

## Module specification

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**Refer to the module guidance notes for completion of each section of the specification.**

Module code	ENG4AF
Module title	Engineering Design Practice and Professional Development
Level	4
Credit value	20
Faculty	FAST
Module Leader	Tongyan Liu
HECoS Code	100182
Cost Code	GAME

### Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng (Hons) Mechatronics Engineering	Core

### Pre-requisites

None

### Breakdown of module hours

Learning and teaching hours	60 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	0 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
<b>Total active learning and teaching hours</b>	<b>0 hrs</b>
Placement / work based learning	0 hrs
Guided independent study	140 hrs
<b>Module duration (total hours)</b>	<b>200 hrs</b>

For office use only	
Initial approval date	24/09/2020
With effect from date	24/09/2020
Date and details of revision	
Version number	1

## Module aims

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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

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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.

Indicative Assessment Tasks:

The assessments will be contained in an overall project based portfolio. Typically candidates will be tasked to provide a portfolio containing the following sections as a minimum:

- Evidence of Professional development that includes reflecting on capability and experiences. Meet with your personal tutor 4 times in the academic year to discuss your development.
- An understanding of your responsibilities as an engineer, including social, ethical, environmental, sustainable requirements.
- A development log of your practical sessions on how you can utilise the skills during engineering design as a professional engineer.

- A design process from concept to preliminary design, the will include a detailed Product Design Specification, Concepts, and a detailed selection process. The final work will be presented in a 5 minutes presentation and the preliminary design will be shown as a CAD model.
- A computer programed script (written for example in Matlab), that demonstrates understanding of the software.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1, 2, 3, 4, 5, 6	Portfolio	100%

## Derogations

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A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

## Learning and Teaching Strategies

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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 (Ultisim 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.

## Indicative Syllabus Outline

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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:**

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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 MacMillan.

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

## Employability skills – the Glyndŵr Graduate

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Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas. [Click here to read more about the Glyndwr Graduate attributes](#)

### Core Attributes

Enterprising  
Creative  
Ethical

### Key Attitudes

Resilience  
Confidence  
Adaptability

### Practical Skillsets

Digital Fluency  
Organisation  
Leadership and Team working  
Emotional Intelligence  
Communication