DE MONTFORT UNIVERSITY LEICESTER

De Montfort University

Course Template

1. Basic information

- Course Name: Mechatronics
- Course Code: CE409A
- Level (UG, PG): Undergraduate
- Academic Period: 2014
- Faculty: Faculty of Technology
- Department: Engineering
- PMB: ENGT
- Offered at: DM - DMU Leicester
- Type (single, joint.): SI
- Highest Award : Bachelor of Engineering (Honours)
- All possible exit awards : Bachelor of Engineering; Diploma of Higher Education; Certificate of Higher Education
- Award notes :

Professional Body Recognition

- Accreditation by Professional/Statutory body:

  Yes
- Exemption by Professional/Statutory body:

  No
- Details

  IMechE

- Modes of attendance: Main MOA: Full-Time
Other MOA:
- Mode Notes:
- Course leader: Kalok Lee

2. Entry Requirements and Profile

Applicants should normally be 18 years of age by the 1st of October in the year of entry.

Candidates should offer one of the following

240 Tariff points: Two GCE A Levels, one of which must be a science based subject, excluding key skills and general studies. An AS-Level is deemed equivalent to half an A-Level.

An Advanced GNVQ or a BTEC certificate in a relevant discipline with merit. BTEC Diploma in a relevant discipline.

Any qualification deemed equivalent to the above.

Applications are welcomed for individual consideration from candidates offering experience or prior learning in place of part or all of the formal entry qualifications.

Direct entry to level two with advanced standing is permitted for applicants who can demonstrate their capability to undertake studies at degree level and have the prior knowledge/qualifications deemed equivalent to the level one studies.

Direct entry to level three with advanced standing is permitted for applicants with an existing ordinary degree in a suitable discipline.

3. Course Description

Characteristics and Aims

BEng Mechatronics is the Faculty of Technology's principal provision for engineering education for those seeking careers within the Mechanical Engineering and allied industries. It is designed to provide the widest access through its multiple entry points. The traditional entry point is year one, which is common to both Mechanical and Mechatronic routes, enabling the student to make an informed choice of route to award. Specialist studies within a route increase as the student progresses to BEng(Hons).

The course is available via full-time or part-time study. Part-time study enables a student to read for a degree whilst developing a career within industry. The full-time student can take an optional sandwich year in industry before completing the degree thus gaining valuable industrial experience as an integral part of the programme. For those not normally qualified to study engineering to degree level a foundation year is available which will enable the student to gain the necessary knowledge and skills to progress to year one of the programmes.

The study programme is aimed at developing the basic and specialist knowledge and skills to enable the student to pursue a career in Electromechanical Engineering to the highest possible level. Student-centred learning forms part of the teaching strategy and allows the students flexibility in their learning experience. Project and guided learning are used to develop personal skills as well as technical competence which are essential for a successful career.

Teaching, Learning and Assessment Strategies

The modules making up the course employ a range of learning and teaching strategies including

Staff directed learning via lectures, tutorials, seminars and work-based exercises for the dissemination of knowledge, information and the demonstration of practical processes and techniques.

Student centred learning via research and presentation of findings, report writing, assignments, practice and practical work based exercises for the development of skills and understanding.

Resource based learning for the development of skills, e.g. practical and measurement skills developed in the work place, the development of keyboard skills and skill in the use of computer based tools.

Collaborative based learning by group assignments.

Project based learning to develop research, presentation and communication skills.

Each level of the course has a different emphasis in the learning strategy. These are outlined below.

Year/Level 1
Applicants will come from a variety of backgrounds with differing levels of ability and knowledge. Year 1 will provide students with the basic level of understanding of the mathematical and scientific principles necessary for them to be able to make an informed choice of the specialism they wish to follow.

Year/Level 2
Builds on the basic engineering knowledge to concentrate on the specific knowledge required for each specialism. The ability of the student to solve problems is further enhanced along with the intellectual and transferable skills necessary to understand engineering problems and their solution.

Year/Level 3
This level provides the student with the tools and abilities necessary to solve more complex problems, to critically examine solutions and to formulate improvements to existing systems. The project provides a vehicle for students to develop and demonstrate their intellectual, analytical, organisational and transferable skills within a particular area of engineering.

