** illustrate suggested outcomes at different learning levels and demonstrate how students' abilities should progress throughout a degree programme.
- **Related accreditation criteria** are the requirements for course accreditation by the Engineering Council.
- The **Learning location** explains the focus of ethics teaching appropriate for each level of the undergraduate degree and indicates places where ethics may be usefully introduced at that level.
- **Graduate attributes** are the behaviours and characteristics that ethics education should instil in students.

This document complements The Royal Academy of Engineering and Engineering Council's Statement of Ethical Principles, available here: www.raeng.org.uk/policy/ethics/pdf/Statement_of_Ethical_Principles.pdf

	Learning outcomes	Related accreditation criteria	Learning location	Graduate attribute
1	Students will recognise ethical dilemmas in engineering. Students will identify the dilemma when presented with an ethical situation.	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.	Induction, Modules	Becoming Ethically Aware: determining that a single situation can be considered from a ethical point of view.
2	Students will identify ethical issues from the perspectives of a variety of stakeholders (client, manager, customer, user, etc.)	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.	Modules	Becoming Ethically Sensitive: being broadly cognizant of ethical issues and having the ability to see how these issues might affect others.
	Students will explain how different human and non-human stakeholders are affected by an ethical issue in engineering.	AHEP outcome 7: Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts.		
	Students will describe potential ethical dilemmas of engineering projects, processes, and products.	AHEP outcome 7: Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts. AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.		
3	Students will describe the components of the RAEng Statement of Ethical Principles and relate these to a particular engineering project. Students will apply a Code of Ethics to situations that involve engineers, their clients, and the public.	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.	Modules, Projects	Gaining Ethical Knowledge: knowing the sets of rules, theories, concepts, frameworks, and statements of duty, rights, or obligations that inform ethical attitudes, behaviours, and practices.
	Students will describe professional norms, principles, and responsibilities related to their chosen field.	AHEP outcome 17: Communicate effectively with technical and non-technical audiences.	Induction, Modules	
4	Students will analyse ethical dimensions and complexities of a professional situation.	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.	Modules, Projects, Placement Preparation	Practicing Ethical Analysis: engaging in a process by which ethical issues are defined, affected parties and consequences are identified, so that relevant moral principles can be applied to a situation in order to determine possible courses of action.
	Students will analyse the motivations, values, and arguments of stakeholders holding different positions in an ethical dilemma.	AHEP outcome 7: Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts. AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct. AHEP outcome 11: Recognise the responsibilities, benefits and importance of supporting equality, diversity and inclusion.		
	Students will analyse problems arising from questionable practice.	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct. AHEP outcome 9: Identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity.		
5	Students will apply ethical principles to the evaluation of strategies for resolving ethical issues.	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.	Modules, Placement Preparation	Practicing Ethical Reasoning: the application of critical analysis to specific events in order to evaluate and respond to problems in a fair and responsible way.
	Students will justify an ethical stance.	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct. AHEP outcome 17: Communicate effectively with technical and non-technical audiences.		
	Students will evaluate viable courses of actions or solutions in response to an ethical dilemma.	AHEP outcome 7: Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts. AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.	Modules, Projects, Placement Preparation	
6	Students will explain the potential consequences of possible solutions to an ethical dilemma.	AHEP outcome 7: Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts. AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.	Capstone Design or Research Projects, Advanced Modules	Engaging in Ethical Judgment: reaching moral decisions and providing the rationale for those decisions.
	Students will identify options for resolving an ethical dilemma.	AHEP outcome 17: Communicate effectively with technical and non-technical audiences. AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.		
7	Students will describe how their value systems inform and influence their professional practice.	AHEP outcome 17: Communicate effectively with technical and non-technical audiences.	Capstone Design or Research Projects, Advanced Modules, Placement Preparation	Becoming Ethically Motivated: committing to ethical action because of a moral judgment.
	Students will propose public policy relating to ethical questions in engineering.	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct. AHEP outcome 17: Communicate effectively with technical and non-technical audiences.		
	Students will advocate for an ethically justified course of action in response to a problem.	AHEP outcome 8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct. AHEP outcome 17: Communicate effectively with technical and non-technical audiences.		