

Module Details	
Module Title:	Design, Build and Test
Module Code:	ENG4006-B
Academic Year:	2019-20
Credit Rating:	20
School:	Department of Chemical Engineering
Subject Area:	Engineering
FHEQ Level:	FHEQ Level 4
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	Hours
Lectures	12
Practical classes and workshops	10
Supervised time in studio/workshop	60
Directed Study	113

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims
<p>(1) To develop problem-solving skills through applied project work.</p> <p>(2) To develop team working – both discipline specific and interdisciplinary, time management and communication skills.</p> <p>(3) To introduce experimental techniques in engineering and technology.</p> <p>(4) To develop understanding of professionalism, engineering ethics and sustainability.</p>

Outline Syllabus

The interactive workshops will focus on critical aspects designed to help students understand fundamental concepts in engineering and solve real-world problems in discipline specific topics as well as interdisciplinary aspects of engineering. They include basic concepts of design and manufacturing, relevant mathematical modelling, materials, and other technologies as appropriate for the projects.

Prototypes will be constrained by a limited budget and students will be able to use given materials and tools (hardware and software) to realise the projects.

In addition, the module establishes professional skills with supplementary lectures on: Health and Safety, Project Management, Time Management, Team Building, Financial Management, Sustainability, Engineering Ethics, Presentation skills and Technical Report Writing including searching for and referencing information.

Learning Outcomes

1	Explain the design process as applied to simple engineering systems, critique a solution and recognise opportunities for design improvements
2	Analyse the role of health and safety, professional conduct and engineering ethics in the design and development of an engineering product
3	Apply knowledge of the principles of sustainability on the basic design methods for the analysis and solution of simple engineering problems.
4	Effectively utilise appropriate laboratory equipment, computer software and instrumentation in order to accomplish the objectives of a project in a safe working environment
5	Participate effectively in the operation of a team and collaborate effectively with members of the team.
6	Deliver a paper or presentation that succeeds in communicating effectively with members of the team.
7	Analyse data using appropriate tools and techniques

Learning, Teaching and Assessment Strategy

The Learning strategy is to develop skills and knowledge through active learning activities. In line with CDIO principles. The learning strategy harnesses active learning and experiential learning is key drivers. The module will be taught through a series of design and build challenges supported by targeted interactive workshops. Each student will complete 3 group projects over two semesters. The first two projects will be discipline-specific and the third project will be a common interdisciplinary project shared with all Engineering disciplines. The project briefs may vary from year to year.

Groups will be selected to include mixed gender, ethnicity and technical ability and will vary from one project to another. Furthermore, groups in the interdisciplinary Project 3 will include students from all four disciplines.

Student assessment will be directly linked to each of the projects. Each group project will be assessed based on the effectiveness of the project to meet the project brief, design quality and

build, with a detailed justification of design, materials, and manufacturing methodologies taking into account ethical and sustainability implications of the project. Students will need to demonstrate lessons learned in all aspects of the work during the presentation stage. A peer evaluation, formative and summative, of participation and commitment to the projects will form part of the assessment.

The 3 competitive projects, which will address LOs 1 to 7, will be assessed as follows:

- Project 1: Group demonstration/Presentation of the deliverable (e.g. product, solution), including formative peer assessment of members in the same group as well as peer assessment between groups.
- Project 2: Coursework (group work + individual work in the form of specific tasks proposed by the students and agreed by academic staff). Plus, group demonstration/presentation of the deliverable, including formative peer assessment of members in the same group as well as peer assessment between groups.
- Project 3: Group demonstration/Presentation of the deliverable (e.g. product, solution), this time including summative peer assessment of members in the same group as well as peer assessment between the multidisciplinary groups.

In addition students will be exposed to discipline specific learning material as detailed below in order to achieve project outcomes:

Biomedical Engineering: Students will learn workshop practice through 5 small group practical classes covering: material forming and joining; control and robotics; fitting and machining; measurement and metrology; CNC machining as well as Bio-sensing Related Electronics In addition students will learn theory and practice in Cell Culture Techniques; Urine Analysis and Physiological Measurements.

Chemical Engineering: Students will study Material Balances with and without Reactions and with Recoveries; Energy Balances and Phase Equilibria. Students will also study Dimensions and Units pertinent to Chemical Engineering.

Civil Engineering: Students will study Surveying; principles of levelling, survey instruments; levels and theodolites from both theoretical lectures and small group lab demonstrations and practical field course sessions. Students will also be introduced to the concepts of Structural Design and Sustainability within the Built Environment.

Clinical Technology: Students will learn theory and practice in Cell Culture Techniques; Urine Analysis and Physiological Measurements.

Mechanical Engineering: Students will learn workshop practice through 5 small group practical classes covering: material forming and joining; control and robotics; fitting and machining; measurement and metrology; CNC machining. In addition students will be given introductory sessions on Computer Aided Engineering.

This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Third Edition (AHEP3) as published by The Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC). These outcomes specify six key areas of learning: Science and Mathematics (SM), Engineering Analysis (EA), Design (D), Economic, Legal, Social, Ethical and Environmental Context (EL), Engineering Practice (P) and Additional General Skills (G).

EA1b, EA2, D1, D2, D4, D5, D6, EL1, EL2, EL3b, EL4, EL5, EL6b, P2, P3, P4, P7, P8, P11b, G1, G2, G4, P11m.

Further details of these learning outcomes can be found at <https://www.engc.org.uk/>.

Mode of Assessment				
Type	Method	Description	Length	Weighting
Summative	Examination - practical/laboratory	Group Project 2 Demonstration/Presentation with peer assessment of contribution	20 minutes	20%
Summative	Examination - practical/laboratory	Group Project 1 Demonstration/presentation	20 minutes	20%
Summative	Examination - practical/laboratory	Group Project 3 Demonstration with peer assessment of contribution	20 minutes	40%
Summative	Coursework	Individual written reflection on specific assigned task from Project 2	1000- words	20%
Referral	Coursework	Evaluative Report on projects (including personal reflection)	3500- words	100%
Formative	Coursework	Project 1 Peer Assessment		%

Reading List
To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html .

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.