Green
Industrial
Futures
Centre for Doctoral Training

EPSRC CDT in Green Industrial Futures

2024/25 Student Handbook

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1. Introduction

1.1. Welcome

Welcome to the Centre for Doctoral Training (CDT) in Green Industrial Futures!

Firstly, many congratulations on being awarded a place on the CDT. We are delighted to work with you to develop your research and professional career pathway.

This CDT is a new centre for doctoral research, funded by the Engineering and Physical Sciences Research Council, aimed to support the next generation of leaders and innovators to realise the green industrial revolution.

The CDT is a joint venture between four leading universities, Heriot-Watt University, Imperial College London, University of Bath and University of Sheffield. You will have access to a range of resources, facilities and leading academics from all four university partners, and we encourage you to make the most of this.

The premise behind the CDT programme is that whilst you are developing a deep expertise of your research area, you will also develop a broad understanding of how your research fits within the whole industrial system. The taught element will expand your knowledge on the key national and global levers & barriers for the net zero transition, e.g. policy, business models, environmental considerations, public acceptance, safety etc. This will not only give you the skills to generate real impact with your research outputs, driving change in industry, but also give you the skills and knowledge to pursue a career in technical, business or academic sectors.

This handbook gives an overview of the programme structure, logistics and administrative arrangement.

If, at any time, you wish to contact the Centre regarding any issues or queries, please do not hesitate to get in touch either with the Co-Directors (Profs. Marcelle McManus, John Andresen, Paul Fennell, Mohamed Pourkashanian) or myself, by emailing the CDT email inbox, cdtgreenindustrialfutures@hw.ac.uk .

I hope that you will find your time in the CDT programme to be a positive and stimulating experience and that it gives you a platform to drive the transition to net zero and make a meaningful impact on the world.

Professor Mercedes Maroto-Valer
CDT-GIF Director
EPSRC Centre for Doctoral Training in Green Industrial Futures

1.2. CDT Student Handbook

This handbook is a supplement to the postgraduate handbook provided by your university, providing information on the collaborative aspects of the CDT programme. Please refer to the links below for the process and procedures related to your own university.

- Heriot-Watt University
- Imperial College London
- University of Bath
- University of Sheffield

1.3. Equality, Diversity and Inclusion Statement

The CDT-GIF is committed to creating a positive and supportive community and environment for our students, supervisors and staff to thrive in. We recognise that to instil the principles of equality, diversity and inclusion into the centre, we must reflect this in all our processes and procedures. The CDT-GIF are currently in the process of establishing and implementing a comprehensive plan about how we embed these important principles in the operation of the CDT, ensuring these processes, including recruitment, flexibility in training, student support, training delivery and events, are inclusive and accessible for all. We also recognise that the CDT is developing the future leaders of industry and academia and we have a responsibility to provide our students with the knowledge and skills to encourage and support equity and inclusion in the workplace. The CDT will therefore provide training in EDI to all of our students.

The CDT-GIF plan for Equality, Diversity and Inclusion will be reviewed by EPSRC (Engineering and Physical Sciences Research Council) in early 2025 and when finalised will be publicly available on the CDT-GIF website.

2. Management, Governance & Key Contacts

2.1. Management Structure

The Management & Governance of the CDT is organised as outlined in Figure 1, with activity led by the Management Board and supported by the Central Team.

Figure 1: Management & Governance of the CDT

The members of the Management Board represent the university partners, and each Co-Director provides oversight for a specific area of activity.

Prof. Mercedes Maroto-Valer
CDT Director
Heriot-Watt University

Prof. John Andresen
CDT Co-Director
Heriot-Watt University
Admissions & Training

Prof. Paul Fennell
CDT Co-Director
Imperial
Impact & Knowledge Exchange

Prof. Marcelle McManus
CDT Co-Director
University of Bath
Academic Research

Prof. Mohamed Pourkashanian
CDT Co-Director
University of Sheffield
Industry Partnerships

The Central Team includes staff at the lead organisation (Heriot-Watt University) as well as staff at the other partner universities (Imperial College, University of Bath and University of Sheffield). During this initial phase of the CDT, staff are still being recruited to some of the roles and we also have some staff acting in an interim capacity. Details of the areas each of the staff members are supporting, is below.

Dr Clare Howard
CDT operations, including finance & legal

Dr Charlotte McLean
CDT training programme & students

Sophia Coe
University of Bath CDT Coordinator

2.2. Other Management & Governance Bodies

The Student Leadership Committee (student representatives) and the Academic Oversight Committee (leading academics in each university) provide guidance and input into the decision making process undertaken by the Management Board.

The Academic Oversight Committee consists of the Management Board, plus the following academic representatives. Each AOC member is the Research Theme Lead and will monitor research quality across the CDT's research portfolio and advise on cross-thematic collaboration.

Heriot-Watt University	Prof. Mijndert van der Spek
Imperial College London	Prof. Yannis Hardalupas
Imperial College London	Prof. Samuel Krevor
University of Bath	Prof. Linda Newnes
University of Bath	Prof. Lorraine Whitmarsh
University of Sheffield	Prof. Lin Ma
University of Sheffield	Prof. Karen Finney

The Independent Advisory Board consists of industrialists and independent academics, who will oversee progress and facilitate engagement with stakeholders.

2.3. Key points of contact

Your first point of contact for most queries should be your PhD supervisor(s) or postgraduate teams/support at your home university. Contacts for CDT specific queries are below:

Non research project related CDT queries:

1. Training and students (Charlotte Mclean) cdtgreenindustrialfutures@hw.ac.uk
2. Finance & legal (Clare Howard) cdtgreenindustrialfutures@hw.ac.uk
3. Bath University queries/Bath CDT Co-ordinator, Sophia Coe sc3716@bath.ac.uk

Academic and/or research project CDT queries (i.e. changes in circumstances, progression etc):

4. Heriot-Watt (Prof. John Andresen) J.Andresen@hw.ac.uk
5. Imperial (Prof. Paul Fennell) p.fennell@imperial.ac.uk
6. University of Bath (Prof. Marcelle McManus) mm291@bath.ac.uk
7. University of Sheffield m.pourkashanian@sheffield.ac.uk

3. Programme Structure – key information

The CDT-GIF is 4 year funded PhD programme funded by the Engineering and Physical Sciences Research Council (EPSRC) and industry partners. It differs from a standard 3.5 year PhD, allowing a significant taught element and professional development opportunities alongside the research project. In Figure 1 you will find an overview of the programme timeline. For more details and key dates, see Section 3.

Figure 1: CDT-GIF Programme Timeline

3.1. Registration/Enrolment

You must register at your 'Home University' – this is the university you will be primarily based at, where your lead supervisor is based at and who you received your offer letter from. Please refer to the documentation provided with your offer letter regarding the registration process. Online registration is not typically available until August/September.

