Programme Specification and Curriculum Map for *MEng (Hons) Mechatronics*

1. Programme title	MEng Hons Mechatronics
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University
4. Programme accredited by	
5. Final qualification	Master in Engineering with Honours Mechatronics
6. Academic year	2014-2015
7. Language of study	English
8. Mode of study	FT /PT/ TKSW

9. Criteria for admission to the programme

We welcome applicants with a wide variety of educational experience including: A/AS levels, AVCE, BTEC National Diploma, Access Certificates, Scottish Highers, Irish Leaving Certificates (Higher Level), International Baccalaureate and a large number of equivalent home and overseas qualifications.

Offers made on a Tariff-point basis will take into account qualifications taken and points accumulated across both years of study. Generally, these will be at 280 Tariff points with a minimum of 200 points from two 6-unit numerate awards plus a third 6-unit award (BBC). At least two of these must be from a science or numerate based subjects.

Generally, we require applicants to have achieved passes in five GCSE subjects including Maths and English at grade C or above and passed at least two subjects through to six-unit Advanced GCE or Vocational Certificate of Education (VCE).

You must have competence in English language and we normally require Grade C GCSE or an equivalent qualification. The most common English Language requirements for international students are

IELTS 6.0 or TOEFL (paper based) 550 or TOEFL (internet based) 79 with specified minimum scores for each component.

Application from mature applicants with suitable life skills and experiences are also welcomed.

10. Aims of the programme

This programme aims to produce competent Design Engineers capable of playing an active role in formulating, meeting the challenges and opportunities arising in contemporary industrial and commercial practice.

Design in this programme is seen essentially as a practice both in the sense as an approach to problem solving and as a working method. Students will develop core design capabilities, which are developed and enhanced progressively through the course.

This programme explores the principles underlying the design and implementation of up-to-date digital systems needed in a variety of problem domains and provides the opportunity of realising such systems.

The programme's educational aims are:

- Develop individuals to operate proactively, challenging established thinking, while offering reasoned alternative views and solutions;
- Instil design thinking in engineering problem solving and identify opportunities for engineering innovation;
- Develop extensive knowledge and understanding of the necessary mathematical and computational tools used in the solution of real world problems, and in particular dealing with unfamiliar and complex design engineering scenarios;
- Build confidence to develop and implement modern technologies relevant to electronic products and systems;
- Develop an in-depth understanding of the scientific principles and techniques of design engineering within the context of electronic systems and products;
- Develop individuals to have the confidence in the application of

analytical and technical skills to undertake detail level design informed by a sound understanding and knowledge of design engineering through the concept, embodiment and validation stages of electronic product or systems development;
- Develop individual's management skills and to foster strong leadership qualities;
- Develop ability and confidence to apply these principles and methods in the practice of design engineering;
- Prepare individuals to engage meaningfully with projects both individually as well as in a team setting;
- Develop skills to critically evaluate appropriate processes of research, innovation, design and development;
- Develop the ability to communicate ideas effectively, verbally, in reports and by means of active participation in industry sponsored live projects;
- Raise awareness of the roles and responsibilities of Professional Design Engineers and of social and commercial environments in which they work;
- Develop practical knowledge of material properties, appropriate manufacturing processes and their cost effective use in the design and improvement of engineered products, processes and systems.

1. Programme outcomes

A. Knowledge and understanding

On completion of this programme the successful student will have knowledge and understanding of:

1. (comprehensive knowledge and understanding of) scientific principles and related engineering disciplines to enable the modelling and analyse complex engineering systems, processes and products and collect and analyse data and draw conclusions for the innovative solution of unfamiliar or novel engineering design problems using future developments and technologies.
2. Extensive knowledge and understanding of concepts, principles and theories of the design process and an appreciation of their limitations.

3. Detailed understanding and application of a systems approach to solving complex engineering problems within the context of Mechatronics.
4. In-depth knowledge and understand analytical techniques and engineering science relevant to Design Engineering within the context of Mechatronics.
5. The issues involved in systems engineering and the range of approaches used in industry to manage the resulting complexity.
6. Developing new technologies and applications relevant to Mechatronics.
7. User-focussed design practice.
8. Working with clients.
9. Commercial and business practices in relation to new product development.
10. Management and business practices used in engineering.
11. Professional and ethical responsibilities of engineers.