The assessment of student learning is embedded in a variety of methods which vary according

to the level of the programme. Phase Tests are used to regularly during level 1 studies to assess developmental learning during the course of the year and to provide feedback to students of their progress. Examinations are used to asses the ability of students to absorb and apply fundamental knowledge under directed conditions. These are used increasingly as the level of study increases. Assignments are used to enable students to research knowledge and to apply that knowledge to specific problems. The students should show the ability to organise their time, work to deadlines and demonstrate transferable skills. The increase in level should be accompanied by an increase in the use of IT, creativity and innovation in the solution of problems. These provide the opportunity for feedback of the student's performance during the learning process. Laboratory exercises are used to enable students to investigate specific knowledge, solve specific problems and to write reports in a specific manner. These provide the opportunity for feedback of the student's performance during the learning process. Projects are used to enable the student to research or study a specific problem or area of study of the student's choice. These provide the student with the opportunity to further develop analytical skills and to demonstrate transferable skills as well as creativity and innovation.

4. Outcomes

Generic outcome headings	**What a student should know and be able to do upon completion of the course**
• **Knowledge & understanding**	The mathematical and scientific principles that can be applied in a professional position within industry. Essential analyticlal and practical facts, concepts, principles and theories associated with the design and analysis of engineering systems. The processes and activities involved in the main functions of a commercial organisation as they relate to the work of an engineer or technologist
• **Cognitive skills**	Identify the information requirements to solve a problem, research and assess this data, using it to develop an appropriate solution, whether as an individual or part of a team. Evaluate alternative designs/processes in a range of functional areas and identify best practices. Be able to communicate with engineers of a different discipline to solve common problems.
• **Subject specific skills**	Apply design and analysis tools to solve engineering problems within the discipline chosen.
• **Key Skills**	Application of numbers: The student will have experience at handling quantitative data and collecting, interpreting, recording and reporting numerical information.

	Communication: The student will have experience at communicating in a variety of ways, including verbally through the group work and presentations. Improving own learning and performance: This skill is developed throughout the course. Emphasis is placed on tasks that develop the skills relevant to the formation of a professional engineer. Information Technology: A range of computer based tools will be used throughout the course, including CAD, FEA and simulation software. Problem solving: Development of problem solving skills and make use of a wide range of methods and tools for problem solving. Working with others: Development of teamwork though frequent opportunities to work in teams during tutorial and laboratory exercises and assignments.

5. Structure and Regulations

Relationship Details

Module	Credits	Level	Take/Pass	Semester	Locations
ENGD1001	**30.00**	**1**	**Must Take**	**Y**	**DM**
ENGD1004	**30.00**	**1**	**Must Take**	**Y**	**DM**
ENGD1005	**30.00**	**1**	**Must Take**	**Y**	**DM**
ENGD1008	**15.00**	**1**	**Must Take**	**Y**	**DM**
ENGD1019	**15.00**	**1**	**Must Take**	**Y**	**DM**
ENGD2001	**15.00**	**2**	**Must Take**	**Y**	**DM**
ENGD2003	**30.00**	**2**	**Must Take**	**Y**	**DM**
ENGD2005	**30.00**	**2**	**Must Take**	**Y**	**DM**
ENGD2009	**15.00**	**2**	**Must Take**	**Y**	**DM**
ENGD2010	**15.00**	**2**	**Must Take**	**Y**	**DM**
ENGD2014	**15.00**	**2**	**Must Take**	**Y**	**DM**
SAND2802	**0.00**	**2**	**Neither**	**1, 2, X, Y**	**DM**
ENGD3000	**30.00**	**3**	**Must Take**	**Y**	**DM**
ENGD3025	**30.00**	**3**	**Must Take**	**Y**	**DM**
ENGD3037	**30.00**	**3**	**Must Take**	**Y**	**DM**
ENGD3038	**30.00**	**3**	**Must Take**	**Y**	**DM**

Structure

Structure notes

1 Course info

Course Specific Differences or Regulations

1 1 Notes The course consists of three routes to award each containing progressive exit qualifications with the following module structure

Honours Degree Level 1 3 x 30 credits, 2 x 15 credits
Level 2 2 x 30 credits, 4 x 15 credits
Level 3 4 x 30 credits

Modules may be replaced or new modules added to the course.

Common Year 1
Level 1 Modules Engineering Mathematics, Mechanical Principles, Electrical and Electronic Principles, Principles of Design and Manufacture and Computer Aided Engineering.
Engineering Mathematics Following a revision of basic algebra, this module introduces the student to numerical methods, data analysis and analytical techniques that will be required throughout the course.

