Engineering Design at Bristol

bristol.ac.uk/study/undergraduate/2020/engineering-design/
Design is at the heart of the engineering curriculum

- We are the School of Civil, Aero and Mechanical Engineering (CAME)
- We are part of the Faculty of Engineering
- Engineering Design is a multi-disciplinary, in-depth programme
- Developed to deliver high-calibre engineers who can lead complex engineering projects that are vital to modern society.
What is engineering design?

-engineering design is a value-added activity
-engineering design is an iterative process
-engineering design process is front end engineering design
-engineering design is software engineering is design
-the engineering design process is quizlet
-is engineering design a major
Figure 1
Traditional Point-Based Approaches to Product Development

Point-Based Serial Engineering
Styling → Marketing → Body → Chassis → Manufacturing

Point-Based Concurrent Engineering Styling
Design Solution (Styling) → Analyze and Critique → Modify → Marketing → Body → Chassis → Manufacturing
What is engineering design?
Why design is important in engineering
Integrated Masters (MEng) Degrees

- SCIENCE & MATHEMATICS
- ENGINEERING ANALYSIS
- DESIGN
- ECONOMIC, LEGAL, SOCIAL, ETHICAL & ENVIRONMENTAL CONTEXT
- ENGINEERING PRACTICE
- ADDITIONAL GENERAL SKILLS
Integrated Masters (MEng) Degrees

- SCIENCE & MATHEMATICS
- ENGINEERING ANALYSIS
- DESIGN
- ECONOMIC, LEGAL, SOCIAL, ETHICAL & ENVIRONMENTAL CONTEXT
- ENGINEERING PRACTICE
- ADDITIONAL GENERAL SKILLS
Design at this level is the creation and development of an economically viable product, process or system to meet a defined need.

It involves significant technical and intellectual challenges and can be used to integrate all engineering understanding, knowledge and skills to the solution of real and complex problems.
# Your first year - the Engineering Design programme 2020

<table>
<thead>
<tr>
<th>Course</th>
<th>Modules</th>
</tr>
</thead>
</table>
| **Engineering Mathematics 1 (EMAT10100)** | - Algebra  
- Matrices  
- Analysis  
- Calculus  
- Differential Equations  
- Probability |
| **Fluids 1 (AENG11101)** | - Fluid statics  
- Control volume analysis  
- Eulerian & Lagrangian approaches  
- Turbulence & separation  
- Similarity & dimensional analysis  
- Bernoulli's equation |
| **ThermoDynamics 1 (MENG11202)** | - First and second laws of thermodynamics  
- Principles in analysis of equipment and machines  
- Enthalpy |
| **Materials 1 (MENG11100)** | - Properties of Materials  
- Material Selection  
- Mechanics of Materials  
- Stress and strain  
- Linear elastic problems |
| **Dynamics of Rigid Bodies (MENG10201)** | - Linear motion of particles and rigid bodies  
- Physical principles of force, momentum and energy  
- Vector notation  
- The principles of kinematics |
| **Design and Computing 1 (CENG16300)** | - Computer programming/AutoCAD  
- Using Matlab environment to model engineering systems  
- Civil Engineering construction drawing  
- Socio, economic and environmental considerations |
| **Application of Electronics (EENG16200)** | - Analogue and digital electronic systems  
- Electrical/electronic sensors and actuators  
- Understanding of electrical power |
| **Electrical Systems Engineering (EENG17300)** | - Basic concepts of electrical engineering  
- High power networks to micro-control systems  
- High level approach in order to highlight the diversity of Electrical & Electronic Engineering disciplines |

bristol.ac.uk
Your first year - the Engineering Design programme 2020

Design Project 1 (CENG10008)

- CAD (Fusion 360/Inventor)
- Understanding of mechanical devices and mechanisms
- Introduction to the design process
- Presenting concepts and producing manufacturing drawings
- Manufacturing processes
Your first year - the Engineering Design programme 2020