Teaching/learning methods

Students gain knowledge and understanding takes place through a combination of lectures, seminars, exercise classes, design build and test projects, forensic deconstruction, CAE and IT workshops, laboratory classes, industrial visits, group and individual project work, experimenting, constructing, analysing, assessing and discussing and self study.

Assessment Method

Students' knowledge and understanding is assessed by technical reports, coursework assignments, essays, presentations, and practical in-class tests.

B. Cognitive (thinking) skills

On completion of this programme the successful student will be able to:

1. Analyse and solve engineering problems using appropriate techniques and through critical thinking.
2. Model and analyse relevant engineering systems.
3. Full engagement with the design process.
4. Select and apply appropriate computer based methods for solving design engineering problems.
5. Fully evaluate external influences on the design process.

6. Innovatively design appropriate systems, components or processes.

Teaching/learning methods

Students learn cognitive skills through design projects, problem solving activities and through report writing.

Assessment Method

Students' cognitive skills are assessed by the products and systems design, with particular reference to their engagement with the design process and by coursework comprised of reports and essays.

C. Practical skills

On completion of the programme the successful student will be able to:

1. Comprehensive knowledge and understanding of the role and limitations of ICT and awareness of other developing technologies related to design engineering.
2. Ability to apply engineering design and design management techniques, taking account of a wide range of commercial and industrial constraints in engineering projects.
3. Plan, manage and undertake a design project, team or individual, including establishing user needs and technical specification, concept generation and evaluation, embodiment and detail design work, verification and review.
4. Ability to evaluate technical risk with an awareness of the limitations of possible solutions.
5. Use relevant laboratory and test equipment.
6. Use 2D and 3D CAD to prepare models.
7. Physical model making and prototyping.
8. Interfacing and system integration.

Teaching/learning methods

Students learn practical skills through design projects, specific skills inputs and set exercises.

Assessment Method

Students' practical skills are assessed by individual and group projects, lab reports, coursework assignments and practical tests.

D. Graduate Skills

On completion of this programme the successful student will be able to:

1. Communicate effectively in writing, verbally, graphically and through presentations to groups.
2. Apply mathematical methods to solving problems.
3. Demonstrate leadership skills and the ability to work effectively as a member of a team.
4. Plan and manage projects effectively
5. Write computer programmes and use CAE software and general IT tools and provide technical documentation.
6. Apply a scientific approach to the solving of problems.
7. Learn independently and to adopt a critical approach in investigation.
8. Develop initiative and creativity in problem solving.
9. Autonomous practice.
10. Design research methods.

Teaching/learning methods

Students acquire graduate skills through

Assessment method

Students' graduate skills are assessed by coursework assignments including design reports, laboratory reports, other written reports, problems sheets, case studies, software programs, industrial placement, group and individual project reports.

12.2 Levels and modules

Level 1 (Year 1)

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: PDE1400 Design Engineering Projects 1 (30 credits)		Student must pass all modules at level 1 to be able to progress on to level 2

PDE1410 Physical Computing: Electronics (30 credits) PDE1420 Physical Computing: Programming (30 credits) PDE1430 Formal Systems (30 credits)		
Level 2 (Year 2)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: PDE2400 Design Engineering Projects 2 (30 credits) PDE2410 Engineering in Context (30 credits) PDE2420 Control Systems (30 credits) PDE 2440 Robotics & Mechatronics (30 credits)		To progress on to a placement year students must pass all modules at level 2. To progress into level 3 without a placement students must pass PDE2410 and a minimum of 60 credits from the remaining modules. Additionally for progression to be granted with this credit deficit the assessment board need to be assured that the student has the wherewithal to pass the module at a second attempt with no further teaching.
Level 3 (optional extra year)		

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following:	Students may also choose to take the year-long placement module: PDE3250 Thick Sandwich Placement (120 credits – for Diploma of Industrial Studies.)	
Level 3 (Year 3/4)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: PDE3412 Advanced Mechatronics and Robotics (30 credits) PDE3422 Industrial Automation and Control (30 credits) PDE3400 Design Engineering Major Project (60 credits)		Student must pass ALL modules to progress to the MEng year.
Level 4 (Year 4/5)		