If your home university is not Heriot-Watt University (HWU) then you will also be registered as a 'non-graduating student' at HWU. This is so all taught courses are recorded in one place. This will also ensure that students have access to online resources. You will need to apply to HWU to be put onto the system. This is for administrative purposes only. Please follow the following process:

- Visit https://www.hw.ac.uk/study/apply/uk/postgraduate.htm and click the 'Apply now' button.
- Click 'Create account' and fill in the 'Create Account' form. For the 'About your study' fields, please select the following:
    - Year of study – **2024**
    - Location - **Scotland, UK**
    - Academic level of study – **postgraduate research**
    - Programme – '**Green Industrial Futures PhD'**
- Once you have created an account, select 'Create a new application' and select 'Postgraduate Research', 'Edinburgh'.
- Fill the new application form in. Please use the following:
    - Programme – **'Green Industrial Futures, PhD'**
    - Enrolment – **'September 2024, Full-time'**
    - Funding – **'Other'**

- o Further or Higher Education **– DO NOT COMPLETE.**
- o Employment History **– DO NOT COMPLETE**
- o Research Project Information – **DO NOT COMPLETE**
  - Submit.

The HWU Central staff will then be able auto-enrol you as a 'non-graduating student'. You will need to bring two forms of ID to the HWU residential to be fully enrolled.

3.2. Before you start

The CDT is designed so that the taught modules are spread throughout Years 1 & 2 so that you are able to have a permanent base at your home organisation. If not already done so, you will need to identify permanent accommodation for yourself near to your home university.

Nearly all CDT-GIF modules are one-week or two-week intensive courses (known as "short & fat" courses, based at Heriot-Watt, Bath, Imperial or Sheffield. Accommodation is arranged by the CDT for all of the residential courses. Prior to attending these modules the Central Team will contact you regarding the accommodation and travel arrangements. Please refer to Sections 5 & 6, 'Residentials and International'.

3.3. The first few weeks

You will usually begin the course during October depending on your university and arrangements with your supervisor. The first few weeks is an important time, and you should:

- Receive IT equipment to satisfy the needs of your project. Your supervisor should arrange this and a desk space for you.
- Meet with your supervisor to discuss your research project and typically receive some initial reading.
- Meet with you supervisor to discuss your Personal Development Plan (see Section 7.2).
- Satisfy any registration requirements at your home university, e.g. induction activities.

4. Research

The research project forms the majority of your PhD qualification. You will start working on your research project from Day 1 and you will have up to four years to complete. Please bear in mind that the training programme will run concurrently and is estimated to take up approximately six months of this time.

Your research must involve 'knowledge creation'. This may be in the application of known techniques to solve new problems, developing new techniques that are applied to solve challenges, as well as fundamental work.

Your research is based within five thematic areas (although there may be overlap with another theme). Throughout the CDT there will be opportunities to work with students working within the same theme, as well as cross-thematically. Senior CDT academics lead each theme.

Carbon capture, utilisation & storage

Green hydrogen & sustainable fuels

Systems integration & resource efficiency

CO_2 removal technology

Integrated theme:

Social change, policy & net zero economics

Figure 2:CDT-GIF's five research themes

4.1. Planning

You should consider planning the project at least one year ahead, including deliverables, milestones and any plans for dissemination (e.g. conferences, research outputs, articles, etc. These plans should be agreed by your supervisors.

We strongly encourage the use of project management software and/or Gantt chart, where you can record and maintain a project plan. You may also consider undertaking a Theory of Change.

4.2. Research principles

It is very important to conduct research that is ethically and environmentally responsible. You will receive training on how to apply the principles of Trusted Research (TR), Responsible Research & Innovation (RRI) and Environmental Sustainability at the first residential at Heriot-Watt. The coursework associated with this residential course will allow you to apply and embed this training into your research from the outset.

UKRI definitions (www.ukri.org/manage-your-award/good-research-resource-hub/):

- **'Trusted research'** is a research and innovation sector term for protecting the UK's intellectual property, sensitive research, people and infrastructure from potential theft, manipulation and exploitation, including as a result of interference by hostile actors.
- **'Responsible research and innovation'** is a process that seeks to promote creativity and opportunities for science and innovation that are socially desirable and undertaken in the public interest. Responsible research and innovation acknowledges that innovation can raise questions and dilemmas, is often ambiguous in terms of purposes and motivations and unpredictable in terms of impacts, beneficial or otherwise. Responsible research and innovation creates spaces and processes to explore these aspects of innovation in an open, inclusive and timely way.

4.3. Progression

To progress through your PhD, you will undergo an annual appraisal process at your home university. Each university has different paperwork and procedures so please refer to your supervisor and/or home university for guidance. This process usually occurs at the end of Semester 2 (e.g. April/May/June). You will also have to complete the training courses to progress. This is an essential part of the CDT.

4.4. Thesis Submission

You should consult your academic supervisor and the regulations of your host university for thesis submission information.

4.5. Viva

The viva is an oral examination, part of the examination process for doctoral degree. The viva gives the examiners the opportunity to discuss your thesis in detail and it gives you an opportunity to defend your work, as well as to validate the thesis and demonstrate your skills in participating in academic discussion with research colleagues.

4.6. Dissemination

Knowledge is only useful if it is disseminated to others. Your research should be impactful. This can include both: (1) academic impact or (2) economic & societal impact. Throughout the programme, where possible (depending on commercial confidentiality), you will be strongly encouraged to present your work to external audiences (e.g. at conferences, to industry partners etc.) and/or publish in a refereed journal. Impact generated beyond academic spheres is defined by UKRI as "*the demonstrable contribution that excellent social and economic research has on society and the economy and its benefits to individuals, organisations or nations*".

4.7. Funder Acknowledgement

You should acknowledge the funding provided by the funding council in any publications or presentations in which you are contributing to.

The required format of the acknowledgement is as follows: 'This work was supported by the UKRI EPSRC Centre for Doctoral Training in Green Industrial Futures EP/Y03550X/1.

You may also have an industry partner that has sponsored your project. You should also acknowledge this funder if appropriate. See Section 9.

