Prifysgol Wrecsam
Wrexham University

Module specification

When printed this becomes an uncontrolled document. Please access the Module Directory for the most up to date version by clicking on the following link: Module directory

Module Code	ENG4AF
Module Title	Engineering Design Practice and Professional Development
Level	4
Credit value	20
Faculty	FACE
HECoS Code	100182
Cost Code	GAME
Pre-requisite module	None

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Mechatronics Engineering	Core

Breakdown of module hours

Learning and teaching hours	60 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	0 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**0** hrs
Placement hours	0 hrs
Guided independent study hours	140 hrs
Module duration (Total hours)	200 hrs

Module aims

To develop understanding of the design process and the use of specifications, to apply advanced design principles to solve engineering design problems, and to develop knowledge and skills for the creation of design solutions by manual methods and by use of computer aided design software (CAD).

To select appropriate materials and processes for economic designs. To appreciate the work with incomplete information and technical uncertainty.

To develop project planning, management, team working and presentation skills. To contextualise these activities within the professional standards and codes of practice for the engineering profession, and to develop the engineering communication skills.

Module Learning Outcomes

At the end of this module, students will be able to:

1	Apply structured techniques to the specification and creative phases of the design process.
2	Use computer-based design and programming software and understand how to relate these to the design process.
3	Appreciate the business needs taking consideration of wider political and social contexts, such as environmental, ethics, economics and sustainability; understand codes of practice in industries.
4	Develop creative design skills, practical skills, engineering communication skills, personal and professional career management skills, and team working skills.
5	Select and apply appropriate research methods to an engineering project, with an awareness of the limitations of any chosen method and to critically evaluate the activities undertaken.
6	Incorporate social, economic, ethical, environmental and sustainability considerations in development work relating to engineering within the fields of business and research.

Assessment

Indicative Assessment Tasks:
This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment 1: A portfolio to cover learning outcomes 1, 2, 3, 5, and 6.

Assessment 2: A 2-hour exam covering outcomes 4, 5, and 6. It is an unseen time-constrained exam.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1, 2, 3, 5, 6	Portfolio	3000	70%	

2	4	Examination	2 hrs	30%	

Derogations

None

Learning and Teaching Strategies

Candidates will learn and be familiar with engineering design process and apply the knowledge learned to conduct a design project. Formal lectures, group project and workshop/lab practice are the integrated parts of module teaching and learning practices.

Lectures will be given on the engineering design process with a detailed insight into the development of a product design specification and quantifiable methods for choosing the best engineering solution. In addition, the health and safety aspects of working in engineering will be discussed and the importance of risk assessments will be outlined.

Coding (using Matlab or similar), Industry standard Computer Aided Design, both mechanical (Inventor or similar) and electrical (Ulitisim or similar) will be taught via tutorials and practical sessions.

Professional studies, including development of transferrable skills, will be integrated with the practical activities for application and assessment but will have separate tutorial sessions. The emphasis will be on recording, reporting and presentation relating to the practical activities.

Welsh Elements

Programme is delivered in English and Chinese, however students can submit assessments in Welsh.

Indicative Syllabus Outline

Engineering Profession: Professional bodies, structure of Engineering profession, range of careers, membership, UK-SPEC academic and professional requirements including sustainable design, health and safety, environmental and ethical considerations.

Design process: Stages in design; stages in development; apply to Software and to hardware product, maintaining a log report of activities. (Specification, task analysis, outline design, selection of components/materials, detailed design including test definition or evaluation parameters, implementation, testing, evaluation of tests, reiteration as necessary, conclusions, reporting). Refer to quality (quality is designed in, not built in).

Design practices, lab/workshop practice and team work: From a specific design brief work as part of a small team, analyse problem, and propose various designs. Choose one cost effective design and produce a design study with full documentation.

Computer aided design (CAD) and simulation in design: Understand how computers can aid the designer in the design process. Introduction to various simulation packages.

Personal skills: Self-evaluation (reflective log); target-setting and managing time; note-taking; log report; formal report of complete exercise; and presentation skills. (Reinforcement of health, safety, sustainability, ethical, economic and social considerations during the design/production process.)

Research development: the role of ‘research and development’ in company growth; role of research in academic contribution to ‘body of knowledge’.

Personal development: relevance of research and industrial context to personal studies, especially individual project, group design project and work placement (as applicable).

Wider considerations: social, economic, ethical, environmental and sustainability considerations in development decisions for business and research.

Research Methods in Individual organisation: maintenance of research log/folder to record intentions, activities and results.

The Planning of Research: Defining the purpose and parameters of research. Reviewing evidence. Research models, strategies and design.

Sources of Data/Problems of Comparability: Published and unpublished data; primary and secondary sources; research bodies/pressure groups; web site sources; interviews; documentary methods; observation; case-study research.

Research Methods and Specific Problems: Surveys: design; principles, problems and methods of sampling; structured/unstructured interviewing; questionnaire design; analysis of survey data, problems of analysis. Experimental methods: design of tests (including simulation tools); collecting and collating of data; calculations, errors and margins; Other techniques: fieldwork, participant and non-participant observation; document research; interviews.

Research Presentation and Appraisal: presentation and analysis of statistics/numerical results; presentation and reporting of research findings. Critical appraisal of reports and statistics. Oral presentations.

Research and Policy: demands for research; consideration of options/policy; recommendations; ethical considerations when deciding policy.

Indicative Bibliography

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads:

Cross, N. (2008) Engineering Design Methods: Strategies for Product Design, 4th Edn., Wiley- Blackwell.

Other indicative reading:

Creswell, J.W. (2008) Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd Edn., Sage Publications, Inc.

Karl, T. Ulrich, Steven D. Eppinger (2016). Product Design and Development. Publisher: Mc Graw Hill.

Maja Bystorm, Bruce Eisenstein (2005). Practical Engineering Design. Publisher CRC Press

Jim Lesko (2008). Industrial Design: materials and manufacturing guide. Publisher: John Wiley & Sons, Inc.

Whitcomb, C. (2013) Effective Interpersonal and Team Communications Skills for Engineers, Wiley-Blackwell.

Fellows, R.F. and Liu, A.M.M. (2008) Research Methods for Construction, 3rd Edn., Wiley-Blackwell.

Davies, M.B. (2007) Doing A successful Research Project: Using Qualitative and Quantitative Methods, Palgrave McMillan.

Stroud, K. (2007) Engineering Mathematics, 6th Edn., Palgrave Macmillan.

Administrative Information

For office use only	
Initial approval date	24/09/2020
With effect from date	24/09/2020
Date and details of revision	22/07/2025 - revalidated, updated template, change of assessment from portfolio to portfolio and exam, derogation removed
Version number	2