Mechanical Principles Provides an introduction to statics, dynamics and thermofluids to give students a wide understanding of the basic principles of mechanical engineering.

Electronic Principles This module aims to provide a wide understanding of electrical and electronic engineering principles and introduces dc and ac circuit concepts in electronic engineering to develop an understanding of circuit performance.

Principles of Design and Manufacture and Computer Aided Engineering These modules are intended to give the student an understanding of the use of computers as an aid to design and analysis of mechanical and electronic engineering components and products. To relate design to the associated manufacturing processes and economic and business concepts surrounding manufacturing.

Level 2 Modules

Project Management: Students will be introduced to many of the key concepts and practice of the commercial issues when developing an engineering product. Case studies and a project provide the opportunity for the student to engage in a substantial individual piece of work in an area of interest that is relevant to the course subject.

Advanced Engineering Mathematics: This module aims to enhance and develop the students' understanding of and ability to analyse and use the language of mathematics in the description of engineering.

Engineering Science 2: Further develops the concepts and principles of mechanical engineering and the application of those principles to the solution of problems in mechanical technology and energy conversion.

Electromagnetics: This module develops an understanding of theory, numerical modelling and experimental practices to enable to students to understand and efficiently design devices ranging from integrated circuits to electric motors.

Embedded Systems & Drives: Provides an introduction to classical control theory and its application to systems. It covers an introduction to the theory and practice of microprocessors and the use of microprocessor based systems to control processes.

Applied Electronics: Introduces case studies to illustrate the methodology of the design process for electronic based products and how to manage the design process.

Level 3 Modules
Dynamics and Control: Develops understanding of the fundamentals of vibrations and solid body dynamics and their application to the analysis and solution of complex engineering problems involving concepts of control and feedback.

Power Electronics: This module introduces and gives the student an understanding of the field of Power Electronics from basic switching power supply principles to modern vector-controlled motor drives. Renewable energy power conversion is also covered. This module encourages the student to apply Concurrent Design for Manufacture methodology to the Product Development Cycle. It introduces the student to the various methods of Rapid Prototyping and their use in the Product Development Cycle.

Systems Integration: This module introduces the student to the fundamental principles of the design of products incorporating mechanical, electronic and microprocessor based elements. It introduces the concepts of feedback from instrumentation to the computer/PLC control. The students will learn about PLC controllers and principles of interfacing industrial processes with control computers and the instrumentation required for this purpose.

Project: Allows students to engage in a substantial piece of individual research work focussed on a topic relevant to their specific discipline

Numbers at sites, including partner institutions

1

Relevant QAA Subject Benchmarking statement(s)

1 1 Benchmark Statements

This programme has been informed by the QAA Subject Benchmark Statement in Engineering. Selected statements have been taken from these and examples of some of the modules that satisfy the requirements have been listed alongside the statement. NB Benchmark statements and attributes are marked as italicised text while example modules are marked as bold text.

Engineering benchmarking standards

Benchmarking standards are defined at threshold and modal:

Threshold

This is interpreted to mean that all students (taken over all years) graduating with an honours degree in the discipline of Engineering, will have achieved this.

Students who reach this will be characterised by being able to:

demonstrate a requisite understanding of the main body of knowledge for their programme of study;

identify and specify a problem or need in terms of its essential components and to search for possible solutions or provisions in a range of existing systems;

select appropriate design methods for the analysis and modelling of components or assemblies in the development of a conceptual model

critically assess the results of the performance of determinable models of engineering systems and to suggest possible improvements to the model

discuss applications based upon the body of knowledge with engineers of differing disciplines

demonstrate transferable skills and an ability to work under guidance and as a team member

identify appropriate practices within a professional and ethical framework and understand the need for continuing professional development

While the above benchmarking standards are defined for threshold, it is nevertheless expected that programmes in Engineering will provide opportunities for students of the highest calibre to achieve their full potentials. Such students will be creative and innovative in their application of the principles covered in the curriculum, they will be able to contribute significantly to the analysis, design and development of systems which are complex, and fit for purpose; and they will be able to exercise critical evaluation and review of both their own work and the work of others

Selected Engineering Benchmark statements

Section 1.2 What is engineering?
Skilled application of a distinctive body of knowledge based on mathematics, science and technology.