5. Taught and Professional Skills Courses

5.1. Taught courses

This is a 4-year PhD programme that incorporates a research thesis (480 credits), core & optional courses (120 credits) and a range of professional skills training (non-credit bearing). See the following tables for a description, delivery method, assessments and credits assigned to each course. Key dates for 2024/2025:

- **4-15 Nov 2024:** HWU Residential, 'Carbon Solutions'
- **3-14 Mar 2025**: Bath Residential, 'Whole Systems and Transformative Change'
- **25 Aug – 5 Sep 2025**: Imperial Residential, 'Business Model Innovation and Investor Pitching for Net Zero & Pilot-scale Carbon Capture Plant'
- **Oct/Nov 2025 (dates tbc):** Sheffield Residential, 'Pilot-Scale Facilities Practical Training At TERC'

Year 1 (Oct 24 – Sep 25)			
Semester	**Delivery**	**Summary**	**Credits**
Semester 1	Heriot Watt Residential (2 weeks)	**Sustainability & Carbon Solutions** This module will summarise the technologies for mitigating carbon dioxide emissions and removing carbon dioxide from the atmosphere. This will include topics associated with CO_2 gas separation, options for carbon storage, utilisation of carbon within products and processes, carbon mineralisation, low-carbon fuels, negative emission technologies, methods of carbon accounting, carbon foot printing. You will also undertake training in applying key research principles: environmental sustainability, Responsible Research & Innovation (RRI) and Trusted Research. **Assessment:** - XPrize Carbon Solutions Challenge (group presentation during residential) - Report ('Applying research principles to research project'). Submitted ~4 weeks after residential.	15 credits
Semester 2	University of Bath Residential (2 weeks)	**Whole Systems and Transformative Change** Throughout the course, you will delve into the principles of Life Cycle Assessment (LCA), understanding how to assess and minimize the environmental impacts of products and processes across their entire life cycle. We will also learn about the crucial role of behaviour change, exploring the psychological and sociological factors that influence individual and collective actions, paving the way for transformative change in industrial practices. Stakeholder and community engagement methods will also be introduced, equipping students with an understanding of socially responsible innovation and industrial development. **Assessment:** - Group Presentation (during residential)	15 credits
Semester 3	Imperial College Residential (1 of 2 weeks)	**Week 1: Business Model Innovation and Investor Pitching for Net Zero** This course will bring together industrial net zero policy, data economics, business model innovation, strategic investment decision making and investor pitching. The course will be posited Business Model Innovation engagement that will be co-developed with members of a prominent industrial cluster and culminate in a pitching exercise to investors. The role of strategic investment is under researched in the net zero ontology. We would bring together whole systems modelling, evolutionary and institutional economics to bridge the gap between energy scenario modelling and evolutionary & institutional economics in the context of net zero transitions to allow insights as to how strategic investment decisions are made – to fund business model propositions - and the consideration of risk and uncertainty in those decisions. **Assessment:** - Investor Pitch (during residential)	5 credits

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Semester 3	Imperial College Residential (1 of 2 weeks)	**Week 2: Pilot-scale Carbon Capture Plant** The course aims to familiarise the students with the complexities involved in operating a pilot scale plant (in this case for carbon capture and storage, though the learning is general). The Imperial College Pilot Plant is extremely well instrumented, and a significant part of the learning is hands-on, involving the development of understanding of measurement and control, and how these aspects interact with each other. This course acts to familiarise the students with pilot-scale plant operation, which will be extended for a larger set of different pilot plants e.g. Pilot-Scale Facilities Practical Training At TERC.	10 credits
		Assessment: - Group presentation (during residential)	
Semesters 1&2	Home university	Electives (see Section 4.2 and Appendix).	15 credits
Throughout Year 1	Online	**Portfolio 1** You will undertake training on how to convey research visually e.g. through academic posters. **Assessment:** Students will create and present a research poster. You will also participate in the Frontiers Forum (a biweekly journal club) aimed to spark multidisciplinary discussion and enquiry around all aspects of industrial decarbonisation, as well as invited speakers with a range of career pathways. **Assessment:** Participation only.	10 credits

Year 2 (Oct 25 – Sep 26)			
Semester 1	University of Sheffield Residential (1 week)	**Pilot-Scale Facilities Practical Training At TERC** This module will offer in-depth practical training and hands-on experience of operating large, pilot-scale facilities at the new national Translational Energy Research Centre at the University of Sheffield that meets the needs of both academic research and wider industrial stakeholders. With instruction on a range of energy systems and green energy solutions – including energy generation from a range of sustainable fuel sources, low-carbon energy vectors, the applications of carbon capture technologies, energy efficiency and power plant simulation – the module will deliver a comprehensive introduction to the operational activities of an industrially-focussed research facility. Students will also have a detailed knowledge of industrial health and safety practices, through adhering to these.	15 credits
		Assessment: - Participation (during residential) - Final report (submitted ~3-4 weeks after participation)	
Semester 2	Various (site visits) (1-2 weeks)	**Industry Challenge Project.** This course will give students an opportunity to work on and address an industry-set real-world challenge to better understand how the sponsoring companies contextualise research. Students will have the opportunity to visit an industrial site to better understand the challenges and barriers faced by	15 credits

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		industry to scale up and deploy decarbonisation projects (technical as well as wider considerations, e.g. social acceptance, skills & training, environmental). Following the site visit/s, students will apply learnings from their own research to address an industry-set challenge. Students will learn how to develop novel research ideas and entrepreneurial skills through the process of producing a project model canvas for a potential solution to this challenge. Using learnings from all taught modules, students will translate this canvas to a business case and present it to industrial challenge-setters and wider stakeholders. The key aim of this module is to ensure student's understand impact beyond publication of their own PhD research.	
		Assessment: - Participation (during residential) - Presentation (during residential) - Impact Pathways Report (submitted ~4 weeks after residential)	
Semester 3	International (various)	**International visit.** You will undertake international training e.g. US's National Carbon Capture Centre, ECCSEL. Access and training at these state-of-the-art facilities aims to bridge the gap between lab and demonstrator/pilot plant research and provide unique opportunities to enhance worldwide knowledge exchange and global partnerships. These opportunities also provide you with extensive exposure to industry-aligned partnerships, different stakeholder perspectives and contextualise the UK's global standing in industrial decarbonisation. There will also be alternative opportunities based in the UK.	Part of Portfolio 2
Throughout Year 2	Online	**Portfolio 2** You will build on learnings from Portfolio 1 around research communication, attending an online workshop on how to present with impact to expert and non-expert audiences. **Assessment**: Presentation of research at conference. You will also participate in the Frontiers Forum. Year 2 students will lead the forum, choosing material and chairing discussion. **Assessment:** Participation. International visit. See above. **Assessment:** Report: 'Global perspectives of industrial decarbonisation'.	20 credits

5.2. Optional courses

As part of your taught course programme, you will select one optional course which is delivered in person **at your home institution**. This course should be aligned to your research project, where appropriate. A list of the available options is outlined in the appendix. If there is a course available outside of the list that you are particularly interested in taking, this must be discussed with the CDT Co-Director for your institution (see Section 2.1). For Cohort 1, students may take the optional course in Year 1 or Semester 1 of Year 2.

5.3. Taught Course Attendance and Assessment

The assessments for each course are listed above. You should be spending approximately 25% of your overall work time in Years 1 & 2 on taught courses and coursework and 75% of your time on your research project. In Years 3 & 4, you will be spending nearly all of your work time on your research project and any associated research activities.

