Programme Handbook

Faculty of Science and Technology

BEng/MEng Mechatronics

Design Engineering and Maths Department | 2017

Name: _____

Contents

Introduction

Your Programme Handbook

The purpose of this Handbook is to introduce you to your programme of study and to direct you to other general information about studying at Middlesex University. The material in this document is as accurate as possible at the date of production; however, you will be informed of any major changes in a timely manner.

Your comments on any improvements to this handbook are welcome. Please put them in writing (an email will suffice) with the name of the Programme Handbook to

Vaibhav Gandhi
v.gandhi@mdx.ac.uk
Programme Leader
Room: TG21
Ext: 5511

Information in Alternative Formats

This handbook can be found online at: ***https://myunihub.mdx.ac.uk/***

If you have a disability which makes navigating the website difficult and you would like to receive information in an alternative format, please contact ***disability @mdx.ac.uk***

We can supply sections from this publication as:

- a Word document with enlarged type — sent by email or supplied on a CD or memory stick
- printed copy with enlarged type
- printed copy on non-white paper
- as Braille

Other formats may be possible. We will do our best to respond promptly. To

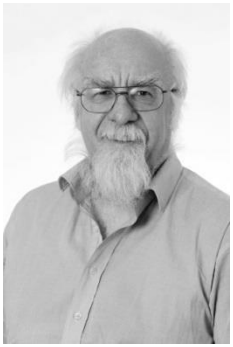
help us, please be as specific as you can about the information you require and include details of your disability.

The Student University Guide

Before reading this Programme Handbook you should read the Student University Guide; this guide contains information on more general university services and facilities, such as UniHub, UniHelp and the Library. It is important that you familiarise yourself with this information in order to get the most from your handbook.

Welcome to Middlesex!

Welcome from the Dean



Welcome to Middlesex University and to the Faculty of Science and Technology. This programme handbook contains an overview of your programme and its modules – keep it safe so that you may refer to it throughout your time on the programme.

Your programme handbook along with other key documents, such as the Academic Regulations and the University Guide, sets out what you can expect from your experience at Middlesex University but also what is expected from you. From our side we will aim to deliver the best student experience we can so that you can build on your skills and knowledge and achieve your full potential. In return we expect you to engage actively in the learning process, to be fully committed to your studies and determined to succeed.

To read more about what your responsibilities may be you should refer to the full University Regulations and in particular 'University Membership' (mdx.ac.uk/regulations). In your early weeks you are not expected to absorb everything in detail but to be aware of key documents and their content. If you have not already done so, have a look at the University Guide and explore UniHub (unihub.mdx.ac.uk) the student website which contains detailed advice and support to assist you further.

We know it takes time to settle in to University life. If you have questions to ask your first port of call should be UniHelp (unihub.mdx.ac.uk/unihelp) which offers face-to-face, email and telephone information and advice seven days a week. The UniHelp desk is located on the Ground Floor of the Sheppard Library and the advisors there will be pleased to help and direct you.Here at Middlesex University, we are very proud of our academic programmes and students and we look forward to meeting you.

Professor Martin Loomes
PVC, Executive Dean - Faculty of Science and Technology

Town Hall - T114
E: m.loomes@mdx.ac.uk
T: 020 8411 5344

Welcome from your Programme Leader

Welcome to Middlesex University!

Congratulations on gaining a place in Mechatronics at Middlesex University. When your studies begin you will quickly observe the high levels of commitment and professionalism displayed by the staff and students involved in our programmes. In this degree programme you will study a range of topics that have been selected to prepare you for employment in a wide range of automation and robotics related areas, or to continue with your studies as a postgraduate student.

Studying at university can be a challenge and we want you to succeed. We think that this course is exciting, full of challenges and one that will allow you to get engaged with some of the latest engineering technologies and learn to use, adapt and develop them and to explore and solve real world practical problems. You will learn several of the latest software skills in industrial automation & control, and also write reports on your research ideas confidently. You will also prepare a digital portfolio of the work you carry out here, which will help you to showcase and demonstrate your skills to prospective employers. I encourage you to be active and immerse yourself in every experience we provide. You will need to work hard during your first year in order to ensure success and acquire a solid grounding for later years' study. If you approach your studies with this level of enthusiasm and commitment, then I know that your experience will be both interesting and enjoyable and that you will be successful in gaining the qualification that you are seeking. In addition to Lecturers and Technical Tutors, we also have Graduate Academic Assistants (GAAs) and Student Learning Assistants (SLA) to help you and support you inside and outside of the class contact times.

I hope that you will enjoy your course and make the most of the opportunities for some hard work and fun too whilst you are here. If you have any questions, problems, or just need a chat, then please contact me, and I will do what I can to help or advise.

I look forward to working with you during your time at Middlesex University.

Best wishes and good luck for your studies,

Vaibhav Gandhi
v.gandhi@mdx.ac.uk
Programme Leader
Room: TG21
Ext: 5511

Academic Calendar

2017/2018 London Academic Calendar - Undergraduate September starters

September/October 2017

25	Welcome / Freshers Week
2	Teaching starts for autumn term

October 2017

23-27	Reality Check Week

November/December 2017

27-1	Programme Progress Review Week
15	Last day of teaching in the autumn term

December 2017/January 2018

20-2	University closed for Christmas vacation
18-5	Christmas vacation

January 2018

3	University re-opens after Christmas
8	Teaching starts for winter term

February 2018

19-23	Programme Progress Review Week

March 2018/April 2018

23	End of teaching
26-6	Easter vacation

April 2018/May 2018

23-15	End of year examinations

May 2018

7 and 28	Bank Holiday

June 2018

18 (9am)	Publication of module results
25	Summer School begins
28 (5pm)	Publication of progression decisions
29 (5pm)	Final qualification results published

July 2018

9-13	Graduation Ceremonies
16-20	Deferred /reassessment examinations (H&E and S&T students)

August 2018

3	Summer School ends
20-29	Deferred /reassessment examinations (all students except H&E and S&T)
27	Bank Holiday

September 2018

11 (5pm)	Publication of module results
17 (5pm)	Publication of progression decisions
21 (5pm)	Final qualification results published

Student attendance dates

21 Sep – 15 Dec (13 wks)	(new international students)
25 Sep – 15 Dec (12 wks)	(new students)
2 Oct – 15 Dec (11 wks)	(returning students)
8 Jan – 23 Mar (11 wks)	
9 Apr – 22 Jun (11 wks)	UG only

Learning Framework Term dates

Autumn Term	2 Oct - 15 Dec 2017	(11 learning weeks)
Winter Term	8 Jan - 23 Mar 2018	(11 learning weeks)
Spring Term	9 Apr - 13 Jul 2018	(14 learning weeks)
Summer Term	16 Jul - 28 Sep 2018	(11 learning weeks)

Programme Details

Your Programme Team

Dr Vaibhav Gandhi

Senior Lecturer in Robotics, Embedded Systems, and Real time systems, Programme Leader BEng/BSc Design Engineering
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Designers in Residence

Helena Ambrosio

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Email: H.Ambrosio@mdx.ac.uk

Peter Frank

Email:
peter.frank@productinnovation.com

Visiting Professors

Prof Bettina von Stamm — Innovation Leadership

Prof Michael MacDonagh — Ford Motor Company

Prof Phil Gray	Quadro Consulting

Senior Graduate Academic Assistants/ Graduate Academic Assistant (SGAA/ GAA)

There are a number of GAAs who work with the programme. GAAs are recent Middlesex graduates who work with your tutors to assist in both teaching and supporting you. For example they may run drop in session to give advice on your assignments and revision as well as providing technical support during project work or tutorials. They do not mark your assessment or provide you with feedback on your progress.

The SGAAs/GAAs below are the ones you will have regular contact with:

Denis Tsvetkov
D.Tsvetkov@mdx.ac.uk

Matthew Bulat
M.Bulat@mdx.ac.uk

Luke Bennett
L.C.Bennett@mdx.ac.uk

Mehnaz Mahaboob
m.mahaboob@mdx.ac.uk

Course costs

The following course-related costs are included in the fees:

- A free electronic core textbook for every module,
- All printing and copying required for your study,
- Self-service laptops available for loan for a maximum of 24 hours,
- Audio-visual equipment available for loan, including digital stills cameras, digital video recorders, digital audio recorders.

Further details on specific additional equipment required which is not included in your fees can be requested from the Programme Leader.

Your Modules

Your first year modules are:

PDE1400 Design Engineering Projects 1 [30]

PDE1410 Physical Computing: Electronics [30]

PDE1420 Physical Computing: Programming [30]

PDE1430 Formal Systems[30]

You can find a list of the modules you are currently registered for within the My Learning area on the My Study page of myUniHub; https://myunihub.mdx.ac.uk/web/home-community/mystudy.

When you click on any of the modules you will be able to access associated learning materials (e.g. lecture notes), reading lists, information on the learning aims and outcomes and assessment methods as well the schedule for assessment which will include deadlines for the submission of your assessment.

Announcements for any of your modules will also appear in My Learning on myUniHub so you should log in and check each module regularly.

Your Programme Feedback

Student Voice Leaders

Working in partnership, Middlesex University and MDXSU support students to talk, take action and to help make Middlesex better – understanding how everyone feels about their university experience and making change happen.

Each year of every programme is represented by a Student Voice Leader – a student who is elected to work with students and academics to get feedback on what is good and what needs improving on your course. They represent you and make students' voices heard, collaborating with everyone at university to create the best possible student experience, and working with MDXSU's President and Vice Presidents to create changes that will improve Middlesex for everyone.

Any student can stand to be a Voice Leader and every student gets a vote in the election – for more information visit http://www.mdxsu.com/voice-leaders.

Programme Voice Groups

The Programme Voice Groups (PVG's) are one of the main formal channels of communication between staff and students. They are a forum in which students (through the Student Voice Leaders) and staff can constructively discuss areas of good practice as well as areas needing improvement, with the collective aim of enhancing the student experience. Students and Staff should both be given assurances they will not be penalised for raising issues at a PVG.

PVG's occur each term and your Student Voice Leader will ask for programme feedback from you to report to staff at the pre-meeting to develop and agenda, for the issues to be addressed at the main meeting. You will also be given feedback from both staff and the Student Voice Leaders on the outcomes of the feedback.

The dates of the Programme Voice Groups for 2017/18 are:

- ***TBD***

Minutes and actions from previous PVG's (formerly Boards of Study) should be made available to you through MyUniHub. Further guidance on the PVG's can be found here*:* *https://unihub.mdx.ac.uk/your-middlesex/student-feedback/*

Surveys

Throughout your time at Middlesex you will be asked to complete several surveys that request your feedback on your programme or modules. The aim of the surveys is to gather your feedback to make improvements to current and future cohorts of students, and enhance the quality of your experience. During your studies, you will be asked to complete the surveys listed below;

Module Feedback – Most students, at different stages in their programme, will be asked to complete a survey for each of their modules. These are short online surveys that usually take place in term two, and provide module leaders an opportunity to consider and implement your feedback to improve the modules available on you programme. You will be asked to complete module feedback surveys throughout your programme.

