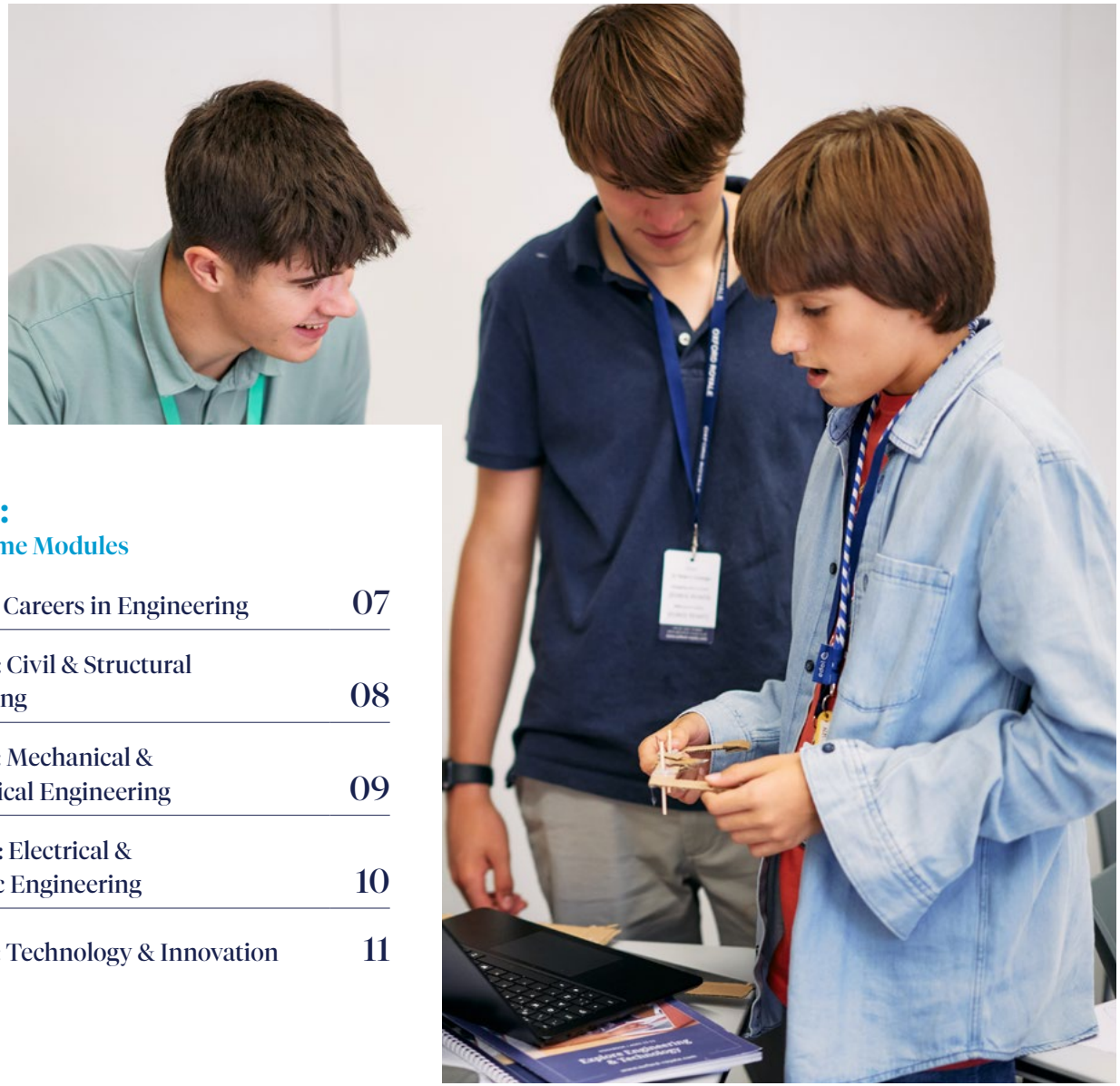
OXFORD ROYALE®

Engineering

Syllabus Guide
For Ages 16 – 18

Contents



Programme Overview

Do you dream of driving positive change through the invention and development of new technologies? Are you seeking a career that combines creativity with excellent scientific knowledge and problem-solving skills?