You will be awarded credit for any course for where you obtain at least 50%. Resit examinations may be necessary either to increase your credit-weighted average to at least 50%, or to obtain credit in any courses in which you have obtained below 50%. All students are offered standard reassessment opportunities, as determined by the institution delivering the course. Please consult your academic supervisor or the CDT Central Team if you need advice.

If you need an overview document of assessment marks at the end of the training programme for progression meetings, please contact the CDT-GIF Central Team.

5.4. Options for a non-standard taught course route

The taught-course programme provides a mechanism for broadening your exposure to subjects that may not be covered within your research project but are nonetheless important to providing you with a broad perspective of key topics in industrial decarbonisation. Not only this, but the time spent with other students during the taught-course programme plays a significant role in developing your professional network within the CDT cohort.

Options for a non-standard taught-course route may be available in **exceptional** cases for those CDT students who:

- Have a Master's degree which covers core modules from the programme.
- Are pursuing a project in the interface with another discipline.
- Are part-time.

CDT students who wish to discuss alternative taught courses should contact the Central Team via cdtgreenindustrialfutures@hw.ac.uk, to raise this. Agreement for this option comes under the remit of the Co-Director for Admissions & Training (Professor John Andresen).

5.5. Extension requests

Any requests for extensions to or exemptions from assessed work, whether for personal reasons (e.g. illness, family circumstances) or work-related reasons (e.g. requirements to attend statutory safety training), need authorisation at CDT level and/or from the course leader. Please email your

request, with a brief justification to cdtgreenindustrialfutures@hw.ac.uk. You may need to fill in additional paperwork and your supervisor will need to be informed of the request/decision.

5.6. Frontiers Forum

Students will participate in the Frontiers Forum as Portfolio 1 & 2. Students from across cohorts will come together in this fortnightly, student-led journal club, joining small groups online to critique material on a chosen net zero topic. This aims to build critical analysis skills, whilst giving students the opportunity to work together, and exchange and develop research ideas within research themes and across disciplines. We will also have invited speakers who will be leaders in their field and who will showcase their career pathways. Attendance at the Frontiers Forum is mandatory in the first two years and optional in Years 3 & 4. If you are unable to attend one or more of the forums for the reasons mentioned above in Section 4.5, please contact cdtgreenindustrialfutures@hw.ac.uk immediately so alternative arrangements can be made.

5.7. Professional Skills Courses

Throughout the four years, there will be a range of professional skills courses available to you. These will be delivered either online or during the residentials/annual conference. At the beginning of each year, the key dates for these courses will be provided. These courses/workshops may include: Equality and Diversity Awareness, Presenting with Impact, Responsible Research and Innovation (RRI), Trusted Research, Effective conference posters, Intellectual property, Commercialisation & Entrepreneurism, Proposal Writing.

For 2024/25:

- 1st Nov - Energy Trading Team Building (as part of HWU residential)
- 12th Nov – Responsible Research and Innovation (RRI) (as part of HWU residential)
- Date tbc – Writing a literature review (online)
- Date tbc - Equality, Diversity and Inclusion awareness training (online)
- Date tbc – Visual research presentation (online)

You will also have the opportunity to undertake skills courses within your home university:

- University of Bath Doctoral College
- Imperial College London Graduate School
- Heriot-Watt Research Futures
- University of Sheffield Academic Skills Centre

5.8. Resources

Any pre-reading materials intended for the residential modules will be sent to you via email in the first instance, although it is intended for a password-protected student webpage to be set-up on our new CDT-GIF website (due to be launched).

6. Research & Training Budgets

6.1. CDT-GIF Financial Arrangements

CDT-GIF is funded by Engineering and Physical Sciences Research Council (EPSRC), plus contributions from the four university partners and industry partners. Your PhD is funded by a combination of these. The majority of CDT-GIF projects have a sponsoring project partner that fund ~50% of the project and training costs. Some projects are funded directly by their home university or CDT.

6.2. Stipend

Stipends are paid to you by your home university. Stipends will increase every year in line with UKRI guidance. You will receive notification of this increase in April/May from the CDT.

Your stipend will cover a period of up to 48 months full time or up to 96 months part-time (50% FTE). However, if you submit your thesis before 48 months (full-time), funding will stop at the end of the financial quarter in which you submit, e.g. March, June, September, December.

6.3. Research budget

Each student has access to a budget to cover their research (e.g. equipment, consumables, training courses), and travel and subsistence budget (e.g. for attending conferences, training workshops, travel to/from industry partner, work placements).

Crucially, this budget also covers the cost of travel to/from training residentials. Accommodation at residentials is organised and funded by the CDT.

Please note there are strict rules for travel and subsistence expenses. You will need to follow your home organisation's policy. If there are any expenses above £1000, you will need to declare this to the CDT via the CDT coordinator based at your home institution.

7. Student Support

7.1. Supervision

The person who is directly responsible for you as a postgraduate student is your lead supervisor based at your home university. Supervisors play a fundamental role in supporting research students throughout their project, in terms of research, personal development and pastoral care. It is important that you maintain regular contact with your supervisors. Although it is project dependent, we would encourage some form of correspondence with your supervisor at least every 2 weeks.

Your lead supervisor is your first point of contact for any issues that arise throughout your programme. If there are challenges in raising issues to your supervisor, students should see section **Error! Reference source not found.**.

7.2. Personal Development Plan (PDP)

Within the first month, you should discuss and complete your personal development plan (PDP). Some universities will require this as standard. Please complete the PDP issued from your home university. However, if your home organisation has not issued a PDP template, please contact the CDT Central Team and we will send you the CDT PDP template.

You should review the PDP regularly (every 6 months) with your supervisor. You should also update your PDP every year.

7.3. Student Wellbeing Services

Your health and wellbeing are important when undertaking a PhD to ensure balance. There are a wide range of services at your home university that will be able to support you. Please reach out the relevant services: they are there to help you.

If at any time you require additional support or letter to access more support, the CDT Central Team and other points of contact are here to help you (see list in next section).

- Heriot Watt University
- Imperial College London
- University of Bath
- University of Sheffield

7.4. Changes of circumstances

We understand that during your time on the programme you may find your circumstances change. Please contact the CDT Admin Team if your circumstances change, so that we can record this and provide support as required.

7.5. Annual leave

Studying for a PhD requires can, at times, be challenging and it is important that you take your annual leave entitlement for your well-being. You are responsible for agreeing your proposed leave arrangements with your supervisors and providing your supervisors with sufficient advance notice of planned absences. Please follow your home university's procedures for declaring any annual leave. If you are on a student visa, you should check with your home university if you are planning on leaving the UK during annual leave to ensure adherence to visa rules.