UK Engagement Survey (UKES) – This provides an independent anonymised way for undergraduate students to feedback of your experience. The survey will focus on your experience and engagement with your programme to allow staff to determine whether any developments or changes are required to improve your experience. This survey is anonymous and managed by an external body called the Higher Education Academy. You will be asked to complete this survey for the first and second year of your course.

The National Student Survey (NSS) – The NSS gives us independent anonymised data of finalist undergraduates' experience throughout their time at Middlesex University. This survey is completed by all final year students nationally, and asks questions based on your overall student experience on your programme. This survey is also anonymous and is managed by an external body called Ipsos-MORI. You will be asked to complete the survey in term 2 of your final year.

Facilities and support services – To ensure that we are delivering the best for students, we will ask students to take part in surveys about our support services. These surveys will be completed at different points during the academic year and are used to enhance your non-academic experience at Middlesex.

How your Programme is Quality Assured

You may have not heard the terms 'quality assurance', 'academic quality', 'academic standards' before and now you have you may think they have nothing to do with you, however these terms are important to you and your programme. The below definitions explain why;

'**Quality'** refers to how well Middlesex supports you in your learning and covers the following areas: the teaching, the support available, the resources available, and how you are assessed.

'**Standards'** refers to the level of achievement you need to succeed on your course and get your qualification. Standards should not vary from one higher education provider to another.

Having both quality and standards means that you and everyone else can have confidence in your degree and your education.

Quality assurance is therefore mainly about maintaining standards and ensuring you have the best possible experience at Middlesex. The University has a range of quality assurance processes and procedures which include the following:

- Programme approval and validation –The process a programme must go through before it can run.
- Programme review – A process which looks at programmes every 6 years to see how they have been running.
- Annual monitoring – How the University reviews how programmes are doing every year.
- External Examining – Independent moderators who help ensure academic standards are being met but are also comparable nationally.

- Student feedback and representation – This includes student surveys, Boards of Study and student representation.

Further information on quality assurance and enhancement can be found here: *http://unihub.mdx.ac.uk/your-study/ensuring-quality*

Resources and Support Available

Library Resources
The University provides a range of support and resources to help you with your studies.

Every student is given a free eTextbook for each module you study. This is chosen by your module leader and can be read online or downloaded to a computer of handheld device. You can access your eTextbooks via MyLearning.

Other learning materials are provided by the Library and the most important ones are gathered together on an online reading list created by your module leader and Liaison Librarian. Your reading list will be in your module area on MyLearning.

There are a variety of ways that you can get help with your studies. The Study Hub on the first floor of the Sheppard Library is a drop in centre for all your queries:

http://unihub.mdx.ac.uk/your-study/studyhub

Every day you will find librarians, Academic Writing and Maths teachers as well as Student Learning Assistants and IT experts available to help you and provide advice. If your query is more in depth you can make an appointment with your Liaison librarian or AWL teacher,

http://unihub.mdx.ac.uk/your-study/library-and-it-support/help-and-support/specialist-advice-and-appointments

http://unihub.mdx.ac.uk/your-study/learning-enhancement-team/tutorials

and they will also be coming into your seminars during the year to teach you skills which will help you succeed in your course.

Finally, there are online resources which you can use in your own time to study where and when you choose:

http://unihub.mdx.ac.uk/your-study/library-and-it-support

http://unihub.mdx.ac.uk/your-study/learning-enhancement-team

Student Support

Student Support Services
UniHelp is the University's central service through which you can access a range of support for the kinds of concerns that might arise throughout your study here. You can contact UniHelp online, by phone, in person and via Chat.

http://unihub.mdx.ac.uk/your-support-services/unihelp

You can also use our FAQs to find the answer to your question here:

http://wgfp-prrw02.mdx.ac.uk:8001/KnowledgeBase/FaqSearch.aspx

If you prefer to talk to us in person, you can find UniHelp on the ground floor of the Sheppard Library at the Hendon Campus, where we are located with a number of support services who can help you with more complex and specialist queries.

Some of the services working alongside us are the:

Student Welfare Advice Team – providing information and advice on money and funding matters, and housing

http://www.mdx.ac.uk/life-at-middlesex/support-services/finance/student-welfare

International Student Advice Team – providing information and advice on visa and immigration concerns, for both international applicants and current international students,

http://unihub.mdx.ac.uk/your-support-services/visas-international and the

Chinese Student Liaison Officer – providing assistance to Chinese-speaking students of our community

All of these services can also be contacted by email or online enquiry form, and you can find appointment bookings, drop-in sessions and other event details on the Student Support pages of UniHub.

http://unihub.mdx.ac.uk/your-support-services

If you are referred by academic staff for additional support with your studies or you wish to change programme or mode of study, UniHelp can enable your referral to the **Progression and Support Team.** The Progression and Support Advisors work with Faculties to help students experiencing difficulties with their studies. Progression and Support Advisors may be able to assist with:

- A change of personal circumstance (for example a period of illness or bereavement)
- Understanding University and programme regulations
- Changing to part-time study
- Interrupting your studies.
- Navigating other support services where students' cases are complex and/or severe and ongoing.

You may be referred to a Progression and Support Advisor by your Academic Adviser or other support service when appropriate, to support you through a period of difficulty in your studies.

http://unihub.mdx.ac.uk/your-study/progression-and-support-advisors

Wellbeing Services

Disability and Dyslexia Support

The Middlesex University Disability Service arranges reasonable adjustments and support packages for students with a wide range of disabilities and medical conditions, including:

- Specific learning difficulties (i.e. dyslexia)

- Mental Health conditions
- Visual impairment
- Mobility issues
- Ongoing illness
- Hearing impairment
- Autism Spectrum Disorders

The sooner you disclose a condition to us the earlier we will be able to arrange support for you. To book an appointment to arrange support please contact the service on 0208 411 2502 or email us at disability@mdx.ac.uk. If you'd like to call over and have a chat with a Disability Adviser please come along to our daily drop in session at 1pm in Sunny Hill House. There's no need to book.

Do you think you might have dyslexia?

If you think you may have dyslexia but have never been tested before then book a dyslexia screening with us by calling on 0208 411 2502 or email us at disability@mdx.ac.uk. The screening will give an indication of possible dyslexia difficulties and where appropriate we will refer you to an external assessor for a full diagnostic assessment.

In the basement area of the Sheppard Library you can find the **North London Regional Access Centre** where services for assessment of disabilities, including dyslexia, are available.
http://unihub.mdx.ac.uk/your-support-services/north-london-regional-access-centre-nlrac

Here you can find:

- Advice and guidance about the needs assessment process
- On-going support to resolve issues about equipment and support recommendations
- Suitable equipment recommendations and practical support strategies to overcome barriers to learning
- Recommendations for reasonable adjustments
- Assistive technology training to help you to use your recommended equipment effectively
- Liaison with support providers to ensure support is arranged quickly and effectively.

Counselling and Mental Health Services
The Counselling & Mental Health team provides mental wellbeing support and a confidential counselling/psychological therapy service to help you manage any challenges that arise while you study with us. We also run workshops on issues connected to mental wellbeing and university life during the academic year.

To refer yourself for an initial assessment appointment, please use this link on our UniHub Counselling & Mental Health pages:

https://unihelp.mdx.ac.uk/counsellingandmentalhealth

We have some same-day 'mini' appointments of 25 minutes each available Monday to Friday. To book an appointment, go to the Counselling & Mental Health UniHub page and follow this link:

http://mdxcounselling.libcal.com/rooms.php?s=counselling&_ga=1.180783015.1088726360.1463741628

For general enquiries, the team can be contacted at: counselling@mdx.ac.uk or you can call us on 020 8411 4118.

For opening times, please visit the UniHub website, and our service will be listed under Your Support Services.

Employability

Middlesex University is committed to supporting you to develop your employability skills; we do this by designing your programme so that you have the opportunity to develop a key set of employability skills including team-working, self- management, business and customer awareness, communication, problem solving and the application of literacy, numeracy and information technology.

We also offer extra-curricular opportunities including:

- access to our Employability Service that will help you plan a route into employment, gain skills and experience for the workplace and secure highly skilled graduate level employment

- a range of services through our Enterprise Development Hub which is dedicated to nurturing innovative student ideas and supporting students into self-employment and entrepreneurship
- paid work at Middlesex while you study; part-time roles pay the London Living Wage and provide work experience opportunities through our Student Ambassador and Student Learning Assistant schemes as well as our Sport & Recreation Service (which also offers volunteering opportunities). Work experience and placement opportunities are also available through redloop, the University's centre for design and innovation
- European and worldwide opportunities to expand your horizons through one of the most comprehensive exchange programmes in the UK; with over 100 different exchange partners to choose from, you can go on exchange on most degree programmes

Employability Service opportunities, tools and support are delivered through:

MDXworks on-campus – CG07 (College Building)

- Employability Drop in Desk – face to face answers to your employability questions
- Middlesex Unitemps Branch – paid, part-time work opportunities at Middlesex University
- Employability workshops and seminars

Monday to Friday: 10am – 5pm

T: 020 8411 6161

W: Unihub.mdx.ac.uk/mdxworks

UNITEMPS

www.unitemps.com

Middlesex Unitemps Branch

T: 020 8411 5151

W: Unitemps@mdx.ac.uk

MDXworks on-line – Website I Telephone I Email I Webchat

- Tailored 1:1 employment support – from CV to interview
- Enterprise support – from business start-up to growth
- The Employment Portal – 24/7 access to interactive employability tools and resources, thousands of jobs and a weekly employability newsletter

- Focused employment support for final year students including an on-line self-assessment
- On-line skills-assessment
- Recruitment service for employers – linking you with recruiting employers
- Specialist LinkedIn support
- Employability blog posts – published in response to your needs
- Access to the Santander internship scheme
- Employment and enterprise support for Middlesex graduates…..for life

E: mdxworks@mdx.ac.uk

T: 01707 398293

W: www.mdxworks.com

Employability Business Partners – Faculty based specialists

- Employer events and networking opportunities
- Sector / programme specific employability workshops and seminars
- Faculty employability projects
- 1:1 tailored employability information, advice and guidance sessions
- Placement/internship support and administration (including Erasmus+)

Book an appointment with a faculty based employability specialist through UniHub:

http://unihub.mdx.ac.uk/your-support-services/make-an-appointment

Personal Development Planning (PDP)

PDP will provide you with an opportunity to assess the value of the skills and knowledge you are developing and identify your future learning and development needs. It offers a structured way to reflect on what you are good at and what you need to develop further. You will learn to review your own skill levels and what you have learned from different situations and environments, including your studies, part time work, voluntary work and other activities. You will record your reflections and use them to help you think about and plan your future development.

Studying or Placement Abroad

A study exchange or a work placement abroad is a great way to enhance your university experience and broaden your horizons. Additionally, taking part in such a programme or opportunity increases your employability and supplements the value of your degree by exposing you to a new culture, different thinking and a different way of doing things. A broad world view demonstrates to potential employers your ability to understand other perspectives, adapt to varying environments, work with diverse teams and bring an appreciation of insights and practices outside of your own.

Middlesex University offers one of the most comprehensive exchange programmes in the UK. We have over 100 different partners within the European Union and the rest of the world. Funding for some of these study and work placement opportunities is available through the Erasmus+ programme.