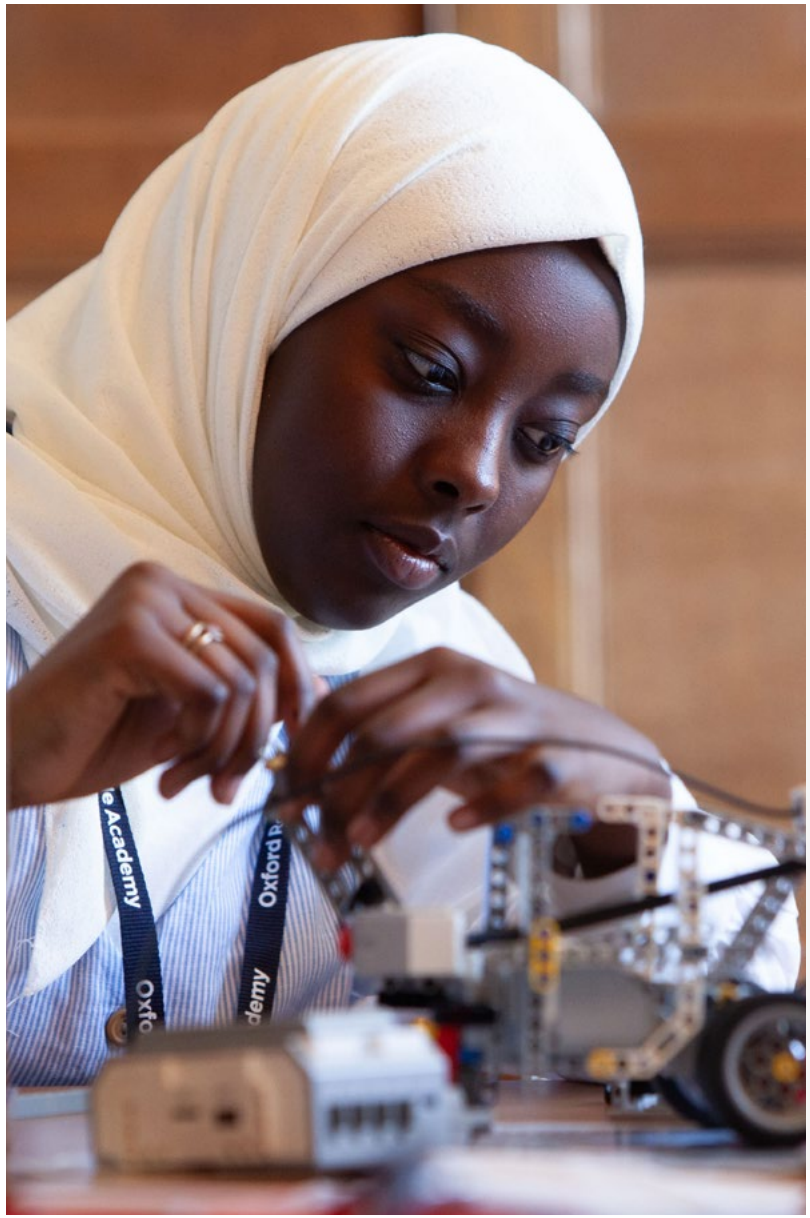
The Oxford Royale Engineering programme aims to help students master key engineering concepts and kickstart their career as they explore the full range of pathways available in the discipline that is shaping the future. 'Designing Tomorrow' blends hands-on experience with in-depth theoretical learning, allowing you to explore a range of specialisms within engineering, including civil, structural, mechanical, aeronautical, and electrical.

You will learn about the engineering design process, reinforcing your mathematical and scientific knowledge, use case studies to understand more about different engineering disciplines, and work on team research and presentation projects. You'll also go above and beyond high school learning with subject-specific preparation for higher study, mastering challenging mechanical mathematics formulae, stats, and dynamics, as well as the six 'engineering habits of mind' and practical skill-sets conducive to well-rounded academic and career development. As you explore the various branches of engineering, you'll be able to make an informed decision as to whether a career in this most challenging and exciting field is right for you.

Who It's For

Studying Engineering opens the doors to a broad array of careers with a focus on skills such innovation, problem-solving, and design.

Whether you aspire to streamline existing technologies, conduct cutting-edge scientific research, or apply world-class project management abilities to test and develop new products, this challenging but rewarding programme allows you to experience specialised university-level study for the first time. You'll gain both the foundational knowledge to understand a variety of different engineering disciplines, and gain greater clarity on how to pick a specialism that will help you secure your dream career.