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: PDE4400 Team Project (60 credits)	Students must also choose 1 level 3 and 1 level 4 module from the following: PDE3410 Embedded Systems: Advanced Programming (30 credits) PDE3411 System-on-a-Chip Design (30 credits) PDE3420 Systems Design and Validation (30 credits) PDE3253 Dissertation, Research Methods, Articulation and Professional Practice (30 credits) PDE3440 Design and Innovation Management	Student must pass ALL modules at this stage.

	(30 credits) PDE4410 Embedded Multimedia Systems (30 credits) CCM4870 Wireless Networks and Mobile Computing (30 credits) CCM4875 Software Defined Radio and Digital Communication Systems (30 credits) CCM4880 Multimedia Signal Processing and Communication (30 credits)	

12.3 Non-compensatable modules	
Module level	***Module code***
3	*PDE3400*
4	PDE4400

13. Curriculum map
See after Programme Specifications

14. Information about assessment regulations

Please refer to the University Regulations for generic guidance and the PDE Programme Handbook, under section “Assessment”, for additional information.

15. Placement opportunities, requirements and support (if applicable)

Students have an option to follow this programme in Thick Sandwich (TKSW) mode. Students in TKSW mode undertake 4 years of study with the following pattern: Years 1 and 2 at the University; year 3 (36 to 48 weeks) on professional placement with an industrial partner; year 4 at the University.

Students following a TKSW placement year are supported through the process of securing a placement, which includes the legal and QAA requirements for placement learning, via tutorial support and the University Placement office.

Whilst on placement, each student is allocated a University placement tutor and a company workplace supervisor who provide the necessary support for a student to undertake a successful placement.

16. Future careers (if applicable)

Whilst on the programme students are encouraged to develop a commercial approach to design engineering via supported live projects with industrial partners and industrial placements. They undertake contextual studies into the nature and contexts of the profession. They interact with a variety of guest lecturers with professional backgrounds. They are supported in developing their exit portfolio, a CV and a career entry plan.

Through these experiences they come to understand design in a commercial context, the nature of the design industries and to plan for their own career entry and development.

17. Particular support for learning (if applicable)

Meeting the learning outcomes of this programme requires active participation in the subject and the development of autonomous practice in meeting design objectives. Supporting this level of active participation and autonomous practice is achieved via regular tutorial contact with academic staff, productive and informed support from technical staff and the use of online, resource-based learning materials where appropriate.
The subject provides extensive studio, laboratory and workshop facilities where students can engage with their coursework assignments in a supported and productive environment.

18. JACS code (or other relevant coding system)

H150 – Engineering Design

19. Relevant QAA subject benchmark group(s)

Engineering

20. Reference points

The following reference points were used in designing the programme:

- UK Standard for Professional Engineering Competence; Chartered Engineer and Incorporated Engineer Standard, Engineering Council UK, 2010.
- UK Standard for Professional Engineering Competence; The Accreditation of Higher Education Programmes, Engineering Council UK, 2008.
- IED Engineering Design Specific Learning Outcomes for EC(UK) Accredited Degree Programmes
- Subject Benchmark Statement: Engineering, The Quality Assurance Agency for Higher Education, 2006.
- Middlesex University Regulations
- Middlesex University and School of Engineering and Information Sciences Teaching Learning and Assessment policies and strategies
- University policy on equal opportunities**.**

21. Other information

N/A

Please note programme specifications provide a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve if s/he takes full advantage of the learning opportunities that are provided. More detailed information about the programme can be found in the rest of your programme handbook and the University Regulations.

Curriculum map for MEng Mechatronics

This section shows the highest level at which programme outcomes are to be achieved by all graduates, and maps programme learning outcomes against the modules in which they are assessed.