What one of our students said:

"The Erasmus experience is not just about the work – it's also about getting to know a country, its culture, its people" MDX Exchange student, Beijing 2015/16

"What I got most out of Erasmus (exchange) is being independent, getting on with people, teamwork, learning basic languages form other students and getting along with people who I wouldn't really associate or hang around with if I was back in London. Your mind just opens up and experiences new things" MDX Exchange student, Cyprus 2014/15

Do you know just a few of the Benefits of Exchange?

1. **Unemployment** is lower among Erasmus students;
2. 87% of mobile students achieved **First Class** in their degree;
3. 1 in 10 Erasmus trainees have **started their own company**;
4. 1 in 3 Erasmus trainees received a **job position** in the host company;
5. 92% of employers are looking for **transversal skills**;
6. 78% of employers are looking for **relevant work experience**;
7. 64% of employers consider **international experience** when recruiting;
8. 64% of employers give **greater professional responsibilities** to mobile people;
9. Additional funding for students from **disadvantaged backgrounds**;

10. On average, mobile graduates **earned more** than non-mobile graduates.

Source: Gone International: mobile students and their outcomes - Report on the 2012/13 graduating cohort (2015)

What are my exchange options?

There are both funded exchange options - through the Erasmus+ Programme - and unfunded exchange options. These can be study or work placement (or a combination of both). These are varied and depend on your programme and capacity. Discuss with your Programme Leader and with the Student Exchanges Office.

Don't hesitate - explore your options.

For more information:

http://unihub.mdx.ac.uk/your-study/student-exchange
http://unihub.mdx.ac.uk/your-support-services/make-an-appointment
exchanges@mdx.ac.uk | facebook.com/ mdxexchanges

Middlesex Student's Union (MDXSU)

Your Students' Union is here to support you throughout your studies and help you make the most of your time at university. Powered by students, we represent student views in university decisions and campaign on issues that students care about. We create lots of opportunities for you to meet new people at a huge range of social events, develop your skills throughout the year, campaign for change on campus and in the community - as well as even getting a job with us and earning the London Living Wage! Everything we do is for students.

Find out more about your students' union and get involved at www.mdxsu.com

University Policies You Should Know

Programme Regulations

As a student of Middlesex University you agree to abide by the University Regulations when you enrol and therefore you should read this handbook in conjunction with the Regulations which are available online at: http://www.mdx.ac.uk/about-us/policies/university-regulations.

You should also read the Student Charter which was co-developed by Middlesex students, staff and the Students' Union. This sets out your responsibilities as a student and those of the University to ensure that all students have an enjoyable, rewarding and effective experience during their time at Middlesex. You can find the Student Charter at: https://unihub.mdx.ac.uk/your-middlesex/student-charter

Assessment

As a programme focussed on the ability to put your knowledge into practice, Engineering Management assessments are mostly coursework. Assessment is an integral part of learning and you may hear it referred to as **formative** or **summative**.

Formative assessment is designed to give you feedback on your performance and how it can be improved. As a result you will get detailed feedback on formative assessment but not a grade. Formative assessment is an important part of the learning process and has been shown to help students improve both their grades and their learning style.

Summative assessment is designed to measure the extent to which you have achieved the learning outcomes of a module and therefore the grade you will be awarded. Learning outcomes are the specific skills and knowledge that you are expected to demonstrate as a result of taking a module. Summative assessment should assess achievement of all learning outcomes in a secure, fair and accurate manner and on your programme this

will mainly comprise of project- based outcomes (presentations, log-books, reports, etc) and laboratory practical assignments.

Assessment may also involve self, peer or group approaches. For example, you may be asked to self-assess your own work, indicating where you feel you have clearly demonstrated your understanding and also identifying areas where can see you have room to improve. Assessment may also be a peer process where students, individually or as groups, offer feedback on one another's work. Group assessment may also be part of your programme where part of the assessment requires you to demonstrate your ability to work as part of a group and possibly receive a group mark.

Please see the module narratives at the end of this handbook or your module handbooks for more information about the specific learning arrangements for your modules.

Submission, receipt, marking and return of assessment

Submission and receipt of assessment

You will find all the deadlines for your first year assessment (both formative and summative) in your module handbook.

Your module handbooks have the precise details of when and how to submit your coursework (but this will be either electronically via myUniHub or in person at the UniHelp desk in the Sheppard Library) and how you get a receipt confirming you have submitted it. Please refer to these and contact your module leader if you have any queries.

Marking, second marking and moderation

Your assessments will be marked by your module tutors. The marking will be moderated by another tutor who will sample the submitted work. All coursework which are given a fail grade will be second marked.

Return of coursework

You are expected to keep a copy of all your coursework and it should be kept somewhere safe (for example on a memory stick). As the marked copy of your work is not normally returned to you it is important you keep a

copy so you can understand the feedback you get properly. It is your responsibility to adequately record a physical artefact (for example by photographing or videoing it) as they are not normally returned.

Exam scripts are not returned to any student however you can obtain feedback on exam performance by contacting your module leader.

External Examiners

External Examiners are one way we assure the academic quality of your programme. They are subject experts who help assure that your Middlesex award is comparable to that at other UK universities by reviewing the programme curriculum, the assessment and the learning resources. Among other things they approve all exam papers before they are taken, attend the assessment board and write a report at the end of the year. You can obtain a copy of this report by contacting programme leader.

The External Examiner(s) for the your Programme are: Prof James Gao, University of Greenwich

IMPORTANT: It is inappropriate for you or any other student to make direct contact with an External Examiner. The appeal and complaints systems exist to allow you to express any concerns you have, including the marks you have been given for your performance.

You can read more about the role of External Examiners on UniHub: https://unihub.mdx.ac.uk/your-study/ensuring-quality/external-examiners

Assessment Feedback

Feedback on your assessment (both formative and summative) provides the opportunity for you to reflect and to use the feedback as the basis for learning and to improve your work.

Feedback can take many forms and may be informal. For example it may be given and discussed orally in the classroom, or it may be more formal and delivered in written or audio form from academic staff or fellow students. Understanding your feedback is very important and to achieve this you are encouraged to discuss feedback with your peers and academic staff.

Receiving feedback on your work is an essential and important part of learning and so we provide regular opportunities for **formative assessment**, the purpose of which is to get detailed feedback on your performance so you get a regular update on how you are developing and to prepare you for any summative assessment.

Feedback on summative assessment will be offered in a variety of forms and all your work will be marked and moderated in line with the Code of Assessment Practice which can be found in section M of the University Regulations: mdx.ac.uk/regulations

You will normally be provided with feedback within 15 working days of the published submission date.

Results Confirmation

At the end of each academic year, module grades are considered and confirmed by an Assessment Board. Following the Board, individual results and your progression status will be released after the point, and will be made available in the My Study area on MyUniHub.

https://myunihub.mdx.ac.uk/web/home-community/mystudy.

If any of your results are provisional they will be labelled as such. Further information on your results and assessment can be found in the University Guide, under the Your Study area of MyUniHub, or by seeking advice from your Progression and Support Team Officer. Further details can also be found in the University regulations.

Academic Misconduct

You should be aware of the Universities academic misconduct policies and procedures. Taking unfair advantage over other students in assessment is considered a serious offence by the University. Action will be taken against any student who contravenes the regulations through negligence, foolishness or deliberate intent. Academic misconduct is a corrosive force in the academic life of the University; it jeopardises the quality of education and devalues the degrees and qualifications of the University. Academic misconduct takes several forms, in particular:

Plagiarism – using extensive unacknowledged quotations from, or direct copying of, another person's work and presenting it for assessment as if it were your own effort. This includes the use of 3rd party essay writing services.

Collusion – working together with other students (without the tutors permission), and presenting similar or identical work for assessment.

Infringement of Exam Room Rules – Communication with another candidate, taking notes to your table in the exam room and/or referring to notes during the examination.

Self-Plagiarism – including any material which is identical or substantially similar to material that has already been submitted by you for another assessment in the University or elsewhere.

Other examples of academic misconduct and the penalties for proven academic misconduct can be found in section F of the University Regulations at: http://www.mdx.ac.uk/about-us/policies/university-regulations?_ga=1.243882241.527797569.1465207702

You should be aware that cover examinations and you should ensure that you are familiar with the examination regulations to know what is expected of you. Details of the examinations can be found here: http://unihub.mdx.ac.uk/study/exams/regs/index.aspx

Support on academic misconduct including plagiarism can be found here: http://unihub.mdx.ac.uk/study/academicpractice/index.aspx

All students are able to appeal against the decisions of assessment board and outcomes of academic misconduct cases. They should be directed to the regulations for appeals which are set out in Section G of the university regulations: http://www.mdx.ac.uk/aboutus/strategy/regulations/index.aspx.

Further information on appeals can be found on UniHub: http://unihub.mdx.ac.uk/study/assess/appeals/index.aspx.

Advice on making an appeal is also given by the Students' Union: http://www.mdxsu.com/top-navigation/advice/advice-and-support.

Information on making a complaint. Students should be directed both to the complaints information on UniHub: http://unihub.mdx.ac.uk/mdx/feedback/complaint/index.aspx and advice and support given by the Students' Union: http://www.mdxsu.com/top-navigation/advice/advice-and-support.

Extenuating Circumstances

Extenuating Circumstances are personal circumstances which have affected your performance in assessment and are brought to the attention of the Assessment Board when considering your academic performance.

For information about how to apply for Extenuating Circumstances please see information available on MyUniHub https://unihub.mdx.ac.uk/your-study/assessment-and-regulations/extenuating-circumstances

Attendance

Middlesex University is keen to support all students to help enhance their academic potential. One of the ways we can do this is by monitoring attendance which will allow us to work with you to resolve issues that may prevent you from attending.

Studies have shown that a good attendance record has a positive impact on performance and therefore is an important factor in helping you to fulfil your academic potential. If your attendance is unsatisfactory, we will review your complete record.

If you experience difficulties beyond your control, which prevent you attending, you should notify your tutor who may be able to offer support and guidance. The University Regulations (C2.1) state every student must attend those teaching sessions specified in the regulations governing the module/programme. In addition, Student Finance England and the Home Office (in the case of international students) require attendance to be monitored.

Things you should know about attendance

Your punctuality and attendance are important, not just for you but for your cohort and peers. If you are frequently late or your attendance falls below the

required amount specified in your programme handbook your record will be reviewed.

- Many parts of the University now use an electronic register to monitor attendance.
- It is your responsibility to ensure your attendance is recorded and as a professional courtesy you should let your lecturer know if you are going to be, or have been absent.
- If you consistently miss sessions you will be contacted by the Attendance Team or your tutor.
- Students should therefore make sure they have their student card when attending sessions.

The X Grade

It is important that you attend all your lectures and tutorials as otherwise you may not be able to achieve the learning outcomes for your modules. As your attendance is so important there are modules which have a minimum level of attendance required. If your attendance fails to meet these requirements you may be excluded from the assessment and be given a grade of X for the module. .

The definition of the X grade is "ineligible for assessment due to unsatisfactory attendance/ participation but may be retaken with permission". It is not a punishment for poor attendance but recognition that you have not been able to prepare yourself for assessment in the content of the module. The full regulations regarding attendance are in Section C of the University Regulations: www.mdx.ac.uk/regulations

For further guidance on attendance requirements please refer to the section on attendance which is available on UniHub: unihub.mdx.ac.uk/study/attend and in the University Guide.