7.6. Medical leave

If you are ill, injured or for any reason, you should let your supervisor know as soon as possible. If you are unable to do this (e.g. supervisor on leave, not contactable), please let the CDT Central Team know.

Please follow your home university's guidance on reporting medical leave absences. For example, typically if you are prevented from working because of illness or injury for more than eight days, you will be required to submit a medical certificate.

If medical leave prevents you from attending one or more of the residential courses, please email the CDT Central Team and submit a medical certificate as soon as possible.

## 7.7. Maternity, Paternity, Adoption and Parental Leave

Each CDT students funding comes from up to two of three routes; EPSRC funding, home institution funding and/or industry funding). The maternity, paternity and parental leave and associated stipend available to each student (and the processes for requesting any suspension of studies needed) will be subject to the rules of their home institution and/or where relevant EPSRC funding. Students can request information in relation to their funding allocation from cdtgreenindustrialfutures@hw.ac.uk to understand their entitlements further. The CDT seeks to ensure that its students receive the same level of leave and stipend across its four universities and funding allocations. Entitlement for EPSRC funded (or pro-rated for part EPSRC funded) are as follows:

EPSRC funded students are entitled to 52 weeks of maternity or shared parental leave. The first 26 weeks should be paid at full stipend rate, pro-rated as necessary for part time students. The following 13 weeks should be paid at a level commensurate with statutory maternity pay. The final 13 weeks are not paid. Partners are entitled to up to 10 days paid Ordinary Paternity Leave on full stipend. Partners may be entitled to up to 50 weeks of Shared Parental Leave; this may include paid and unpaid leave, depending on the individual circumstances, any paid leave should be at full stipend. Adoption leave should be granted on the same basis as maternity leave. There is no qualifying period for maternity, paternity, adoption or shared parental leave.

It is the duty of the student to inform their supervisor if they are pregnant, in good time, in accordance with the relevant host university guidance. In addition, where additional risk assessments have been undertaken to allow the necessary research to take place, it is important to inform your supervisor as soon as possible to enable updated risk assessments to be conducted.

7.8. Raising a concern

If you would like to raise a concern about a specific aspect of the programme, you should first contact your supervisor. They are often the best person to provide advice and guidance. If students do not wish to contact their supervisor, students may also raise concerns with the CDT-GIF Co-Director based at their university (see section **Error! Reference source not found.**3) for academic concerns, or through cdtgreenindustrialfutures@hw.ac.uk for non-academic concerns.
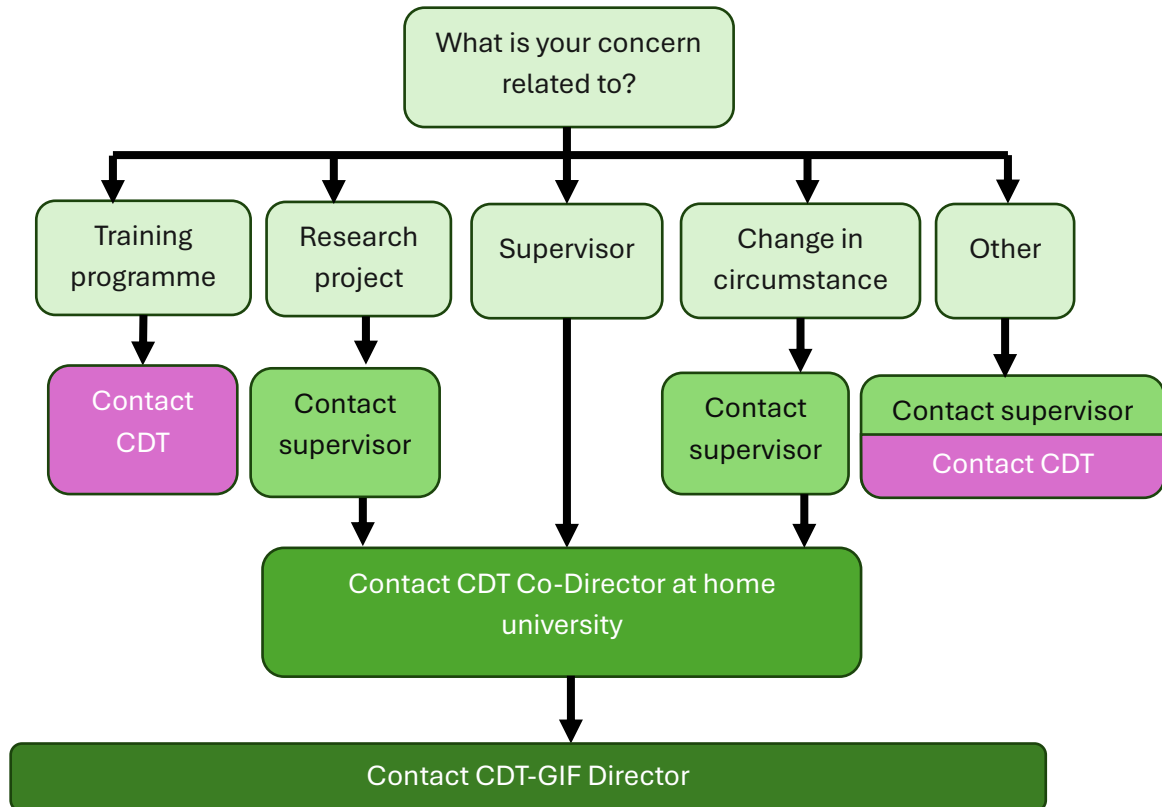
7.9. Complaints

If for whatever reason, your concern could not be resolved and you wish to make a formal complaint, you should proceed through your home university's complaints system where you are registered. Complaints will be taken extremely seriously and handled with care. Depending on the nature of the complaint, the university may alert the CDT Central Team and/or CDT Director. Each university agrees to co-operate and to take reasonable steps to address any student complaint that is received.

For more information about your home university's complaints procedure:

5. Heriot Watt
6. Imperial
7. University of Bath
8. University of Sheffield

7.10. Suspension of Studies

During the period of your studies, you may need to take some time off for personal reasons (not annual leave). If you require to do this, you should apply for a Voluntary Suspension of Studies from your home university. If you are taking time off for health reasons, you should include a letter from your healthcare professional with the request to your home university and your stipend will continue for up to 13 weeks (see Section 7.6). Please refer to your home university's student PGR handbook for full details of this process. If your suspension of studies is approved, your stipend may be paused and the time you take off will be added to the end of your studies.

You may also want to suspend your studies to undertake a work placement with your sponsoring industry partner or an external organisation (see also Section 9.2). If you are in the UK on a student visa, there are some conditions associated with this, including number of hours worked per week) so you may not be able to do so. Please contact your home university and the CDT at cdtgreenindustrialfutures@hw.ac.uk to ensure all visa guidance is adhered to.

