Pearson BTEC Level 4 Higher National Certificate in Civil Engineering

1. Construction Design Project (Pearson-set)

The success of any project relies on the development of a good design and the technical information to allow the project to be built. The aim of this unit is to help students to appreciate and be aware of the design process and the information required to communicate the design itself, specify and quantify materials, provide instructions for the assembly and erection, and facilitate precise costing and project management. Topics included in this unit are: project phases; construction drawing; detailing; Computer Aided Design (CAD); Building Information Modelling (BIM); schedules; specifications; bills of quantities; information collaboration. On successful completion of the unit, students will be able to analyse scenarios, make decisions and produce drawings and specifications to achieve appropriate, creative and innovative home design proposals

2. The Construction Environment

The construction industry is one of the major contributors to CO2 emissions. Also, the way that buildings are designed, constructed and maintained means they have an ongoing impact on the environment. Similarly, as a major employer, the industry has an ongoing impact on the working conditions of those in the sector and the way that people are educated, trained and supported through their careers. In this unit, students will explore the make-up and the impact of the construction industry on the environment and society. By exploring the roles and relationships of individuals and organisations in the construction sector, students will gain an overview of the organisational and the personal ways in which the sector works to continue to improve the built environment and limit its impact on the environment, while maintaining economic sustainability and growth.

3. Science & Materials

This unit aims to support students to make material choices to achieve the desired outcomes of a brief. This is approached from the perspective of materials being fit for purpose; as defined by testing standards and properties, but also by consideration of the environmental impact and sustainability. Awareness of health & safety is considered alongside the need to meet legislative requirements. The topics covered in this unit include: health and safety; storage and use of materials; handling and problems associated with misuse and unprotected use; environmental and sustainable

consideration in material choices; human comfort performance parameters. Material choice is developed through the understanding of testing procedures to establish conformity to standards and define performance properties. The performance of materials to satisfy regulations and provide appropriate comfort levels is addressed through design and calculations.

4. Mathematics for Construction

The aim of this unit is to develop students' knowledge and understanding of the mathematical principles and theories that underpin many aspects of construction technology, structures and materials. Students will be introduced to mathematical methods and statistical techniques so that they can analyse and solve problems in a construction engineering context. Topics included in this unit are: trigonometry and algebraic mathematical techniques; matrices; statistical techniques; differential and integral calculus; binomial and normal distribution; dimensional analysis; arithmetic progressions; vector analysis. On successful completion of this unit, students will be able to employ mathematical methods in a variety of contextualised examples; use analytical and computational methods to evaluate and solve engineering construction problems; interpret data using statistical techniques and apply calculus techniques. Students will gain crucial employability skills such as critical thinking, problem solving, analysis, reasoning and data interpretation.

5. Civil Engineering Technology

This unit explores the role of professional civil engineers, their essential involvement in the construction and maintenance of infrastructure, and the key technologies they apply. The technologies and processes of civil engineering in the development of highways, bridges and substructures are crucial in supporting contemporary societies. Topics included in this unit are: earthwork activities; temporary and permanent dewatering procedures; methods and techniques used to create substructures, highways and superstructures and the common hazards; technical problems and solutions associated with modern civil engineering activities.

6. Principles of Structural Design

Buildings, bridges, roads and many other types of man-made structures are critical to the economic and social wellbeing of our society. We rely on these structures to provide us with suitable spaces and infrastructure to support our daily lives. In this unit, students will explore the fundamental principles of structural design, codes of practice and standards required to construct safe, effective static structures commonly used in

today's building and infrastructure projects. Topics included in this unit are: methods and techniques used to determine bending moments and shear forces in simply supported steel and reinforced concrete beams; deflection in simply supported steel beams; axial load carrying capacity of steel and reinforced concrete columns.

7. Setting, Measuring & Setting Out

In practice, surveying functions are divided between the 'Land Surveyor' to establish the positional reference and provide topographic data, and the 'Civil Engineer' to provide control of construction (setting out) and monitoring. Since there is dependence and commonality between them, this unit covers both contexts equally. In this unit, students will explore the techniques used to set up controls and conductinitial surveys, including communication of results and methods of setting out the built environment. Students will be able to identify and analyse the sources of error and mitigation techniques used in common aspects of surveying.

8. Digital Applications for Construction Information

Achieving successful projects in the built environment requires a range of different types of information to describe the project, quantify the materials, provide clear instructions for assembly and erection, and allow for accurate costing and management. Throughout the process of design, construction and post-occupancy management, information is critical. Central to construction information is the production of construction drawings. Theseprovide the geometric definition of a project through the use of graphic conventions. Most other forms of construction information will rely, to a greater or lesser degree,on reference to construction drawings. Therefore, the production of accurate and clearly defined construction drawings is a critical part of the overall construction information package. Digital applications play a key role in the production of construction drawings. They provide a way to manage drawing information and make changes with greater efficiency and can be shared readily through a variety of digital communication systems. In this unit students will develop the skills to needed produce accurate and consistent construction information using industry-standard software. On completion of the unit,students will be able to produce a construction information package. Successful achievement of the unit, may also lead to vendor certification.