Programme learning outcomes

Knowledge and understanding		**Practical skills**	
A1	Comprehensive knowledge and understanding of scientific principles and related engineering disciplines to enable the modelling and analyse complex engineering systems, processes and products and collect and analyse data and draw conclusions for the innovative solution of unfamiliar or novel engineering design problems using future developments and technologies.	C1	Comprehensive knowledge and understanding of the role and limitations of ICT and awareness of other developing technologies related to design engineering.
A2	Extensive knowledge and understanding of concepts, principles and theories of the design process and an appreciation of their limitations.	C2	Ability to apply engineering design and design management techniques, taking account of a wide range of commercial and industrial constraints in engineering projects.
A3	Detailed understanding and application of a systems approach to solving complex engineering problems within the context of Mechatronics.	C3	Plan, manage and undertake a design project, team or individual, including establishing user needs and technical specification, concept generation and evaluation, embodiment and detail design work, verification and review.

A4	Understand analytical techniques and engineering science relevant to Design Engineering within the context of Mechatronics.	C4	Ability to evaluate technical risk with an awareness of the limitations of possible solutions.
A5	The issues involved in systems engineering and the range of approaches used in industry to manage the resulting complexity.	C5	Use relevant laboratory and test equipment.
A6	Developing new technologies and applications relevant to Mechatronics.	C6	Use 2D and 3D CAD to prepare models.
A7	User-focussed design practice.	C7	Physical model making and prototyping.
A8	Working with clients.	C8	Interfacing and system integration.
A9	Commercial and business practices in relation to new product development.		
A10	Management and business practices used in engineering.		
A11	Professional and ethical responsibilities of engineers.		
Cognitive skills		**Graduate Skills**	
B1	Analyse and solve engineering problems using appropriate techniques and through critical thinking.	D1	Communicate effectively in writing, verbally, graphically and through presentations to groups.
B2	Model and analyse relevant engineering systems.	D2	Apply mathematical methods to solving problems.
B3	Full engagement with the design process.	D3	Demonstrate leadership skills and the ability to work effectively as a member of a team.

B4	Select and apply appropriate computer based methods for solving design engineering problems.	D4	Plan and manage projects effectively
B5	Fully evaluate external influences on the design process.	D5	Write computer programmes and use CAE software and general IT tools and provide technical documentation.
B6	Innovatively design appropriate systems, components or processes.	D6	Apply a scientific approach to the solving of problems.
		D7	Learn independently and to adopt a critical approach in investigation.
		D8	Develop initiative and creativity in problem solving.
		D9	Autonomous practice.
		D10	Design research methods.

Programme outcomes																																			
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	
Highest level achieved by all graduates																																			
3	3	4	4	3	4	3	3	3	3	3	3	4	3	4	3	4	4	3	3	3	4	3	3	3	3	3	3	3	3	3	3	3	3	3	

Module Title	Module Code	Programme outcomes																																		
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10

Design Engineering Projects 1	PDE 1400							X	X	X		X	X	X	X	X		X			X		X	X	X		X	X	X	X	X		X	X		X
Physical Computing: Electronics	PDE 1410				X								X	X									X		X			X				X	X	X	X	
Physical Computing: Programming	PDE 1420				X								X			X			X				X			X	X	X	X		X		X	X		
Formal Systems	PDE 1430				X								X	X				X										X					X			
Design Engineering Projects 2	PDE 2400		X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Engineering in Context	PDE 2410		X			X				X	X	X					X			X		X					X			X			X			X
Control Systems	PDE 2420	X	X	X	X	X							X	X		X		X	X		X		X	X	X	X	X	X			X	X	X	X	X	X
Robotics & Mechatronics	PDE 2440	X	X	X	X	X	X						X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	

Thick Sandwich Placement	PDE 3250					X			X	X	X	X	X	X	X					X	X						X	X	X	X		X	X		X	
Design Engineering Major Project	PDE 3400	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Advanced Mechatronics and Robotics	PDE 3412	X			X								X	X		X		X	X		X		X	X	X	X	X	X	X				X	X	X	X	X
Industrial Automation and Control	PDE 3422	X	X	X	X	X							X	X		X		X	X		X		X	X	X	X	X	X	X			X	X	X	X	X	X
Team Project	PDE 4400	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MEng Options																																						