If you require a letter from the CDT to endorse your application for VSS, then please contact the CDT Central Team.

7.11. Early Exit Qualification

If you are considering leaving the programme, please discuss with your supervisors or contact the CDT Central Team. There may be some support that we can provide before making the decision.

If you decide to leave the programme, you may be eligible to leave with an exit qualification. The exit qualification you would be eligible for depends on how many courses and how much of the research project you have completed.

Please be aware that there may be financial consequences if you leave the programme early, for example in relation to stipend. Please refer to your host universities rules in the first instance and raise any queries with cdtgreenindustrialfutures@hw.ac.uk .

8. Student Community

8.1. Mentoring

In the first two years of the programme, you will be offered a peer-to-peer mentor (a fellow PhD student based at your home university). More details will follow.

In your 3rd and 4th year, you will be offered the opportunity to be a mentor for CDT students in their first year. This will broaden your experience as a postgraduate researcher.

8.2. Team Building

The CDT-GIF is a new centre, and we aim to build a thriving community of student researchers. The CDT has committed to ensuring each cohort integrates in the first two years of the programme.

Throughout this programme, there will be plenty of opportunities to connect with other CDT students and build your professional network. The first cohort building activity is on 1st November before the HWU residential, where you will take part in a 'Power Trader' Games, an interactive workshop where you will be in charge of your own energy company. We will also be organising a number of other activities/socials during the residential courses.

8.3. CDT-GIF Annual Student Conference

A short student-led mini conference will be held each year, usually in June, which will give you the opportunity to hear about the work of other students within CDT-GIF, including collaborating within and outside of the five research themes.

First year students present posters describing the background to their project; second and third years give an oral presentation on their research project.

The conference is optional for fourth years. The conference also includes a social event.

8.4. CDT-GIF Website

The current CDT-GIF website is a placeholder and will be replaced by a more functional website that will include a password-protected student space. You will receive further information when the website is launched in 2025.

8.5. Student Leadership Committee

The Student Leadership Committee (SLC) will be a student-led committee consisting of two student representatives at each university from different cohorts (up to 8 students in total). Peer-nominated students will be invited to apply to the position and elected by the CDT students. Each SLC term lasts two years. To ensure the student voice is at the centre of decision-making the chair of the SLC will regularly attend Management Board meetings (where appropriate and relevant for the student) to present arising challenges or opportunities raised by students.

The first students will be selected during the first HWU residential.

8.6. Feedback

If you have any questions or feedback you wish to share on any aspect relating to the CDT, please contact your supervisors or the CDT Central Team at cdtgreenindustrialfutures@hw.ac.uk. Contact details can be found in Section 2.

You can also get in contact with your student representatives in the 'Student Liaison Committee' (Section 2) who will take your feedback to Management Board.

CDT-GIF students are also requested to complete anonymous online feedback forms by the CDT for all the taught courses. This feedback will be reviewed by the Central Team and any issues will be raised and appropriate action taken.

9. Working with Industry

9.1. Industry sponsor/partner agreement

If your project is sponsored by an industry partner, then a studentship agreement must be signed by the CDT student, the industry partner and the home university. The foreground Intellectual Property (IP) should be discussed and agreed by all parties taking into account the specific needs or requests from the industry sponsor and/or university regarding individual project

requirements. You must comply with any studentship/industry partnership agreements you may have within your host institution. This may include timelines for sharing proposed papers with industry partners. You may need to acknowledge the co-funder / industry partner where appropriate and agreed with industry partners.

9.2. Work placements

An industrial work placement is strongly encouraged but not compulsory. Available work placements will be communicated to the students and a student will be selected depending on the credentials and expertise the employer is seeking. In some instances, the work placement will be with the sponsoring industry partner so this will be a more organic arrangement between student and sponsor.

We would strongly recommend work placements take place between the end of Year 2 and the beginning of Year 4. If a student is considering a placement >1 month then they would be asked to take a TSS and suspend their studies (see Section 7.10). This would ensure that they don't miss out on any time to do their PhD as a result of the placement. We would advise a duration of ~3 months is optimal, but work placements should not be longer than 6 months. For international students, a maximum duration limit for work placement will be 2 months and the placement will have to be undertaken <50% part-time to adhere to visa regulation. For international students we will follow all of the necessary visa regulation in close communication with visa teams in each of the home university – these will be dealt with on a case-by-case basis.

Where reasonable, the Research Training and Support Grant should be used to support travel and subsidence when required. If stipends are suspended, typically the industry partner will cover the costs through their CDT membership.

10. Standards

10.1. Code of practice

You are required to abide by the regulations of your home university and conform with its policies, procedures, ordinances and regulations. See below for full details.

- Heriot Watt PGR Code of Practice.
- Imperial
- University of Bath
- University of Sheffield Code of Practice

10.2. Code of conduct

In order to ensure a safe and secure student environment, the CDT-GIF expects all students to conduct themselves in a manner that:

- Demonstrates respect for staff, external representatives, fellow students, University property, external property and facilities.
- Enhances the reputation of the CDT-GIF and their home university.
- Is sensitive to a culturally diverse environment.

- Demonstrates active engagement in the learning process, a commitment to postgraduate research and the CDT-GIF programme, and determination to succeed.

These principles will apply at all times, but particularly during residential courses, site visits and international trips, where you will be expected to represent the CDT-GIF and your home university. Students must adhere to their home university's code of conduct and behaviour policy. The CDT-GIF will take code of conduct violations very seriously and will follow the relevant student discipline policy based at the students home university.

10.3. Hours of work

The 48 months funding (full-time) provided assumes students will work on average 40 hours per week, including responsibilities for the taught elements of the programme.

11. Appendix

Optional Taught Courses

Heriot Watt	
Foundations of Energy	Students will receive an overview of current energy production and consumption, extraction and conversion technologies, environmental impact of energy consumption, policies, and current energy debates and will provide them with fundamental skills to analyse energy systems quantitatively. **Assessment:** Exam (70%) and Coursework (30%) **Delivered in:** Semester 1
Renewable Energy Technologies	Students will receive an overview over Renewable Energy resources and will be introduced to current and emerging technologies to exploit Renewable Energy resources. Students will be introduced to available or projected technologies for generation of electricity or to satisfy primary energy demand from renewable resources and to place these technologies in context with environmental, political and economic constraints. **Assessment:** Coursework (100%) **Delivered in:** Semester 1
Imperial	
For details of the assessments on Imperial optional courses, please refer to the Department of Chemical Engineering.	
Carbon capture and clean fossil fuels	Students taking this course will be able: - To understand how the environmental impacts of fossil fuels in general can be minimised - To understand how syngas can be generated and used - To understand issues relating to industrial CCS - Understand how a range of technologies, including more advanced power cycles can minimise the costs of CO2 avoidance. - To understand CO2 capture from a range of processes, including how efficiency drops for power stations are calculated - To understand CO2 storage - To consider issues of media reporting of CCS - To understand the wider picture of energy production **Assessment:** **Delivered in:**