Embedded in the overall mix of modules.

Engineering is directed to developing, providing and maintaining infrastructure, goods and services for industry and the community. Embedded in the overall mix of modules.

The outcome of Engineering is a product, or perhaps a process or service. Embedded in the overall mix of modules.

Engineering is about the application of the understanding of, knowledge, skills and know-how of scientific, mathematical and technological principles in a business context to achieve an economic solution.
Embedded in the overall mix of modules.

Section 2 The skills, attributes and qualities of an engineer.

Intellectual abilities
Solve engineering problems.
Example modules: ENGD2003, ENGD2005
Analyse and interpret data.
Example modules ENGD2003, ENGD2009
Design a system, component or process to meet a need. Example modules ENGD2010, ENGD3037

Practical skills
Use a wide range of tools, techniques and equipment, including pertinent software.
Example modules ENGD1008, ENGD1019
Use laboratory and workshop equipment to generate valuable data.
Embedded in the overall mix of modules requiring laboratory exercises.

General transferable skills
Communicate effectively with colleagues and others.
Use IT effectively.
Manage resources and time.
Work in a multi-disciplinary team.
Develop creativity, particularly in the design process.
Become analytical, in the formation and solution of problems. Become innovative in the solution of engineering problems.
All embedded in the overall mix of modules.

Section 3 Engineering degree programmes
Content of the programme should include:
Mathematics and science.

Example modules ENGD1001, ENGD2005, ENGD3038 Information technology and communications.
Example modules ENGD3014, ENGD3037
Design - creativity and innovation.
Example modules ENGD2010, ENGD3037
Engineering practice.
Embedded in the overall mix of modules
Integration of knowledge and understanding.
Embedded in the overall mix of modules.

Many of the skills are so fundamental to engineers that they are built in to or practised in the majority of the modules.

This programme has been informed by the UKSpec learning outcomes.

US1: Knowledge and understanding of scientific principles and methodology necessary to underpin their education to enable appreciation of its scientific and engineering context.
US2: Knowledge and understanding of scientific principles and methodology necessary to underpin their education to enable them to apply mathematical methods, tools and notations in the analysis and solution of engineering problems.
US3: Ability to apply and integrate knowledge and understanding of other engineering

disciplines to support their study.

E1: Understanding of engineering principles and the ability to apply them to analyse key engineering processes.
E2: Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.
E3: Ability to apply quantitative methods and computer software to solve engineering problems.
E4: Understanding of and the ability to apply a systems approach to engineering problems.

D1: Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues.
D2: Understand customer and user needs and the importance of considerations such as aesthetics.
D3: Identify and manage cost drivers.
D4: Use creativity to establish innovative solutions.
D5: Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal.
D6: Manage the design process and evaluate outcomes.

S1: Knowledge and understanding of the commercial and economic context of engineering problems.
S2: Knowledge of management techniques which may be used to achieve engineering objectives within that context.
S3: Understanding of the requirement for engineering activities to promote sustainable development.
S4: Awareness of the framework of relevant legal requirements governing engineering activities.
S5: Understanding the need for a high level of professional and ethical conduct in engineering.

P1: Knowledge and characteristics of particular equipment, processes or products.
P2: Engineering workshop and laboratory skills.
P3: Understanding of the contexts in which engineering knowledge can be applied.
P4: Understanding the use of technical literature and other information sources.
P5: Awareness of intellectual property and contractual issues. P6: Understanding of appropriate codes of practice and industry standards.
P7: Awareness of quality issues.
P8: Ability to work with technical uncertainty.

6. Quality Assurance Information

QA of Workbased Learning

NA

Liaison with Collaborative Partners

NA

Procedures for Maintaining Standards

The Programme is managed by a programme leader together with a programme team. They are guided by the prevailing academic regulations and modular scheme handbooks produced by Registry.

An external examiner is attached to the programme who acts as a critical friend. He/She attends the assessment board and scrutinises student work and marking to ensure that standards have been maintained at an apposite level.

Each year the programme leader completes a Programme Enhancement Plan which is approved by the Programme Board/Subject Authority Board and Faculty Academic Committee.

The student voice is heard via student representatives on the Programme Board and the Staff Student Consultative Committee. Feedback from students is gathered by end of module questionnaires and programme questionnaires.

The programme is subject to a periodic review in line with University requirements.

Course Handbook Descriptor