Embedded Systems: Advanced Programming	PDE 3410	X		X	X		X						X	X		X		X	X				X		X	X	X	X			X	X	X		X	X
System-on-a-Chip Design	PDE 3411		X	X			X						X	X		X		X	X		X		X			X	X				X	X	X	X	X	X	X
Systems Design and Validation	PDE 3420	X	X	X	X	X								X			X	X	X		X						X			X		X					
Design Dissertation	PDE 3253		X		X	X				X	X									X	X	X					X						X			X	
Design and Innovation Management	PDE 3440		X			X				X	X	X						X			X		X					X			X			X			X
Embedded Multimedia Systems	PDE 4410				X		X						X	X		X		X	X				X		X	X					X	X					

Wireless Networks and Mobile Computing	CCM 4870	X		X	X		X							X		X		X	X				X		X	X	X	X							X					
Software Defined Radio and Digital Communication Systems	CCM 4875			X	X		X							X		X		X	X				X	X	X	X	X	X							X					X
Multimedia Signal Processing and Communication	CCM 4880	X		X	X		X						X	X		X		X	X				X	X				X				X	X							

Programme Specification and Curriculum Map for *BEng (Hons) Mechatronics*

1. Programme title	BEng Hons Mechatronics
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University
4. Programme accredited by	
5. Final qualification	Bachelor in Engineering with Honours Mechatronics
6. Academic year	2014-2015
7. Language of study	English
8. Mode of study	FT /PT/ TKSW

9. Criteria for admission to the programme

We welcome applicants with a wide variety of educational experience including: A/AS levels, AVCE, BTEC National Diploma, Access Certificates, Scottish Highers, Irish Leaving Certificates (Higher Level), International Baccalaureate and a large number of equivalent home and overseas qualifications.

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Generally, we require applicants to have achieved passes in five GCSE subjects including Maths and English at grade C or above and passed at least

two subjects through to six-unit Advanced GCE or Vocational Certificate of Education (VCE).

You must have competence in English language and we normally require Grade C GCSE or an equivalent qualification. The most common English Language requirements for international students are IELTS 6.0 or TOEFL (paper based) 550 or TOEFL (internet based) 79 with specified minimum scores for each component.

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10. Aims of the programme

This programme aims to produce competent Design Engineers capable of playing an active role in formulating, meeting the challenges and opportunities arising in contemporary industrial and commercial practice.

Design in this programme is seen essentially as a practice both in the sense as an approach to problem solving and as a working method. Students will develop core design capabilities, which are developed and enhanced progressively through the course.

This programme explores the principles underlying the design and implementation of up-to-date digital systems needed in a variety of problem domains and provides the opportunity of realising such systems.

The programme's educational aims are:

- Instil design thinking in engineering problem solving;
- Understanding of the necessary mathematical and computational tools used in the solution of real world problems, and in particular dealing with unfamiliar and complex design engineering scenarios;
- Build confidence to develop modern electronic products and systems incorporating up-to-date electrical and mechanical components along with the associated software programmes;
- Develop understanding of the scientific principles and techniques of design engineering within the context of electronic systems and products;

- Develop confidence in the application of analytical and technical skills to undertake detail level design informed by a sound understanding and knowledge of design engineering through the concept, embodiment and validation stages of electronic product or systems development;
- Develop ability to apply these principles and methods in the practice of design engineering;
- Prepare individuals to engage meaningfully with projects both individually as well as in a team setting;
- Develop the ability to communicate ideas effectively, verbally, in reports and by means of active participation in industry sponsored live projects;
- Raise awareness of the roles and responsibilities of Professional Design Engineers and of social and commercial environments in which they work;
- Develop practical knowledge of material properties, appropriate manufacturing processes and their cost effective use in the design and improvement of engineered products, processes and systems.

11. Programme outcomes

A. Knowledge and understanding

On completion of this programme the successful student will have knowledge and understanding of:

1. Scientific principles and methods necessary to underpin education in engineering, to enable the modelling and analysis of non-routine engineering systems, processes and products, and collect and interpret data and draw conclusions in the solution of familiar engineering design problems recognising their limitations.
2. Concepts, principles and theories of the design process and an appreciation of their limitations.
3. And application of a systems approach to solving complex engineering problems within the context of Mechatronics.
4. Understand analytical techniques and engineering science relevant to Design Engineering within the context of Mechatronics.
5. The issues involved in systems engineering and the range of approaches used in industry to manage the resulting complexity.