Subsurface Energy Technologies	In this module, students will learn about the role of subsurface geoscience and engineering in recent, current, and emerging energy technology. We will study the current and anticipated role of subsurface energy technologies in national, regional, and global decarbonisation plans and evaluate key manifestations of the issues of geology, geomechanics, and fluid dynamics central to subsurface energy technologies: Carbon capture and storage, geothermal energy, and subsurface hydrogen storage. **Assessment:** **Delivered in:**
University of Bath	
Professional and research skills	Learn how to address the ethical dilemmas that come with integrating AI/ML in engineering practice and research such as those relating to data protection, cybersecurity, and regulatory frameworks. You'll further develop professional skills to help your employability such as career planning, commercial awareness, leadership, and effective communication. Working with an academic will help you develop your research proposal for dissertation. **Assessment:** **Delivery in**: Semester 1 & 2
Leadership and professional skills development	Develop the leadership skills you need for a successful career in engineering and technology organisations. You will gain a solid grounding in key transferable and professional skills and get the chance to practise them. Working individually and in groups, You will learn how to work effectively in diverse teams, enhance your communication skills and develop your problem-solving ability. **Assessment:** Presentation (50%), PDP (30%), Individual exercises (10%), Group exercises (10%) **Delivery in**: Semester 1 & 2
Managing engineering and technology organisations	Develop a solid grounding in key managerial disciplines like strategy, marketing, finance, human resources and decision-making. You will apply management practices to business scenarios, assess current practice and make recommendations for a sustainable future. Working individually and in teams, you'll develop your analytical and presentation skills by exploring the operational performance of complex engineering- or technology-driven organisations. **Assessment:** Presentation (40%), Exam (60%) **Delivery in**: Semester 1
Operations and supply chain management	Address key operations and supply chain management decisions faced by organisations, with emphasis on the engineering business context. This unit will equip you with the tools and techniques to design, analyse and improve business processes and supply chain operations. You'll make use of a balance of academic theory and practical content activities such as case studies, guest lectures, classroom games and industry-based examples. **Assessment:** Report (50%), Exam (50%) **Delivery in**: Semester 2
Digital transformation: project and change management	Explore how project and organisational change management enable digital transformation. You'll learn fundamental theoretical models and practical strategies in project and change management. You'll discover how AI can support at all stages of managing an engineering project, while considering any ethical implications. A combination of theoretical learning and practical sessions will help you develop the skills and knowledge needed to excel in this evolving field. **Assessment:** **Delivery in**: Semester 1 & 2
AI and sustainable development	Explore how to use AI to tackle sustainability issues in key areas such as energy, environmental pollution, circular economy, and decarbonisation. Through theoretical lectures, discussions, and group projects, you'll learn how to apply

	the transformative power of AI to complex global challenges while considering ethical, societal, and economic implications. **Assessment:** Presentation (30%), Coursework (70%) **Delivery in**: Semester 2
Advanced numerical methods	Study advanced algorithms and methods for AI and ML and apply them effectively to enhance creative design, creative problem solving, engineering processes, decision making and innovation. Explore topics such as data mining, modelling and optimisation. **Assessment:** Coursework (50%), Numerical methods test (50%) **Delivery in**: Semester 2
Automation, manufacturing, and design	Explore how automation, digital design and manufacturing are driving change to more efficient and sustainable processes. You'll learn about the roles of big data, digital twins, internet of things, and internet 5.0, and more. Working in groups, you'll develop ML models, train, and validate them using data you've collected. You'll run and evaluate your model to identify ways to improve its resilience. **Assessment:** Coursework (100%) **Delivery in**: Semester 2
Science based decision making	Develop a principled approach to make sound evidence-based decisions that inform sustainable product development and environmental activities in an organisation. Using a variety of qualitative and quantitative methods, you'll objectively appraise the impacts of carbon reduction interventions. You'll also explore the 'cradle-to-grave' journey of a product and its potential social, economic, political, and climate impact. And you'll learn how to report and communicate results to decision makers. **Assessment:** Exam (100%) **Delivery in**: Semester 2
Professional skills for climate leadership	Develop the interpersonal skills required to lead climate initiatives. Working in teams, you'll develop collaborative skills such as teamwork, influencing, negotiation, mentoring and networking. You will also develop personal competencies such as reflection, and the awareness of the emotional impacts of climate change on yourself and others. Finally, you'll explore the potential of diversity and the dangers of unconscious bias. **Assessment:** Individual reflection (70%), Peer Evaluation (30%) **Delivery in**: Semester 1 & 2
Organisational change management	Combine organisational and behavioural change theory with a hands-on approach to developing skills in communication and stakeholder management. This will prepare you to effect action through influencing and changing others' behaviour at both individual and organisational levels. **Assessment:** Coursework (50%), In-class assessment (50%) **Delivery in:** Semester 1
Project management for decarbonisation	Explore the strong approach organisations are taking to reduce their carbon footprint and reach net zero. This involves project management, risk management, governance, and reporting. You'll learn about project management in the context of sustainability within an organisation. You'll also practise using techniques and tools to help organisations mitigate and adapt to the effects of climate change. **Assessment:** Coursework (50%), In-class assessment (50%) **Delivery in**: Semester 1 & 2
Project and change management	Develop your skills in managing projects in engineering and technology organisations, including those that involve organisational change. You'll enhance your appreciation of how project management fits into a wider context including strategic management, contemporary engineering practice and organisational factors **Assessment:** Report (50%), Exam (50%) **Delivery in**: Semester 1