Health and Safety

Information and advice regarding health, safety and welfare is accessible on a university wide basis at: http://unihub.mdx.ac.uk/.

The information resource for Middlesex University students contains a summary of this advice. On this website you will find useful information on:

- Health related issues such as registering with a doctor, dentist or optician. A summary of key infectious diseases and a range of health matters such as minor illnesses, alcohol, drugs and travel
- Health and safety issues such as the University's health and safety policy, first aid arrangements, fire procedures, accident reporting procedures and how to raise concerns. Also several other key health and safety related policies such as alcohol, substance misuse and no smoking.
- Personal safety related issues such as reporting and dealing with crime.
- There are no programme specific health and safety requirements, however you must follow safety regulations within the workshops when dealing with different tools and machinery, as required by your technical tutors.

Appendix 1: Programme Specification

BEng Mechatronics

Programme Specification

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.

1. Programme title	BEng Hons Mechatronics
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University
4. Details of accreditation by professional/statutory/regulatory body	
5. Final qualification	Bachelor of Engineering (Hons)
6. Year of validation **Year of amendment**	2017/2018
7. Language of study	English
8. Mode of study	FT / TKSW

9. Criteria for admission to the programme

Admission to the BEng (Hons) Mechatronics programme will require 280 UCAS tariff points normally including a minimum of 200 points from at least two science or numerate based subjects.

In addition Middlesex University general entry requirements apply as outlined in the university's regulation B2. Applicants whose first language is not English are required to achieve 6.0 in IELTS overall (with a minimum of 5.5 in each component) or an equivalent qualification recognised by Middlesex University. The equivalence of qualifications from outside UK will be determined according to NARIC guidelines.

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

10. Aims of the programme

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

This program is designed to develop and enhance problem solving and design skills through a variety of projects and hands-on laboratory sessions, including those based on teamwork. This includes design and control aspects of mechanical systems that must be operated through electrical/electronic and computer control. This programme further explores the principles underlying the design and implementation of up-to-date mechatronic systems needed in a variety of problem domains.

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 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. Concepts, principles and theories of the design process and an appreciation of their limitations.
3. The application of a systems approach to solving complex engineering problems within the context of Mechatronics.
4. 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. Current commercial, management and business practices and their limitations relating to engineering and to new product development.
8. 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 methods

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

9. The role and limitations of common ICT tools and limitations to common ICT tools and ability to specify requirements for computer-based engineering design tools to solve unfamiliar problems. 10. Characteristics of particular materials, equipment, processes and products.	
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. Fully engage 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. Design innovative systems, components or processes.	**Teaching/learning methods** Students learn cognitive skills through design projects, problem solving activities and through report writing. **Assessment methods** 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. Plan, manage and undertake a design project, team or individual, including establishing user needs and technical specification, concept generation and evaluation,	**Teaching/learning methods** Students learn practical skills through design projects, specific skills inputs and set exercises.

embodiment and detail design work, verification and review. 2. Evaluate technical risk with an awareness of the limitations of possible solutions. 3. Use relevant laboratory and test equipment. 4. Create CAD models and make physical models and prototypes. 5. Interface different technologies to develop integrated systems. 6. Apply engineering design techniques, taking into account of a selection of commercial and industrial constraints. 7. Apply and integrate knowledge and understanding of other engineering and non-engineering disciplines to support engineering design activities.	**Assessment methods** 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, computer models, and a scientific approach to solving problems in engineering design. 3. Demonstrate leadership skills and the ability to work effectively as a member of a team. 4. Write computer programmes and use CAE software and general IT tools and provide technical documentation. 5. Learn independently and adopt a	**Teaching/learning methods** Students acquire graduate skills through design projects, competitions, problem solving activities, presentations, and through report writing. **Assessment methods** Students' graduate skills are assessed by coursework assignments including design reports, laboratory reports, other written reports, problems

critical approach in investigation. 6. Use technical literature and other information sources effectively including electronic media.	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

Year 1				
AY	**PDE1400** Design Engineering Projects 1 [30]	**PDE1410** Physical Computing: Electronics [30]	**PDE1420** Physical Computing: Programming [30]	**PDE1430** Formal Systems[30]
Year 2				
AY	**PDE2400** Design Engineering Projects 2 [30]	**PDE2410** Engineering in Context [30]	**PDE2420** Control Systems [30]	**PDE2440** Robotics and Mechatronics [30]
Year 3	**PDE3250** - Thick Sandwich Placement (compulsory for TKSW only)			

Year 3/4		
Term 1	**PDE3432** Mobile Robots and Manipulators [30]	**PDE3422** Industrial Automation and Control [30]
Term 2	**PDE3400** Design Engineering Major Project [60]	

12.2 Levels and modules

Starting in academic year 2010/11 the University is changing the way it references modules to state the level of study in which these are delivered. This is to comply with the national Framework for Higher Education Qualifications. This implementation will be a gradual process whilst records are updated. Therefore the old coding is bracketed below.

Level 4 (1)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: Students must take all of the following: PDE1400 Design Engineering Projects 1 [30 PDE1410 Physical Computing: Electronics [30] PDE1420 Physical Computing: Programming [30] PDE1430 Formal Systems [30]	N/A	Students must pass all level 4 modules to progress.
Level 5 (2)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

Students must take all of the following: PDE2400 Design Engineering Projects 2 [30] PDE2410 Engineering in Context [30] PDE2420 Control Systems [30] PDE 2440 Robotics and Mechatronics [30]	N/A:	TKSW -To progress on to a placement year students must pass all modules at level 5. FT/PT – Students must pass all level 4 and 5 modules to progress.
Level 6 (3) TKSW mode only		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
TKSW mode only Students must take PDE3250 Industrial Placement (120 credits – for Diploma of Industrial Studies.)	N/A	
Level 6 (3)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

Students must take all of the following: PDE3432 Mobile Robots and Manipulators [30] PDE3422 Industrial Automation and Control [30] PDE3400 Design Engineering Major project [60]	N/A	

12.3 Non-compensatable modules (note statement in 12.2 regarding FHEQ levels)	
Module level	**Module code**
6	PDE3400

13. Curriculum map

See page 40.

14. Information about assessment regulations

Please refer to the University Regulations.

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

Students on the TKSW mode take a placement (36 to 48 weeks) at the end of year 2. A dedicated Employability Advisor helps in the search for an appropriate employer and provides students with appropriate Placement. They

also provide students with appropriate guidance and support in preparation for, during and after placement. The placement forms the basis for an assessed report based on the organisation. At the start of the placement students are allocated an individual supervisor who provides support and advice for the duration of the project.

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.

16. Future careers (if applicable)

As a BEng Mechatronics graduate you will have excellent career prospects; the range of potential employers will be vast across the private, public and not-for-profit sectors

To support students in this activity during their 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 all practical sessions. Supporting this level of active participation is achieved via regular contact with academic staff, productive and informed support from technical staff, supports provided by Graduate Academic Assistants (GAAs), Student Learning Assistants (SLAs) and the use of online 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. These areas are shared with other subjects and programmes.

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:

- QAA Engineering subject benchmark statement (2015)
- QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland;
- Middlesex University Regulations;
- Middlesex University Learning and Quality Enhancement Handbook;
- UK Standard for Professional Engineering Competence;
- Chartered Engineer and Incorporated Engineer Standard, Engineering Council UK, 2014;
- The Accreditation of Higher Education Programmes, Engineering Council UK, 2014;
- IED Engineering Design Specific Learning Outcomes for EC(UK) Accredited Degree Programmes.

21. Other information

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

MEng Mechatronics

Programme Specification

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.

1. Programme title	MEng Hons Mechatronics
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University
4. Details of accreditation by professional/statutory/regulatory body	
5. Final qualification	Master of Engineering (Hons)
6. Year of validation **Year of amendment**	2017/2018
7. Language of study	English
8. Mode of study	FT / TKSW

9. Criteria for admission to the programme

Admission to the MEng (Hons) Mechatronics programme will require 280 UCAS tariff points normally including a minimum of 200 points from at least two science or numerate based subjects.

In addition Middlesex University general entry requirements apply as outlined in the university's regulation B2. Applicants whose first language is not English

are required to achieve 6.0 in IELTS overall (with a minimum of 5.5 in each component) or an equivalent qualification recognised by Middlesex University. The equivalence of qualifications from outside UK will be determined according to NARIC guidelines.

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

10. Aims of the programme

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

This program is designed to further enhance problem solving and design skills through a variety of projects and hands-on laboratory sessions. This includes design and control aspects of mechanical systems that must be operated through electrical/electronic and computer control. Students will improve core critical thinking and design capabilities, which are further developed and enhanced progressively through the course.

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

11. Programme outcomes

A. Knowledge and understanding	**Teaching/learning methods**
On completion of this programme the successful student will have: 1. Comprehensive knowledge and understanding of Scientific principles	Students gain knowledge and understanding takes place through a combination of lectures, seminars, exercise classes, design build and test

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. Knowledge and understanding of the application of a systems approach to solving complex engineering problems within the context of Mechatronics. 4. Comprehensive knowledge and understanding of analytical techniques and engineering science relevant to Design Engineering within the context of Mechatronics. 5. Detailed understanding of the issues involved in systems engineering and the range of approaches used in industry to manage the resulting complexity. 6. Extensive knowledge and understanding of developing new technologies and applications relevant to Mechatronics. 7. Extensive knowledge and understanding of current commercial, management and business practices and their limitations relating to engineering and to new product development. 8. Knowledge and understanding of professional and ethical	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 methods** Students' knowledge and understanding is assessed by technical reports, coursework assignments, essays, presentations, and practical in-class tests.

responsibilities of engineers. 9. Comprehensive knowledge and understanding of the role and limitations of common ICT tools and ability to specify requirements for computer-based engineering design tools to solve unfamiliar problems. 10. Extensive knowledge and understanding of a wide range of engineering materials and components.	
B. Cognitive (thinking) skills On completion of this programme the successful student will be able to: 1. Critically analyse and solve engineering problems using appropriate techniques and through critical thinking. 2. Model and critically analyse relevant engineering systems. 3. Fully engage with the design process. 4. Select, justify and apply appropriate computer based methods for solving design engineering problems. 5. Fully evaluate external influences on the design process. 6. Design creative and innovative systems, components or processes.	**Teaching/learning methods** Students learn cognitive skills through design projects, problem solving activities and through report writing. **Assessment methods** 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. Plan, manage and undertake a design project, team or individual, including establishing user needs	**Teaching/learning methods** Students learn practical skills through design projects, specific skills inputs and set exercises.

and technical specification, concept generation and evaluation, embodiment and detail design work, verification and review. 2. Critically evaluate technical risk with an awareness of the limitations of possible solutions. 3. Use relevant laboratory and test equipment. 4. Create CAD models and make physical models and prototypes. 5. Interface different technologies to develop integrated systems. 6. Apply engineering design techniques, taking into account of a selection of commercial and industrial constraints. 7. Effectively apply understanding of concepts from a range of fields including those outside engineering to engineering design projects.	**Assessment methods** 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. Critically apply mathematical methods, computer models, and a scientific approach to solving problems in engineering design. 3. Demonstrate leadership skills and the ability to work effectively as a member of a team. 4. Write computer programmes and use CAE software and general IT	**Teaching/learning methods** Students acquire graduate skills through design projects, competitions, problem solving activities, presentations, and through report writing. **Assessment methods** Students' graduate skills are assessed by coursework assignments including design reports, laboratory reports,

tools and provide technical documentation. 5. Learn independently and adopt a critical approach in investigation. 6. Use technical literature and other information sources effectively including electronic media.	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