6. Developing new technologies and applications relevant to Mechatronics.
7. User-focussed design practice.
8. Working with clients.
9. Commercial and business practices in relation to new product development.
10. Management and business practices used in engineering.
11. Professional and ethical responsibilities of engineers.

Teaching/learning methods

Students gain knowledge and understanding takes place through a combination of lectures, seminars, exercise classes, design build and test projects, forensic deconstruction, CAE and IT workshops, laboratory classes, industrial visits, group and individual project work, experimenting, constructing, analysing, assessing and discussing and self study.

Assessment Method

Students' knowledge and understanding is assessed by technical reports, coursework assignments, essays, presentations, and practical in-class tests.

B. Cognitive (thinking) skills

On completion of this programme the successful student will be able to:

1. Analyse and solve engineering problems using appropriate techniques and through critical thinking.
2. Model and analyse relevant engineering systems.
3. Full engagement with the design process.
4. Select and apply appropriate computer based methods for solving design engineering problems.
5. Fully evaluate external influences on the design process.
6. Innovatively design appropriate systems, components or processes.

Teaching/learning methods

Students learn cognitive skills through design projects, problem solving activities and through report writing.

Assessment Method

Students' cognitive skills are assessed by the products and systems design, with particular reference to their engagement with the design process and by coursework comprised of reports and essays.

C. Practical skills

On completion of the programme the successful student will be able to:

1. Demonstrate knowledge and understanding of the role and limitations of common ICT tools and to specify requirements for computer-based engineering design tools to solve unfamiliar problems.
2. Ability to apply engineering design and design management techniques, taking account of a wide range of commercial and industrial constraints in engineering projects.
3. Plan, manage and undertake a design project, team or individual, including establishing user needs and technical specification, concept generation and evaluation, embodiment and detail design work, verification and review.
4. Ability to evaluate technical risk with an awareness of the limitations of possible solutions.
5. Use relevant laboratory and test equipment.
6. Use 2D and 3D CAD to prepare models.
7. Physical model making and prototyping.
8. Interfacing and system integration.

Teaching/learning methods

Students learn practical skills through design projects, specific skills inputs and set exercises.

Assessment Method

Students' practical skills are assessed by individual and group projects, lab reports, coursework assignments and practical tests.

D. Graduate Skills

On completion of this programme the successful student will be able to:

1. Communicate effectively in writing, verbally, graphically and through presentations to groups.
2. Apply mathematical methods to solving problems.
3. Demonstrate leadership skills and the ability to work effectively as a member of a team.
4. Plan and manage projects effectively
5. Write computer programmes and use CAE software and general IT tools and provide technical documentation.
6. Apply a scientific approach to the solving of problems.
7. Learn independently and to adopt a critical approach in investigation.
8. Develop initiative and creativity in problem solving.
9. Autonomous practice.
10. Design research methods.

Teaching/learning methods

Students acquire graduate skills through

Assessment method

Students' graduate skills are assessed by coursework assignments including design reports, laboratory reports, other written reports, problems sheets, case studies, software programs, industrial placement, group and individual project reports.

12. Programme structure (levels, modules, credits and progression requirements)

12. 1 Overall structure of the programme

See page 20 for a diagram of the overall structure of the programme.

12.2 Levels and modules

Level 1 (Year 1)

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

Students must take all of the following: PDE1400 Design Engineering Projects 1 (30 credits) PDE1410 Physical Computing: Electronics (30 credits) PDE1420 Physical Computing: Programming (30 credits) PDE1430 Formal Systems (30 credits)		Student must pass all modules at level 1 to be able to progress on to level 2
Level 2 (Year 2)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

Students must take all of the following: PDE2400 Design Engineering Projects 2 (30 credits) PDE2410 Engineering in Context (30 credits) PDE2420 Control Systems (30 credits) PDE 2440 Robotics & Mechatronics (30 credits)	Students must take all of the following: PDE2400 Design Engineering Projects 2 (30 credits) PDE2410 Engineering in Context (30 credits) PDE2420 Control Systems (30 credits) PDE 2440 Robotics & Mechatronics (30 credits)	Students must take all of the following: PDE2400 Design Engineering Projects 2 (30 credits) PDE2410 Engineering in Context (30 credits) PDE2420 Control Systems (30 credits) PDE 2440 Robotics & Mechatronics (30 credits)
Level 3 (optional extra year)		