2020

Design Project 1
(CENG10008)

- Building individual competencies/confidence
- Introduction to:
  - CAD
  - Technical drawing
  - Design processes
  - Creativity
  - Mechanisms
  - Real world problems
  - Manufacturing

2021

Design Project 2
(CENG20015)

- Design tools/techniques
- Team working/management
- Design trade/off compromise
- Prototyping/testing
- Product realisation/evaluation and reflection

2022

Industrial Placement
(CENG30011)

- Methods of design and analysis in practice
- Good working knowledge of technical specialisations
- Develop skills in design optimisation
- Improve competence in oral/written presentations and report writing
- Improve team working/management

2023

Design Project 4 (CENG40058)

- In-depth understanding of a product or system through research and modelling activities
- Development of expertise in a subject area
- Detailed investigation of an artifact, process or sub-system
- Economic, environmental, business and social design drivers
- Development of analytical and/or physical models to quantify design parameters and understand manufacturing implications

2024

Design Project 5 (CENG40059)

- Undertake a significant multidisciplinary engineering design project
- Design and development of a virtual or physical model/protype of a product or system
- Projects encompass both technical and commercial aspects and require the students to integrate and apply the specialist knowledge gained through Design Project 4
- Run in association with industrial partners and University research

Foundations/development and application of broad skills & knowledge

Application in practice/interpersonal skills

Specialisation/expertise and depth of knowledge

Sponsored by Industrial partners
Your first year - the Engineering Design programme 2020

bristol.ac.uk
Our staff and partners

Paul Harper  Jeff Barrie  Andy Greener  Will Clements  Mike McCann  Chris McMahon
Nathan Halewood
MEng Engineering Design

- Graduated 2019
- Summer Placement Atkins Nuclear 2015
- Industrial Placement at Atkins Infrastructure 2016-2017
- Networks and Drainage Engineer
- I work on surface water management and clean water distribution system design
On July 3 2017, SNC-Lavalin and Atkins joined forces

SNC- LAVALIN

→ A leading engineering and construction group in the world offering services in oil and gas, mining and metallurgy, infrastructure and power

→ Major player in the ownership of infrastructure

+ ATKINS

Member of the SNC-Lavalin Group

= Our Vision

→ One of the world’s most respected design, engineering and project management consultancies serving infrastructure, transportation and energy sectors

→ We strive to be the premier engineering solution partner, committed to delivering complex projects from vision to reality for a sustainable lifespan
HPC
- Surface Water Channel Design
- Highly complex integrated gravity networks design
- Multi discipline team
- BIM compliant design using Civil3D and NavisWorks

Thames Valley Mains Rehabilitation
- Clean water distribution main scheme design
- ArcGIS skills developed for design purposes
- Regular focused client and contractor liaison
Claudia J Martin

**Airbus / University of Bristol**
- Graduated in 2018
- EngD Research Engineer in Composites Manufacturing
- Summer placement between 1\textsuperscript{st}/2\textsuperscript{nd} year – ARUP – Engineering Intern in rail team
- Placement at DNV GL – Engineer/Consultant working in renewable energy
- Summer placement between 4\textsuperscript{th}/5\textsuperscript{th} year – Rolls Royce UTC at TU Dresden – Composites Research Engineer

www.bristol.ac.uk/engineering/interdisciplinary/engineering-design/
Airbus Wing of Tomorrow

- Airbus programme aimed at developing a composite wing manufacturing concept for a next-generation single-aisle aircraft
- Composite materials open up new possibilities for wing configuration and construction
- However new challenges arise e.g. highly complex parts difficult to manufacture

www.bristol.ac.uk/engineering/interdisciplinary/engineering-design/
MEng Engineering Design

The EngD

- Four-year postgraduate research programme for researchers who aspire to key leadership positions in industry
- Industry based project
- Technical training
- Professional career development

www.bristol.ac.uk/engineering/interdisciplinary/engineering-design/