Year 1				
AY	**PDE1400** Design Engineering Projects 1 [30]	**PDE1410** Physical Computing: Electronics [30]	**PDE1420** Physical Computing: Programming [30]	**PDE1430** Formal Systems[30]
Year 2				
AY	**PDE2400** Design Engineering Projects 2 [30]	**PDE2410** Engineering in Context [30]	**PDE2420** Control Systems [30]	**PDE2440** Robotics and Mechatronics [30]
Year 3	**PDE3250** - Thick Sandwich Placement (compulsory for TKSW only)			
Year 3/4				
Term 1	**PDE3432** Mobile Robots and Manipulators [30]		**PDE3422** Industrial Automation and Control [30]	
Term 2	**PDE3400** Design Engineering Major Project [60]			
Year 4/5				
Term 1	Optional Module		Optional Module	
Term 2	PDE4400 Team Project [60]			

Year 4/5 options

Students are required to take 2 from

PDE4853 Design Engineering Dissertation [30]

PDE4410 Embedded Multimedia Systems [30]

PDE4803 Advanced topics in Mechatronics [30]

12.2 Levels and modules

Starting in academic year 2010/11 the University is changing the way it references modules to state the level of study in which these are delivered. This is to comply with the national Framework for Higher Education Qualifications. This implementation will be a gradual process whilst records are updated. Therefore the old coding is bracketed below.

Level 4 (1)

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: Students must take all of the following: PDE1400 Design Engineering Projects 1 [30] PDE1410 Physical Computing: Electronics [30] PDE1420 Physical Computing: Programming [30] PDE1430 Formal Systems [30]	N/A	Students must pass all level 4 modules to progress.

Level 5 (2)

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

Students must take all of the following: PDE2400 Design Engineering Projects 2 [30] PDE2410 Engineering in Context [30] PDE2420 Control Systems [30] PDE 2440 Robotics and Mechatronics [30]	N/A:	TKSW -To progress on to a placement year students must pass all modules at level 5. FT/PT – To progress onto level 6 on the MEng students must achieve a grade 8 or better in all modules.

Level 6 (3) TKSW mode only		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
TKSW mode only Students must take PDE3250 Thick Sandwich Placement (120 credits – for Diploma of Industrial Studies.)	N/A	
Level 6 (3)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

Students must take all of the following: PDE3432 Mobile Robots and Manipulators [30] PDE3422 Industrial Automation and Control [30] PDE3400 Design Engineering Major project [60]		Student must pass ALL modules and achieve at least a 2.1 overall to progress to level 7.
Level 7 (3)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
PDE4400 Team Project [60]	Students must also choose 2 from the following: PDE4853 Design Engineering Dissertation [30] PDE4410 Embedded Multimedia Systems [30] PDE4803 Advanced topics in Mechatronics [30]	

12.3 Non-compensatable modules (note statement in 12.2 regarding FHEQ levels)	
Module level	**Module code**
6	PDE3400
7	PDE4400

13. Curriculum map

See page 29.

14. Information about assessment regulations

Please refer to the University Regulations.

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

Students on the TKSW mode take a placement (36 to 48 weeks) at the end of year 2. A dedicated Employability Advisor helps in the search for an appropriate employer and provides students with appropriate Placement. They also provide students with appropriate guidance and support in preparation for, during and after placement. The placement forms the basis for an assessed report based on the organisation. At the start of the placement students are allocated an individual supervisor who provides support and advice for the duration of the project.

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.

16. Future careers (if applicable)

As a MEng Mechatronics graduate you will have excellent career prospects; the range of potential employers will be vast across the private, public and not-for-profit sectors

To support students in this activity during their 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 all practical sessions. Supporting this level of active participation is achieved via regular contact with academic staff, productive and informed support from technical staff, supports provided by Graduate Academic Assistants (GAAs), Student Learning Assistants (SLAs) and the use of online 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. These areas are shared with other subjects and programmes.

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:

- QAA Engineering subject benchmark statement (2015)
- QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland;
- Middlesex University Regulations;
- Middlesex University Learning and Quality Enhancement Handbook;

- UK Standard for Professional Engineering Competence;
- Chartered Engineer and Incorporated Engineer Standard, Engineering Council UK, 2014;
- The Accreditation of Higher Education Programmes, Engineering Council UK, 2014;
- IED Engineering Design Specific Learning Outcomes for EC(UK) Accredited Degree Programmes.

21. Other information

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.

Appendix 2: Curriculum Map

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	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	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.
A2	Extensive knowledge and understanding of concepts, principles and theories of the design process and an appreciation of their limitations.	C2	Critically evaluate technical risk with an awareness of the limitations of possible solutions.

A3	Knowledge and understanding of the application of a systems approach to solving complex engineering problems within the context of Mechatronics.	C3	Use relevant laboratory and test equipment.
A4	Comprehensive knowledge and understanding of analytical techniques and engineering science relevant to Design Engineering within the context of Mechatronics.	C4	Create CAD models and make physical models and prototypes.
A5	Detailed understanding of the issues involved in systems engineering and the range of approaches used in industry to manage the resulting complexity.	C5	Interface different technologies to develop integrated systems.
A6	Extensive knowledge and understanding of developing new technologies and applications relevant to Mechatronics.	C6	Apply engineering design techniques, taking into account of a selection of commercial and industrial constraints.
A7	Extensive knowledge and understanding of current commercial, management and business practices and their limitations relating to engineering and to new product development.	C7	Effectively apply understanding of concepts from a range of fields including those outside engineering to engineering design projects.
A8	Knowledge and understanding of professional and ethical responsibilities of engineers.	C8	

A9	Comprehensive knowledge and understanding of the role and limitations of common ICT tools and ability to specify requirements for computer-based engineering design tools to solve unfamiliar problems.		
A10	Extensive knowledge and understanding of a wide range of engineering materials and components		
Cognitive skills		Graduate Skills	
B1	Critically 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 critically analyse relevant engineering systems.	D2	Critically apply mathematical methods, computer models, and a scientific approach to solving problems in engineering design.
B3	Fully engage with the design process.	D3	Demonstrate leadership skills and the ability to work effectively as a member of a team.
B4	Select, justify and apply appropriate computer based methods for solving design engineering	D4	Write computer programmes and use CAE software and general IT tools and provide technical

	problems.		documentation.
B5	Fully evaluate external influences on the design process.	D5	Learn independently and to adopt a critical approach in investigation.
B6	Design creative and innovative systems, components or processes.	D6	Use technical literature and other information sources effectively including electronic media

Programme outcomes																											
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	D1	D2	D3	D4	D5	D6
Highest Level Achieved																												
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

Module Title	Module Code by Level	Programme outcomes																												
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	D1	D2	D3	D4	D5	D6
Design Engineering Projects 1	PDE1400							Y	Y			Y	Y	Y	Y		Y	Y		Y	Y			Y	Y	Y	Y	Y	Y	Y
Physical Computing: Electronics	PDE1410				Y							Y	Y							Y	Y					Y			Y	
Physical Computing: Programming	PDE1420				Y					Y		Y			Y					Y		Y			Y	Y	Y	Y	Y	
Formal Systems	PDE1430				Y							Y	Y				Y									Y			Y	
Design Engineering Projects 2	PDE2400		Y	Y				Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Engineering in Context	PDE2410		Y			Y		Y	Y							Y				Y			Y	Y	Y		Y		Y	Y
Control Systems	PDE2420	Y			Y	Y				Y		Y	Y		Y		Y	Y		Y		Y			Y	Y		Y		Y
Robotics and Mechatronics	PDE 2440	Y	Y	Y		Y	Y			Y		Y		Y	Y		Y	Y	Y	Y	Y	Y	Y		Y			Y	Y	

Thick Sandwich Placement	PDE3250					Y		Y	Y			Y	Y	Y				Y					Y		Y	Y	Y		Y	
Mobile Robots and Manipulators	PDE3432	Y			Y		Y			Y			Y		Y			Y		Y		Y				Y	Y			Y	Y
Industrial Automation and Control	PDE3422	Y				Y				Y	Y	Y	Y		Y		Y	Y		Y	Y	Y				Y	Y			Y	Y
Design Engineering Major project	PDE3400	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y
Team Project	PDE4400	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Design Engineering Dissertation	*PDE4853*		Y		Y		Y	Y	Y									Y	Y				Y		Y				Y	Y
Embedded Multimedia Systems	*PDE4410*				Y	Y				Y		Y	Y		Y		Y			Y	Y	Y				Y		Y			
Advanced topics in Mechatronics	*PDE4803*	Y	Y		Y		Y	Y	Y			Y			Y	Y		Y	Y				Y	Y	Y	Y		Y	Y	Y

Curriculum map for MEng Mechatronics

Knowledge and understanding		Practical skills	
A1	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	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.
A2	Concepts, principles and theories of the design process and an appreciation of their limitations.	C2	Evaluate technical risk with an awareness of the limitations of possible solutions.
A3	The application of a systems approach to solving complex engineering problems within the context of Mechatronics.	C3	Use relevant laboratory and test equipment.
A4	Analytical techniques and engineering science relevant to Design Engineering within the context of Mechatronics.	C4	Create CAD models and make physical models and prototypes.
A5	The issues involved in systems engineering and the range of approaches used in industry to manage the resulting complexity.	C5	Interface different technologies to develop integrated systems.

A6	Developing new technologies and applications relevant to Mechatronics.	C6	Apply engineering design techniques, taking into account of a selection of commercial and industrial constraints.
A7	Current commercial, management and business practices and their limitations relating to engineering and to new product development.	C7	Apply and integrate knowledge and understanding of other engineering and non-engineering disciplines to support engineering design activities.
A8	Professional and ethical responsibilities of engineers.		
A9	The role and limitations of common ICT tools and limitations to common ICT tools and ability to specify requirements for computer-based engineering design tools to solve unfamiliar problems.		
A10	Characteristics of particular materials, equipment, processes and products		
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, computer models, and a scientific approach to solving problems in engineering design.

B3	Fully engage 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	Write computer programmes and use CAE software and general IT tools and provide technical documentation.
B5	Fully evaluate external influences on the design process.	D5	Learn independently and to adopt a critical approach in investigation
B6	Design innovative systems, components or processes.	D6	Use technical literature and other information sources effectively including electronic media.