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following:	Students must take all of the following: PDE3250 Thick Sandwich Placement (120 credits – for Diploma of Industrial Studies.)	
Level 3 (Year 3/4)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: PDE3412 Advanced Mechatronics and Robotics (30 credits) PDE3422 Industrial Automation and Control (30 credits) PDE3400 Design Engineering Major Project (60 credits)		Student must pass ALL modules at level 3 to graduate.

12.3 Non-compensatable modules	
Module level	***Module code***

3	*PDE3400*

13. Curriculum map

See after Programme Specifications

14. Information about assessment regulations

Please refer to the University Regulations for generic guidance and the PDE Programme Handbook, under section “Assessment”, for additional information.

15. Placement opportunities, requirements and support (if applicable)

Students have an option to follow this programme in Thick Sandwich (TKSW) mode. Students in TKSW mode undertake 4 years of study with the following pattern: Years 1 and 2 at the University; year 3 (36 to 48 weeks) on professional placement with an industrial partner; year 4 at the University.

Students following a TKSW placement year are supported through the process of securing a placement, which includes the legal and QAA requirements for placement learning, via tutorial support and the University Placement office.

Whilst on placement, each student is allocated a University placement tutor and a company workplace supervisor who provide the necessary support for a student to undertake a successful placement.

16. Future careers (if applicable)

Whilst on the programme students are encouraged to develop a commercial approach to design engineering via supported live projects with industrial partners and industrial placements. They undertake contextual studies into the nature and contexts of the profession. They interact with a variety of guest lecturers with professional backgrounds. They are supported in developing their exit portfolio, a CV and a career entry plan.

Through these experiences they come to understand design in a

commercial context, the nature of the design industries and to plan for their own career entry and development.

17. Particular support for learning (if applicable)

Meeting the learning outcomes of this programme requires active participation in the subject and the development of autonomous practice in meeting design objectives. Supporting this level of active participation and autonomous practice is achieved via regular tutorial contact with academic staff, productive and informed support from technical staff and the use of online, resource-based learning materials where appropriate.

The subject provides extensive studio, laboratory and workshop facilities where students can engage with their coursework assignments in a supported and productive environment.

18. JACS code (or other relevant coding system)

H150 – Engineering Design

19. Relevant QAA subject benchmark group(s)

Engineering

20. Reference points

The following reference points were used in designing the programme:

- UK Standard for Professional Engineering Competence; Chartered Engineer and Incorporated Engineer Standard, Engineering Council UK, 2010.
- UK Standard for Professional Engineering Competence; The Accreditation of Higher Education Programmes, Engineering Council UK, 2008.
- IED Engineering Design Specific Learning Outcomes for EC(UK) Accredited Degree Programmes
- Subject Benchmark Statement: Engineering, The Quality Assurance Agency for Higher Education, 2006.

- Middlesex University Regulations
- Middlesex University and School of Engineering and Information Sciences Teaching Learning and Assessment policies and strategies
- University policy on equal opportunities**.**

21. Other information
N/A

Please note programme specifications provide a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve if s/he takes full advantage of the learning opportunities that are provided. More detailed information about the programme can be found in the rest of your programme handbook and the University Regulations.

Curriculum map for BEng Mechatronics

This section shows the highest level at which programme outcomes are to be achieved by all graduates, and maps programme learning outcomes against the modules in which they are assessed.