Upon completion of this programme at Oxford Royale, you will:

1. Understand the meaning of engineering, different engineering disciplines, the core skills of engineers, and the significant contributions engineers make to the world.
2. Understand the attributes, communication, and collaboration skills required to be a well-rounded engineer in the 21st century.
3. Have developed your design and problem-solving skills and be able to apply these to practical design projects.
4. Grasp the theoretical principles and practical applications of mechanical, civil, structural, aeronautical, electrical, electronics, and sustainable engineering.
5. Be clear on the pathway to becoming an engineer, including the challenges and rewards associated with this career.
6. Be able to discuss state-of-the-art innovations and technology and their impact on society.

During the programme you will also develop a number of core skills:

1. **Collaborate with international peers:**
   Work with global peers and hone your communication and teamwork skills through workshops and group projects.

2. **Develop problem-solving skills:**
   Enhance your critical thinking and problem-solving abilities with daily lessons and workshops.

3. **Build confidence:**
   Thrive in a supportive environment, think creatively, share ideas, and discover your strengths.

4. **Showcase your success:**
   Showcase achievements, explore peer projects, and engage in critical discourse during subject challenges and Exhibition Days.

5. **Gain a taste of independence:**
   Manage your assignments and schedule while exploring a new location with new friends and staff support.

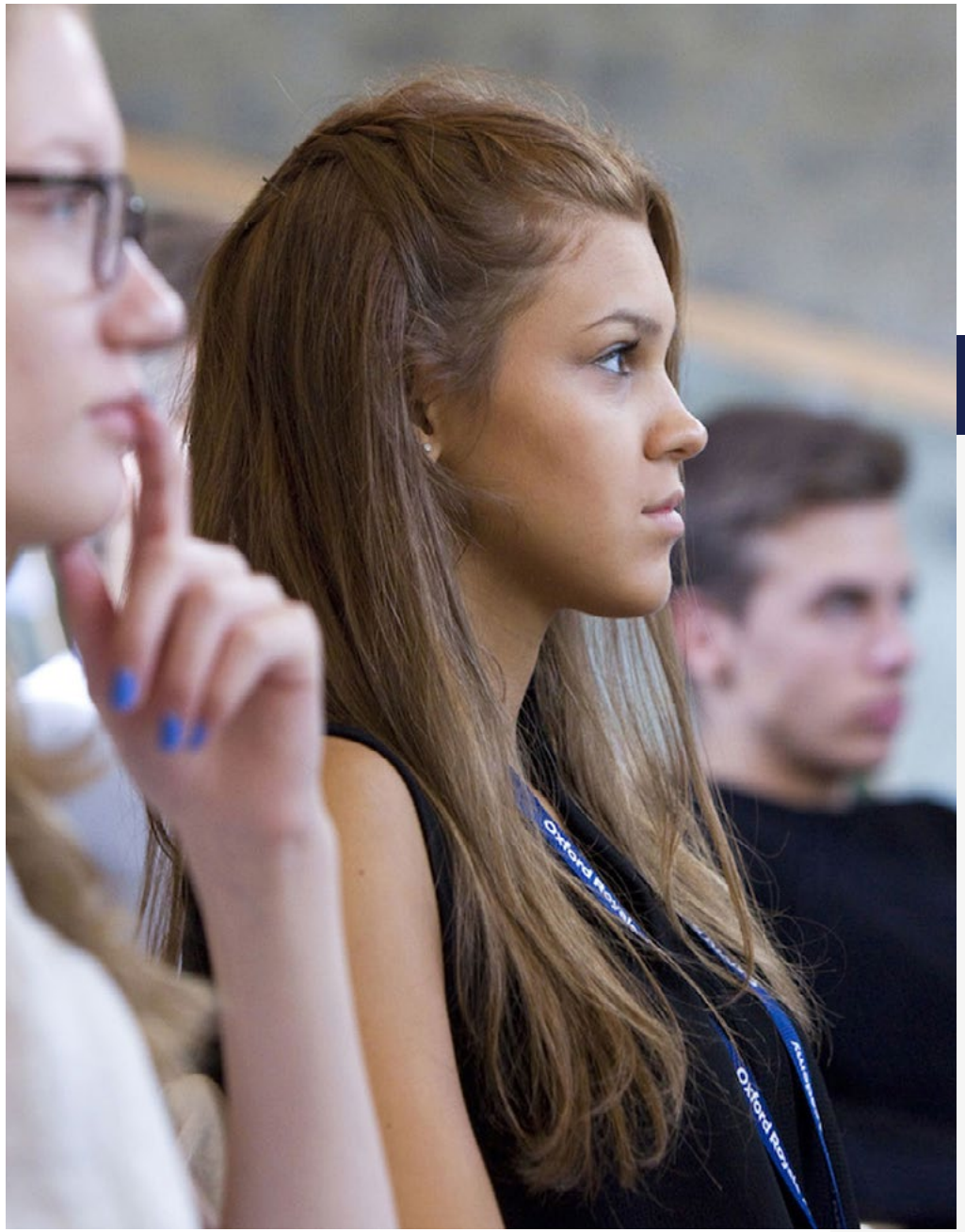
How You'll Learn

Our programme aims to give you a holistic early experience of studying Engineering at undergraduate level.

Transcending traditional classroom study, we offer a blend of seminars, practical workshops, simulated engineering scenarios, and theoretical problem-solving.

Teaching methods include:

1. Practicals and design challenges that simulate real-world engineering projects
2. Academic workshops
3. Graded presentations and practical and written assignments
4. Lectures from esteemed engineering professionals and / or academics related to the subject
5. Seminars



Module 1:

Careers in Engineering

This module provides an introduction to the differences between engineering disciplines, allowing you to identify which fields of engineering are of particular interest to you out of civil, mechanical, aerospace, and electrical engineering. You will go on to learn about engineering project management and design thinking, gaining a solid understanding of the engineering design process, as well as the theory and application of key project management skills. After mapping out a design pathway for a process or product of your choice, you will study the fundamentals of mathematics for engineering, mastering key models of mechanical mathematics and how they can be applied to real-world engineering problems.

Module 2:

Civil and Structural Engineering