Programme outcomes																											
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	D1	D2	D3	D4	D5	D6
Highest Level Achieved																												
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6

Module Title	Module Code by Level	Programme outcomes																													
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	D1	D2	D3	D4	D5	D6
Design Engineering Projects 1	PDE1400							Y	Y			Y	Y	Y	Y		Y	Y		Y	Y			Y	Y	Y	Y	Y	Y	Y
Physical Computing: Electronics	PDE1410				Y							Y	Y							Y	Y					Y			Y	
Physical Computing: Programming	PDE1420				Y					Y		Y			Y					Y		Y			Y	Y	Y	Y	Y	
Formal Systems	PDE1430				Y							Y	Y				Y									Y			Y	
Design Engineering Projects 2	PDE2400		Y	Y				Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Engineering in Context	PDE2410		Y			Y		Y	Y							Y				Y			Y	Y	Y		Y		Y	Y
Control Systems	PDE2420	Y			Y	Y				Y		Y	Y		Y		Y	Y		Y		Y			Y	Y		Y		Y

Robotics and Mechatronics	PDE 2440	Y	Y	Y		Y	Y			Y		Y		Y	Y		Y	Y	Y	Y	Y	Y	Y		Y			Y	Y	
Thick Sandwich Placement	PDE325 0					Y		Y	Y			Y	Y	Y				Y					Y		Y	Y	Y		Y	
Mobile Robots and Manipulator s	PDE343 2	Y			Y		Y			Y			Y		Y			Y		Y		Y			Y	Y			Y	Y
Industrial Automation and Control	PDE342 2	Y				Y				Y	Y	Y	Y		Y		Y	Y		Y	Y	Y			Y	Y			Y	Y
Design Engineering Major project	PDE340 0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y

Appendix 3: Module Narratives

In this section you will find details of all the modules associated with your programme so that you can see what is involved in your programme and make any choices over option modules (if applicable).

The narratives were correct at the time this handbook went to print but details change over time and therefore you should always refer to the latest version available on the My Study area of myUniHub: https://myunihub.mdx.ac.uk/web/home-community/mystudy

Your online reading lists can be accessed from the My Study area of myUniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE1400
Module Title	Design Engineering Projects 1
Level	4
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims
This module will develop knowledge and understanding of a range of modelling and prototyping processes and techniques in order for students to successfully complete a number of projects. They will learn to use a range of workshop machinery to accomplish this. The projects will require students to develop and use a variety of problem solving skills and to utilise knowledge gained from other taught modules.

Learning Outcomes

Knowledge

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

1. demonstrate an understanding of the design process and be able to make relevant design decisions.

Skills

This module will call for the successful student to:

2. demonstrate operational competence in a range of workshop machinery;
3. work to a brief;
4. develop transferable skills including verbal and visual skills;
5. draw freehand sketches of ideas and designs;
6. maintain a logbook;
7. engage in idea generation exercises and apply these skills to design objectives;
8. participate effectively as a team member;
9. carry out design tasks and engage in group discussions;
10. communicate effectively in written form;
11. use basic project management skills to apply autonomous and methodical work practices;
12. use basic CAD skills (e.g. Solidworks) to enable use of appropriate machinery and prototyping technologies;

Syllabus

- •Overview of engineering materials and manufacturing processes
- An introduction to the process of design/redesign through exercises and project work enabling a practical application of taught skills
- Freehand sketching and drawing techniques
- Idea generation and iteration
- Safe use of a range of machine and hand tools
- CAD skills (e.g. Solidworks)

Learning, Teaching and Assessment Strategy

Students will engage with the module through a number of practical tasks and projects.

These projects will develop confidence and change the focus of work for students. Projects have been designed to give an insight into the different Engineering streams available which enable students to make an informed decision relating to their degree specialism choice.

Students are required to attend two 3- hour practical sessions per week, one 3D workshop session and one lab session. Attendance, participation and progress on projects in these sessions will be monitored throughout the module. There is an expectation that students attend all scheduled sessions to ensure that they are able to demonstrate they have achieved learning outcomes.

Assessment Scheme

Formative Assessment: Student progress on each project will be continually formatively assessed and feedback given at appropriate stages by a range of tutors.

Summative assessment requires students to demonstrate that they have met all learning outcomes, and consists of a number of projects (usually 4) completed within the academic year. The projects, which are a mixture of individual and group work, are selected in order to ensure students demonstrate an overall understanding of relevant concepts and techniques as well as the ability to apply and critique them.

The learning outcomes have been broken down into milestones, which need to be demonstrated by student class activity during the projects. Full details of the milestones and how they can be demonstrated will be given at the start of the module. Students and staff will be able to monitor progress of the achievement of these throughout the year.
Milestones will be evaluated by some of the following methods

depending on the nature of the project and learning outcome: models, rigs, prototypes, log books, presentation boards, oral presentations, project reports. Completion of the milestones ensures that all learning outcomes have been met.

The projects undertaken during this module normally take 6-8 weeks to complete.

- Project 1 relates to basic knowledge of processes and involves small tasks to develop and demonstrate competence.
- The remaining projects completed (2 or 3 each lasting 6-8 weeks) relate to the design and implementation of systems to carry out a specified tasks. The themes of the projects will give insight into the different engineering streams available which enable students to make an informed decision relating to their specialism.

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE1410
Module Title	Physical Computing Electronics
Level	4
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

The aim of this module is to develop students' knowledge and understanding of the fundamentals of electronics. Students will develop a range of practical skills, attitudes and techniques required to construct electronic circuits successfully.

Learning Outcomes

Knowledge

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

1. demonstrate an understanding of the fundamentals of digital and analogue electronic circuits as applied to Physical Computing, i.e. real world situations.

Skills

This module will call for the successful student to:

2. interpret circuit schematics and use them to construct working circuits using a range of appropriate techniques;
3. design simple circuits using standard building blocks;
4. use electronic theory (e.g. Ohm's law) to analyse circuits and correctly calculate component values;
5. connect sensors and actuators to a microcontroller system.

Syllabus

- Analogue and digital signals. Voltage levels as information signals.
- Voltage, current, resistance, power, inductance, capacitance. Ohm's law
- Overview of standard electronic components
- Digital input/output and analogue input/output to a microcontroller system
- Standard driver circuits for actuators
- Overview of communications protocols
- Interpreting datasheets
- Knowledge of component symbols. Interpretation of circuit schematics.
- Ability to translate electrical schematics into physical circuits.
- Debugging electronic circuits.
- Use of instruments and equipment (multimeter, oscilloscope, variable power supply, signal generator).

Learning, Teaching and Assessment Strategy

The basic principles of electronics will be taught using a practical hands-on approach through tasks and projects during lab sessions. All learning activities will all be based on Physical Computing, i.e. sensing and controlling the physical world with digital devices.

Students are required to attend one 3- hour practical lab session per week. Attendance, participation and progress in these sessions will be monitored throughout the module. There is an expectation that students attend all scheduled sessions to ensure that they are able to demonstrate they have achieved learning outcomes.

Assessment Scheme

Formative Assessment: Student progress will be continually formatively assessed and feedback given at appropriate stages by range of tutors.

Summative assessment requires students to demonstrate that they have met all learning outcomes, and is entirely assessed by a series of practical tasks and projects completed during the lab session.

The learning outcomes have been broken down into milestones, which need to be demonstrated by student class activity during the sessions. Full details of the milestones and how they can be demonstrated will be given at the start of the module. Students and staff will be able to monitor progress of the achievement of these throughout the year.
Milestones will be evaluated by some of the following methods depending on the nature of the project and learning outcome: construction of circuits, testing of circuit performance. Completion of the milestones ensures that all learning outcomes have been met.

Assessment Weighting
Coursework: 100%

Learning Materials

Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE1420
Module Title	Physical Computing:Programming
Level	4
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims
This module aims to enable students to write computer programmes in response to a given brief which respond to and control physical devices and processes.

Learning Outcomes

Knowledge

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

1. demonstrate knowledge of the principles of applied computer programming;
2. demonstrate an understanding of and use at least one computer language, for example Labview or C;
3. demonstrate knowledge of the range of paradigms of programming languages and an overview of what they are used for.

Skills

This module will call for the successful student to:

1. program a microcontroller to carry out a number of tasks;
2. identify the essential features of all programming;
3. analyse a programming task and design an algorithmic approach to address it;
4. read and analyse computer programs;
5. use integrated development environments;
6. write code to read data from sensors, process the information and carry out an action based on the information;
7. identify and correct mistakes using a variety of debugging strategies;
8. write clear, well structured code both individually and as part of a team.

Syllabus

• Computer programming/software engineering techniques.
• The software development process (compiling, uploading, debugging).
• Comparison of high level programming and low level programming.
• Sequential nature of programs. Program flow and structure.
• Good coding practise
• Debugging methods.
• Digital input, digital output, analogue input, analogue output.
• Overview of communication protocols.

Learning, Teaching and Assessment Strategy

The basic principles of programming will be taught in a practical hands-on approach through programming tasks and projects during lab sessions. All learning activities will all be based on Physical Computing, i.e. sensing and controlling the physical world with computers. A range of hardware will be used.

The basic principles of electronics will be taught using a practical hands-on approach through tasks and projects during lab sessions. All learning activities will all be based on Physical Computing, i.e. sensing and controlling the physical world with digital devices.
Students are required to attend one 3- hour practical lab session per week. Attendance, participation and progress in these sessions will be monitored throughout the module. There is an expectation that students attend all scheduled sessions to ensure that they are able to demonstrate they have achieved learning outcomes.

Assessment Scheme

Formative Assessment: Student progress will be continually formatively assessed and feedback given at appropriate stages by a range of tutors.

Summative assessment requires students to demonstrate that they have met all learning outcomes, and is entirely assessed by a series of practical tasks and projects completed during the lab session.

The learning outcomes have been broken down into milestones, which need to be demonstrated by student class activity during the sessions. Full details of the milestones and how they can be demonstrated will be given at the start of the module. Students and staff will be able to monitor progress of the achievement of these throughout the year.

Milestones will be evaluated by some of the following methods depending on the nature of the project and learning outcome: writing simple programs, integrate code with sensors and

actuators, implement higher level systems. Completion of the milestones ensures that all learning outcomes have been met.

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE1430
Module Title	Formal Systems
Level	4
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

The aim of this module is to develop the student's knowledge and understanding of tools and techniques available to support efficient application of mathematics to engineering design.

Learning Outcomes

Knowledge

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

1. demonstrate knowledge of a range of formalisms applicable to engineering design.

Skills

This module will call for the successful student to:

1. use formal systems to capture system properties;
2. manipulate formal systems, using tools where appropriate, to analyse system properties.

Syllabus

- Syntax and semantics
- Representation of common data types such as number systems,images, sound
- Concept of deduction and transformations within formal systems
- Theories, models and algebras will be discussed, motivating the use of purely algebraic techniques as a way to reason about abstract representations of design problems
- A variety of formal systems will be selected for illustration/application as appropriate to the tasks in the other modules. The degree of formality will be relaxed as the course proceeds, moving from the underlying principles of formalisation to the use of such formalisms as tools, typically embodied within algebras, well-defined techniques or automated tools.
- Sets, relations and functions using a concrete syntax based on ZF set theory.
- Logical systems such as propositional, predicate and simple temporal logic. The use of Boolean algebra as a codified formalism for logic.
- Simple traditional algebra (including its extension to complex numbers). Equations and recurrence relations. Series and products.
- Representations of space using techniques such as Vector and matrix algebras, classical geometry and trigonometry
- Problem reformulation using transforms (e.g. Laplace, Fourier, Z)
- Differential and integral calculus including the solution of simple ODEs.

- The use of appropriate automated tools (e.g. Matlab, LabVIEW, bespoke simulation software packages, user-written programs embodying formalisms).