Programme learning outcomes

Knowledge and understanding		**Practical skills**	
A1	Scientific principles and methods necessary to underpin education in engineering, to enable the modelling and analysis of non-routine engineering systems, processes and products, and collect and interpret data and draw conclusions in the solution of familiar engineering design problems recognising their limitations.	C1	Demonstrate knowledge and understanding of the role and limitations of common ICT tools and to specify requirements for computer-based engineering design tools to solve unfamiliar problems.
A2	Concepts, principles and theories of the design process and an appreciation of their limitations.	C2	Ability to apply engineering design and design management techniques, taking account of a wide range of commercial and industrial constraints in engineering projects.
A3	And application of a systems approach to solving complex engineering problems within the context of Mechatronics.	C3	Plan, manage and undertake a design project, team or individual, including establishing user needs and technical specification, concept generation and evaluation, embodiment and detail design work,

			verification and review.
A4	Understand analytical techniques and engineering science relevant to Design Engineering within the context of Mechatronics.	C4	Ability to evaluate technical risk with an awareness of the limitations of possible solutions.
A5	The issues involved in systems engineering and the range of approaches used in industry to manage the resulting complexity.	C5	Use relevant laboratory and test equipment.
A6	Developing new technologies and applications relevant to Mechatronics.	C6	Use 2D and 3D CAD to prepare models.
A7	User-focussed design practice.	C7	Physical model making and prototyping.
A8	Working with clients.	C8	Interfacing and system integration.
A9	Commercial and business practices in relation to new product development.		
A10	Management and business practices used in engineering.		
A11	Professional and ethical responsibilities of engineers.		
Cognitive skills		**Graduate Skills**	
B1	Analyse and solve engineering problems using appropriate techniques and through critical thinking.	D1	Communicate effectively in writing, verbally, graphically and through presentations to groups.
B2	Model and analyse relevant engineering systems.	D2	Apply mathematical methods to solving problems.

B3	Full engagement with the design process.	D3	Demonstrate leadership skills and the ability to work effectively as a member of a team.
B4	Select and apply appropriate computer based methods for solving design engineering problems.	D4	Plan and manage projects effectively
B5	Fully evaluate external influences on the design process.	D5	Write computer programmes and use CAE software and general IT tools and provide technical documentation.
B6	Innovatively design appropriate systems, components or processes.	D6	Apply a scientific approach to the solving of problems.
		D7	Learn independently and to adopt a critical approach in investigation.
		D8	Develop initiative and creativity in problem solving.
		D9	Autonomous practice.
		D10	Design research methods.

Programme outcomes																																						
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10				
Highest level achieved by all graduates																																						
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3				

Module Title	Module Code	Programme outcomes																																				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10		
Design Engineering Projects 1	PDE1400							X	X	X		X	X	X	X	X		X			X		X	X	X		X	X	X	X	X		X	X		X		
Physical Computing: Electronics	PDE1410				X								X	X									X		X			X				X	X	X	X				
Physical Computing: Programming	PDE1420				X								X			X			X				X			X	X	X	X		X		X	X				
Formal Systems	PDE1430				X								X	X				X										X					X						

Design Engineering Projects 2	PDE2400		X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Engineering in Context	PDE2410		X			X				X	X	X					X			X		X					X			X			X			X
Control Systems	PDE2420	X	X	X	X	X							X	X		X		X	X		X		X	X	X	X	X	X			X	X	X	X	X	X
Robotics & Mechatronics	PDE 2440	X	X	X	X	X	X						X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
Thick Sandwich Placement	PDE3250					X			X	X	X	X	X	X	X					X	X						X	X	X		X		X	X		X	
Design Engineering Major Project	PDE3400	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Advanced Mechatronics and Robotics	PDE3412	X			X								X	X		X		X	X		X		X	X	X	X	X	X				X	X	X	X	X
Industrial Automation and Control	PDE3422	X	X	X	X	X							X	X		X		X	X		X		X	X	X	X	X	X			X	X	X	X	X	X
Team Project	PDE4400	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MEng Options																																				

Embedded Systems: Advanced Programming	PDE3410	X		X	X		X						X	X		X		X	X				X		X	X	X	X			X	X	X		X	X
System-on-a-Chip Design	PDE3411		X	X			X						X	X		X		X	X		X		X			X	X				X	X	X	X	X	X
Systems Design and Validation	PDE3420	X	X	X	X	X								X			X	X	X		X						X			X		X					
Design Dissertation	PDE3253		X		X	X				X	X									X	X	X					X						X			X
Design and Innovation Management	PDE3440		X			X				X	X	X					X			X		X					X			X			X			X