Civil and structural engineering involves the design, construction, and maintenance of the built environment, including buildings and public or private infrastructure. Throughout this module, you will use real-world case studies to delve into the role of civil and structural engineering in society, before learning about the features of a structure that need to be considered during the design process, and key materials used. You will also learn about the principles and fundamentals of statics and dynamics, two integral branches of mechanics, and you'll study different types of load in structural engineering, considering how different loads impact upon structures. Finally, you'll have the chance to apply everything you've learnt through hands-on design projects.

Module 3:

Mechanical and Aeronautical Engineering

Mechanical and aeronautical engineering focus on the design, analysis, and manufacturing of mechanical systems, with aeronautical engineering using mechanical mathematics to design and construct aircrafts. You will begin this module by learning about the different branches and key terms within mechanical engineering, before delving into the principles of thermodynamics and power generation, their application to engineering systems, and different types of machines and their uses. This will be followed by an introduction to fluid mechanics and a hydraulics design challenge. Finally, you will learn more about the role of an aerospace engineer, studying the importance of aeroplane wing shape, before applying the core concepts and principles to a design challenge.

Module 4:

Electrical and Electronic Engineering

Electrical engineering is concerned with the practical applications of electricity, whereas electronic engineering focuses on the design and application of electrical systems for industry. This module kicks off with an introduction to the applications of these branches of engineering, as well as a deep dive into core electronic circuit components, devices, systems, and symbols. You'll learn about DC and AC currents, studying the respective rules and laws applied in DC and AC circuits. Then, you'll analyse the core principles of PV cells and systems, coming to understand how solar radiation is harnessed for electricity generation and evaluate current and future applications. Finally, you will undertake an electrical engineering practical.

Module 5:

Innovation and Technology

This module focuses on new horizons in engineering. You will delve into emerging trends in technology, critically assessing their respective advantages, disadvantages, and risks, and reflecting on some of the novel career opportunities emerging from these new industries. Finally, you will critically evaluate predicted engineering trends for the next 30 years, understanding the roles of engineering entrepreneurs in developing innovations that bring benefits to society worldwide. Finally, you will have the opportunity to design and build a model for a sustainable future city in a stimulating practical simulation activity.

OXFORD ROYALE®

www.oxford-royale.com

All information correct at the time of publication.