Learning, Teaching and Assessment Strategy

The material will be motivated through a number of examples integrated with the other first year topics and modules.

Students are required to attend one 3-hour workshop session per week which is made up of a 1-hour lecture, a 1 hour of problem class, and a 1-hour computer based session. Lectures are where new ideas are presented and students can work towards a deeper understanding of the material. In problem classes students undertake a carefully managed sets of exercises and tasks to develop basic skills and fluency in a highly supported environment. Computer based sessions will require students to engage and complete online activities. This will include opportunities for peer-assistance, group discussions and tutor intervention. One important aspect of this component is that it will develop students' ability in formulating questions, which is often the first step to resolving problems. Support material and activities are available online and form part of the assessment activities.

Attendance, participation and progress on activities and tasks will be monitored in these sessions throughout the module. To ensure that students are able to demonstrate they have achieved learning outcomes there is an expectation that students attend all scheduled sessions.

Assessment scheme

The assessment of this module is task based. The learning outcomes have been decomposed into numerous milestones which are demonstrable during the lifetime of the module. Student progress on demonstrating these milestones will be continually assessed during all student contact opportunities. Full details of the milestones and how they can be demonstrated will be given at the start of the module. Students and staff will be able to monitor progress of the achievement of these throughout the year.

Formative Assessment: Student progress on each task will be continually formatively assessed and formative feedback given at appropriate stages. Formative feedback will be given throughout the module on all activities, and tasks by tutors.

Summative assessment requires students to demonstrate that they have met all learning outcomes, and is entirely assessed by a series of tasks completed during the taught sessions. The tasks are selected in order to ensure students demonstrate an overall understanding of relevant concepts and techniques, and the ability to apply them.

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE2400
Module Title	Design Engineering Projects 2
Level	5
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims
This module aims to provide the student with the knowledge and skills required to carry out engineering projects and will give them the opportunity to apply them, together with knowledge and skills from other modules, in practical projects.

Learning Outcomes

Knowledge

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

1. demonstrate specialised knowledge of software packages appropriate to their study area.

Skills

2. This module will call for the successful student to:
3. write software programs;
4. apply and assess engineering design methods;

5. exercise significant judgement in the application of engineering project management techniques;
6. construct physical prototypes and models;
7. use creativity to implement innovative engineering design solutions.

Syllabus

- Programming in an appropriate language (e.g. LabView, Python)
- Use of software packages relevant to subject (e.g. Solidworks modeling, circuit simulation, PCB design)
- The Engineering Design process
- Requirements capture and Product Design Specifications.
- Idea generation and innovation techniques.
- Project management tools.

Learning, Teaching and Assessment Strategy

This module is delivered in several blocks:

1. Students will build on their knowledge of programming gained in the previous year to enable them to develop substantial software projects. The particular language will depend on the student's chosen programme of study (e.g. Python for Robotics students). [8 weeks]
2. Students will learn one or more software packages relevant to their programme of study. For instance, Mechatronics and Robotics students will develop their knowledge of Solidworks in greater depth, learning to apply finite element analysis to models and to simulate the motion of assemblies. Electronics students will learn schematic design, circuit simulation and PCB layout. [5 weeks]

3. Students will learn Engineering Design methods and apply them to practical projects. These projects will depend on the student's programme of study and could include taking part in external competitions (e.g. Eurobot, IMechE Year 2 Design Challenge) or developing a product for an external client. [11 weeks]

Students are required to attend one 3-hour practical lab session per week for 24 weeks, based in a laboratory environment that allows group work.
Attendance, participation and progress on projects in these sessions will be monitored throughout the module. To ensure that students are able to demonstrate they have achieved learning outcomes, there is an expectation that students attend all scheduled sessions.

Assessment scheme

Formative Assessment: Student progress on assessment will be continually formatively assessed and feedback given at appropriate stages.

Summative Assessment:

1. Learning outcome 1 will be assessed by project submitted in week 13. The project and submission will depend on the software package being learnt, which depends in turn on the programme of study of the student. For instance, a Robotics or Mechatronics student might develop a Solidworks model of a robot, carry out an FEA analysis on it and model its motion to prove that the design would meet a particular specification. The submission in this case would be the Solidworks model itself and a report showing that it meets its specification. An Electronics student would design a circuit to meet a specification,

draw its schematic, simulate it and lay out the PCB. The submission in this case would be the schematics, PCB design and a report. (Weighting 25%)

2. Learning outcome 2 will be assessed by a software project submitted in week 8. The exact nature of the project and submission will depend on the programme of study of the student. It will generally be a code listing of a programme written to meet a given specification. (Weighting 25%)
3. Learning outcomes 3,4,5 and 6 will be assessed by practical projects the results of which are submitted in week 18 (Weighting 25%) and week 24 (Weighting 25%). The submissions will depend on the type of projects being carried out, but will typically consist of formal lProduct Design Specifications, evidence of idea generation in logbooks, physical prototypes, verbal and visual presentations.

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE2410
Module Title	Engineering in Context
Level	5
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module aims to explore and demonstrate the role and responsibilities of the engineer in various contexts outside their subject specialism. These would cover issues such as recognising obligations to society, the profession, the environment and commitment to professional standards. The module will also cover other wider issues such as globalisation (global manufacturing, operating in global markets, cultural issues, financial concerns, risk etc) and its impact on business operations.

Learning Outcomes

Knowledge

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

1. demonstrate specialised understanding of the commercial, legal, financial, ethical and environmental context of engineering processes.

2. demonstrate understanding of the impact of engineering decisions on society and the environment on a national and global level.
3. demonstrate understanding of the need for a high level of professional and ethical conduct in engineering.
4. demonstrate understanding of the need for sustainable design and manufacture, waste management and recycling and be aware of National, EU and world legislation.
5. show specialised awareness of intellectual property and contractual issues.
6. show appreciation of a range of other engineering disciplines.
7. apply engineering activities and management techniques to promote sustainable development, identifying, analysing and managing cost drivers.
8. demonstrate understanding of product lifecycle analysis and its application to consumer goods.

Skills

This module will call for the successful student to:

9. demonstrate risk and propose appropriate measures to avoid commercial risk.
10. generate and analyse rational and cogent conclusions as a result of data analysis.
11. use technical literature and other information sources and demonstrate proficiency in written communication;
12. work with appropriate codes of practice and industry standards, including quality standards.

Syllabus

- Career and Professional Development: The role of the Learned Societies in Engineering; Personal Development Plan and Continuous Professional Development.
- Ethics and Professional Conduct: Public responsibility of a scientist/engineer; environmental issues, sustainability, recycling, pollution, effects on different communities, animals, nature.
- Project Management: Case Studies; Business Strategy; Process & Operations Management.
- Manufacturing and Materials: Manufacturing processes and the impact of material choice on these, new and smart materials relevant to the electronics industry, raw materials,
  components, hazardous materials, emissions & waste, environmental impact, sustainability, quality management, product life cycle analysis, eco and physical properties of materials and their impact on the environment and their associated costs. Appropriate manufacturing processes, their use and limitations.
- Business: Product Lifecycle Management. Finance / accounting
- Law for Engineers: Company law, Intellectual property, Privacy
- Issues, The Data Protection Act, Premises and health and safety

Learning, Teaching and Assessment Strategy

The module will be delivered through a series of lectures and seminars. These will also be enhanced by directing students to attend external lectures or colloquiums organised by various professional engineering institutions and other organisations. A

number of guest lectures will also be organised to bring industrial perspective and breadth to the module.

Students are required to one 3 hour learning sessions per week. Attendance, participation and progress on all exercises and assignments will be monitored throughout the module in these sessions.

Assessment scheme

Formative Assessment: Student progress on assessment will be continually formatively assessed and feedback given at appropriate stages. Formative feedback will be given throughout the module on all activities by tutors.

Assessment comprises of two components

1. Assignment 1 (70%). Group assignment: A detailed report based on a multinational manufacturing company, analysing and documenting its business operations within the remit of the module content. Report length limited to 3,000 words. This assignment will test learning outcomes 1, 2, 4, 5, 7, 8, 9, 10, 11, 12. Typical group size is three (week 17).
2. Assignment 2 (30%). A 2,000 word essay on ethics and professionalism. This assignment will test learning outcomes 3 and 6 (week 24).

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE2420
Module Title	Control Systems
Level	5
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module aims to provide knowledge and understanding of control systems and explains the principles of feedback control. The module also develops the student's ability to analyse techniques for designing and modeling controllers to solve real world problems based on block diagrams and transfer functions and to use such techniques in the context of engineering design.

Learning Outcomes

Knowledge

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

1. demonstrate specialised knowledge and understanding of the fundamentals of classical control systems and their design methods;
2. demonstrate understanding of discrete control system design and an awareness of advanced control algorithms;
3. critically analyse simple control systems in terms of value of controlled quantity as specified by the desired signal but with process influenced by external disturbances;

Skills

This module will call for the successful student to:

4. analyse a system model based on information about a typical application, and develop a control system model as a block diagram with an associated mathematical model for establishing the transfer function and other associated information;
5. apply the techniques used to design and analyze the performance of feedback control systems in both time and frequency domain, including compensator design;
6. use common computer aided control design packages such as MATLAB/Simulink and LabVIEW in modelling, analyzing and prototyping control systems;
7. design control systems/controller to solve practical design engineering problems;

Syllabus

- Mathematical tools for designing control systems to include: differential and integral equations, linear approximation techniques, Laplace transform, etc.
- Basic control systems terminology and examples.
- Modelling of typical engineering systems, e.g. electronic circuits, mechanical system, etc.
- Feedback Control.
- Stability, steady state error, sensitivity.
- Transient response, Frequency Response, Bode plots, Nyquist stability criterion
- Controller Design Methods such as PI, PD and PID etc.
- Compensators, Concepts of adaptive control, optimal control and robust control
- Use of Matlab, Simulink, and LabVIEW.

Learning, Teaching and Assessment Strategy

The module will be delivered through a series of lectures, which are supported by guided hands-on exercises and lab sessions. Students are required to attend one 3 hour learning session per week. Attendance, participation and progress on all exercises and projects will be monitored throughout the module in these sessions.

Assessment scheme

Formative Assessment: Student progress on assessment will be continually formatively assessed and feedback given at appropriate stages. Formative feedback will be given throughout the module on all activities by tutors.

Summative assessment comprises of two components:

1. Learning outcome 1, 2, 3, 4, 5, 6 will be assessed by problem solving exercises using appropriate tools (30%, submission in week 4, 10, 12, 16 and 20)
2. Learning outcomes 3, 4, 5, 6, 7 will be assessed by projects to design feedback control systems for given tasks and then simulate and implement it using appropriate tools (70%, submission in week 18, 20, and 23).

To ensure that students are able to demonstrate they have achieved learning outcomes there is an expectation that students attend all scheduled sessions.

Assessment Weighting
Coursework: 100%

Learning Materials

Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE2440
Module Title	Robotics and Mechatronics
Level	5
Credit	30
Other Restrictions and Requirements	
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module aims to develop the student's understanding of the concepts and theory of operation that lie behind mechatronic devices and systems. The student will gain experiential understanding of the effect that design has on these mechatronic devices through construction, programming, demonstration and analysis. This module will also develop realisable solutions to real world situations and develop the student's practical capability in the design and realisation of mechatronic systems using appropriate hardware and software. The student will also develop a wider knowledge of application of robotics in the real world.