University of Sheffield	
For details of the assessments on UoS optional courses, please refer to the UoS School of Mechanical, Aerospace and Civil Engineering.	
Professional Development Portfolio	This module is designed to build your skills for graduate-level study and life beyond your degree as an agile learner and professionally responsible engineer committed to your ongoing development. You will: (a) acquire and develop professional skills, such as communication, collaboration, information management and research skills (b) have an opportunity to practise and build your creative and practical skills (c) explore the professional responsibilities of an engineer. In addition, the module provides space for you to reflect on and build your profile by undertaking supported independent professional development in an area you choose based on your career plans beyond your degree. **Delivery in**: Semester 1&2
Managing Innovation and Change in Engineering Contexts	This module introduces you to the importance of innovation in manufacturing and service organisations whose primary business activity is engineering and/or technology. Innovation management is introduced as the thoughtful combination of new product/process development and change management. Through case studies, theoretical frameworks, and tools you will come to understand innovation at multiple scales: international, national, regional, organisational and team, with particular emphasis on how organisations manage and exploit the commercial risks and opportunities inherent in innovation, and how project teams and engineers can respond to innovation challenges effectively. The module is aimed at engineering students of any discipline.
Industrial Applications of Finite Element Analysis	The module aims to provide students with a thorough understanding of the principles of finite element modelling and its application to solve industrial engineering problems. A set of industry-relevant problems will be provided to students along with experimental results for model validation. Students will be allocated one of their preferred projects and will have to devise a modelling strategy to solve their particular problem. Knowledge will be drawn from lectures introducing the theory behind finite element modelling of dynamic problems for modal and transient analyses, non-linear problems including contact, material behaviour and large deformation as well as fracture. (For Mechanical Engineers). **Delivery in**: Semester 1
Fundamentals and Applications of Tribology	Many practicing engineers use tribology regularly without a true understanding of its importance and its role in engineering design. This module introduces fundamental science that explains surface phenomena of wear, friction and lubrication. Students learn through industrial case studies, techniques to assess a range of engineering and machine contacts, from bearings to hip joints and banana skins! Theoretical and practical techniques will cover contact mechanics, friction, wear and lubricant films in hydrodynamic and elasto-hydrodynamic lubrication regimes. Students will learn to evaluate failure mechanisms and compare key design features that can be used to diagnose failure as well as improve design. (For Mechanical Engineers). **Delivery in**: Semester 1
Advanced Engineering Fluid Dynamics	The module introduces advanced subjects in fluid mechanics and focuses on the theory and applications of the fundamental physical laws governing fluid flows. The Navier-Stokes and the continuity equations are revisited and the energy and the general Scalar Transport Equations for fluid flows will be derived. Creeping flows, laminar/turbulent boundary layer flows, shock and expansion waves, drag rise and supersonic aerofoils, etc. will be discussed. A key skill developed is problem solving in the area of advanced fluid mechanics

	through how equations, models and boundary conditions may be adapted and simplified to describe a wide variety of engineering fluid flows. **Delivery in**: Semester 1
Advanced Energy and Power	This module will introduce students to the rapidly changing landscape of conventional power generation. The course will provide a greater depth and range of specialist knowledge for advanced plant design for the future including carbon capture. This will provide a foundation for leadership and a wider appreciation of future conventional power station design. Students will become knowledgeable in the sources of pollutants and mitigation techniques employed by the industry and a wider appreciation of social and environmental considerations. The course will permit the students to engage in fundamental design of key components in power generation (burners, boilers) as well as in the simulation of carbon capture plant. **Delivery in**: Semester 2
Advanced Dynamics	In this module we will explore how linear/nonlinear structures vibrate and how we can model them in order to understand and optimise their complex behaviour both analytically and numerically. We will uncover the behaviour of theoretical nonlinear models and we will explore and evaluate the fascinating world of advanced dynamics, random vibration, nonlinear systems and chaos through lectures and dedicated reading. We link advanced engineering with concepts from physics and maths that are of core importance in the new era of engineering, considering structures from light aerospace structures to offshore wind turbines and space shuttles. Furthermore, we will discover the world of Hamiltonian mechanics by capturing its fundamental physics. The learning will be supported by dedicated tutorial sessions. **Delivery in**: Semester 1
Additive Manufacturing – Principles and Applications	This module will provide you with a comprehensive introduction to Additive Manufacturing (3D Printing), providing you with an insight into the technologies themselves, when and how they might be applied, and the broader economic, social and industrial context within which these techniques sit. Our aim is to provide you with an understanding of the underlying principles and considerations relevant to this area, so that you are able to apply this knowledge confidently and effectively during your future career. **Delivery in**: Semester 1
Mechanics and applications of advanced manufacturing technologies	In this course students are introduced to advanced conventional manufacturing processes including sheet/bulk metal forming and Machining operations and the relevant mechanics of the processes and materials deformation. Analytical modelling techniques are also introduced and their applications are explained in order to determine the deformation of materials under the applied loads. Fundamentals of deformation and relevant force calculations together with mechanics of machining in metallic materials will be covered as the secondary manufacturing operations. The module provides a greater range and depth of knowledge related to the deformation of materials and process analysis in primary and secondary manufacturing operations using theoretical and experimental learning methods. The students will be equipped with tools to analyse and design manufacturing operations utilising various manufacturing methods within a wider engineering context. **Delivery in**: Semester 1
Human Factors and User-centred Design	The module is designed to give students an introduction to human factors and user-centred design and how they are used within the design process (alongside engineering analysis, manufacturing considerations, marketing etc.). The module concentrates on developing an understanding of how populations are characterised and how that influences design decisions. It gives an overview of the theory and practices surrounding design with humans before asking students to apply those theories in a series of case studies. The

	module gives students an opportunity to work within a team and learn from peers as they tackle the case studies. **Delivery in**: Semester 2
Engineering Commercial Success: And making the world a better place!	Students work in interdisciplinary teams to create solutions to a real problem provided by a real customer. Typically the customer will be a member or members of the community e.g. children with disabilities, terminally ill people, etc. Student teams learn how to solicit needs from user interviews and go on to create (and where possible prototype) solutions that meet functional, commercial and social requirements. Teams pitch their concept and business start up proposals to an invited audience and assessors. **Delivery in**: Semester 1
Advanced Aerospace Propulsion Technology	This module enhances students' foundational knowledge by introducing a more specialist Level 7 understanding of major aero propulsion devices. For example, the rocket design will be mastered from the design lessons and innovations of the rockets of historical importance. The more in depth analysis of the alternative air breathing engines such as ramjet, scramjet, and synergistic air-breathing rocket engine will be investigated. Then the advanced gas turbine off-design performance will be analysed. The advanced gas turbine combustion will also be investigated. Finally, the recent explosive development of electric/hybrid propulsion and aircraft will be examined.
Strategic Engineering Management and Business Practices	This module aims to provide fundamentals of what strategy is and distinguish it from activities, tactics and goals of an organisation. It explains its important role in the continual success of organisations. It also introduces how strategy can be translated into business practices, methods, procedures to achieve the goals of an organisation's strategy. The module is designed to develop your analytical and critical skills in the strategic management issues facing engineering organisations in today's fast-changing environment. It is a unique opportunity for you to equip yourself with the essential industry-relevant skills to excel as a future leader.
Experiments and Valid Computer Models	You will undertake three experiments and compare results with analytical solutions obtained using appropriate theories and software. The experiments will be performed on different established areas of mechanical engineering such as: thermofluids, solids and dynamics. The experiments are similar to those carried out by practising engineers and therefore provide experience of the challenges in acquiring meaningful results and the issues involved in producing a useful theoretical model. You will be required to produce three full laboratory reports. (For Mechanical Engineers)