Learning Outcomes

Knowledge

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

1. demonstrate specialised knowledge and a deep understanding of robotic and mechatronic components, their operation and control.
2. critically analyse the application of these components in practice.
3. interface different types of robotic and mechatronic components with appropriate hardware (e.g. a microcontroller or LabView system)
4. program appropriate control hardware (e.g. LabView ELVIS) to respond to inputs and produce outputs.

Skills

This module will call for the successful student to:

5. develop the skills necessary to design, develop, program and prototype functioning systems that utilise electro-mechanical and electronic sensors and actuators, together with appropriate robotic and mechatronic control systems.
6. write reports on robotic and mechatronic technology, underpinned by literature review.
7. select and apply knowledge of automation techniques to given industrial problems.

Syllabus

Mechatronic System Components

- A review of the types of mechatronic energy sources: Electrical,
- Pneumatic and Hydraulic
- Energy production, conversion and storage (DC batteries)
- Characteristics and control of actuators e.g: DC motors, stepper motors, brushless motors, servo motors, solenoids, pneumatic valves Characteristics and interfacing of

sensors e.g.: potentiometers, quadrature encoders, accelerometers, piezo, capacitance, inertial navigation units, force sensors, strain gauges, etc.
- Sensor and actuator specification including concepts such as
- bandwidth, dynamic range, sensitivity
- Introduction to vision sensing

Introduction to Industrial Automation

- Introduction to pneumatic, electro-pneumatic and hydraulic systems
- Compressors, accumulators, filters, airlines, etc
- Actuators Control valves System design PLC control, H logic

Survey of the Applications of Robotics, for e.g.,

- Industrial robotics
- Mobile agents and Simultaneous Location and Map-building (SLAM)
- Land Mobility (wheels, tracks, legs)
- Underwater robots (ROVs)
- Flying robots (UAVs)
- Medical/Surgical robots
- Biomimetic systems
- Social robotics
- Domestic robots (vacuum cleaners…)
- Military
- Planetary exploration

Engineering skills

- Problem solving in a technical context - using theory in practice

- Research Skills
- Mechatronic system prototyping techniques

Learning, Teaching and Assessment Strategy

The module will be delivered through a series of lectures, which are supported by guided hands-on exercises and lab sessions. Students are required to attend one 3 hour learning session per week. Attendance, participation and progress on all exercises and projects will be monitored throughout the module in these sessions.

Based on three hours a week contact time over twenty-four weeks, an estimate of the number of weeks allocated to each section may be as follows:

• Survey of the application of robotics 2 weeks
• Mechatronic systems and components 14 weeks
• Introduction to industrial automation 8 weeks

Assessment scheme

Formative Assessment: Student progress on assessment will be continually formatively assessed and feedback given at appropriate stages. Formative feedback will be given throughout the module on all activities by tutors.

Summative assessment comprises of three components:

1. Learning outcome 1, 2, 3, 4 and 5 will be assessed by a project demonstrating an understanding of mechatronic system components. This may include design and development of a given project, a logbook/diary and a demonstration video of a given practical task (60%, submission in week 5, 9, 13 and 16).

2. Learning outcome 6 will be assessed via a literature review essay submission on a particular area of robotic application (20%, submission in week 24).
3. Learning outcome 7 will be assessed by demonstrating an understanding of basic industrial automation system. This will include a short report and a demonstration of the solution to a given automation task (20%, submission in week 22).

To ensure that students are able to demonstrate they have achieved learning outcomes, there is an expectation that students attend all scheduled sessions.

Assessment Weighting
100% Coursework

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE3250
Module Title	TKSW Placement
Level	6
Credit	120
Owning Subject	Product Design & Engineering
Level Restrictions	Undergraduate

Aims

The aim of this module is to strengthen, extend and apply the knowledge, skills and experiences the student has gained from their programme in the context of a working environment, and to complement, stimulate, reinforce and encourage the development of discipline-specific technical knowledge, and the student's transferable skills.

Learning Outcomes

Knowledge

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

1. demonstrate knowledge of professional requirements in an industry context.

Skills

This module will call for the successful student to:

2. record and critically reflect on their personal practice;

3. set meaningful and productive personal development targets;
4. consolidate and apply graduate skills in a professional working context.

Syllabus

This is a supervised work experience module that normally lasts for 48 weeks (and not less than 36 weeks) spent in a company, or companies, on a temporary employment contract. The student can complete the required 36 weeks minimum experience in a single company, or in additional companies, up to a maximum total of three. It is designed to give students experience of working and the opportunity to build on the material studied during the first two years of their programme. A log book, final report and report from the company provide the School with a measure of the achievement of the aims of the module. The work undertaken is varied and depends on the particular companies, which range from small local employers to large multi-nationals. It can range from research and development work within design projects to quality assessment and control, or plant operation.

Learning, Teaching and Assessment Strategy

A log book, final report and report from the company provide a measure of the achievement of the aims of the module. Learning will occur by direct involvement in the work programme. Each student is allocated a University Tutor who will visit the student in placement at least twice to liaise with the industrial supervisor, discuss the progress and advise on any matters as necessary. The student will also attend two recall sessions, to allow discussion with tutors and peer group. One will be scheduled in October, one in February.

A Placement Handbook will be supplied to each student as a general guide, and assistance will be given (by Middlesex University Careers Office) with the development of CV and interview techniques.

Assessment Scheme

The assessment will be continuous and will consist of two components:

1. Log book (50%) to be submitted at the end of the placement will assess LO 1, 2 and 4
2. Final project report (50%) at the end of the placement will assess LO 2 and 3

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE3400
Module Title	Design Engineering Major
Level	6
Credit	60
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module aims to provide the student with the opportunity to undertake a major piece of self-directed engineering design using the knowledge and skills learnt throughout the programme. The module will provide the opportunity to engage in the project over an extended period of time and allow the student to make a significant personal contribution to all phases of the engineering design and development process appropriate to the goals of their programme.

Learning Outcomes

Skills

This module will call for the successful student to:

1. investigate and critically analyse unfamiliar engineering problems and be able to exercise significant judgment in the process of solving them;
2. critically apply their knowledge to formulate solutions to engineering problems;
3. synthesize the outcomes of their project from analysis, prediction, experimentation, prototyping, consultation, etc.;

4. undertake formative critical evaluation in the rejection, selection and development of feasible solutions;
5. undertake an evaluation of the project outcome utilising specialised knowledge in terms of technical feasibility, conformance to the specification and viability of the chosen technical solution;
6. communicate the outcomes of a project to a wide audience (general public and academic).

Syllabus

The student will engage with this module through the practical application of their specialised knowledge and skills. Depending on the students' individual projects, additional specialist tutorials will be provided where necessary.

Learning, Teaching and Assessment Strategy

At the beginning of the module the student will be presented with a list of projects suggested by tutors associated with the programme. In consultation with their tutors, the student will choose a topic that they would like to pursue and will be assigned a member of staff as a supervisor. The topics would generally be aligned to the tutor's research or personal interest so that they can provide specialist guidance. There will also be the opportunity for students to suggest their own ideas for projects, subject to approval and agreement of a tutor to act as a supervisor. The student will be expected to meet with their supervisor at least once a week for the duration of the module, where they will report on their progress, receive formative feedback and set negotiated targets. The student must keep an engineering logbook, which is witnessed by the supervisor at each meeting.

In addition to the one-to-one supervision meetings, all students undertaking projects will meet for two 3 hour sessions each week. In these sessions they will receive general guidance on academic writing, project planning, project management, collecting and processing results, etc. They will also present progress on their work to their peers and receive formative feedback from their tutors. In addition, they will receive guidance on life after university, including job searching, interview techniques, free-lancing, postgraduate research, etc.

Assessment Scheme

Formative Assessment: Student progress on assessment will be continually formatively assessed and feedback given at appropriate stages. An Initial Project report, consisting of an initial literature review,
background information, project plan, project budget, risk assessment and ethics assessment will be submitted in week 16 and expected to be about 15 pages long.

Summative assessment will be in week 26. The grade for the module will be awarded based on the overall academic profile of the submission, rather than weighting each individual piece of work, because the submissions are so closely inter-related.

Learning outcomes 1,2,3,4,5 will be assessed by:

1. A formal written project report (including, but not limited to: Introduction, Background, Literature Review, Implementation, Testing/Evaluation, Conclusion, References). Expected to be at least 40 pages long
2. A PDF Scan of the student's engineering logbook showing progress through the development of the project and

evidence of regular supervision meetings.
Learning outcome 6 will be assessed by

3. A poster presenting the project in the style of an academic conference poster, suitable for display at the Degree Show.
4. A webpage, including a Tweet and link to a Youtube video suitable for the general public.
5. Formal oral presentation of 10 minutes (plus questions) to a panel of tutors.

Students MUST submit all elements of summative assessment in order to pass the module. To ensure that students are able to demonstrate they have achieved learning outcomes there is an expectation that students attend all scheduled sessions and meet with their supervisors regularly.

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE3422
Module Title	Industrial Automation&Control
Level	6
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module aims to develop the student's understanding of current approaches and practical techniques used in industrial automation and control. The student will also be made aware of the use of modern automation and its influences on design engineering practice.

Learning Outcomes

Knowledge

On completion of this module, successful students will be able to:

1. demonstrate a critical understanding of a wide range of highly-specialised knowledge and associated technologies used in industrial automation and control.

Skills

This module will call for the successful student to:

2. design and implement industrial control systems for automation application;
3. configure and program flexible manufacturing systems and automated inspection using image processing;
4. program programmable logic controllers (PLCs) and implement these in relatively complex industrial applications;
5. select and use appropriate simulation tools to model and optimize manufacturing/assembly processes.

Syllabus

- Introduction to modern manufacturing systems.
- Programmable logic controllers and networking applications.
- Flexible manufacturing systems.
- Industrial communication and interfacing – networks, field bus, CAN, etc.
- Automated inspection using image processing.
- Manufacturing/assembly process simulation.
- Robot programming languages – on-line and offline.

Learning, Teaching and Assessment Strategy

The module will be delivered through a series of lectures, which are supported by guided hands-on exercises and lab sessions. Students are required to attend two 3 hour learning sessions per week. Attendance, participation and progress on all exercises and projects will be monitored throughout the module in these sessions.

Formative Assessment: Student progress on assessment will be continually formatively assessed and feedback given at

appropriate stages. Formative feedback will be given throughout the module on all activities by tutors.

Summative assessment comprises three components

1. Learning outcomes 1, 2 and 4 will be assessed by a PLC based project to execute a given task and meet given specifications. (40%, submission in week 4)
2. Learning outcome 1, 2 and 5 will be assessed by a mini project based on computer simulation of manufacturing or assembly process (30%, submission in week 8)
3. Learning outcome 1 and 3 will be assessed by a mini project based on flexible manufacturing system programming and reconfiguration (30%, submission in week 12)

To ensure that students are able to demonstrate they have achieved learning outcomes, there is an expectation that students attend all scheduled sessions.

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE3432
Module Title	Mobile Robots and Manipulators
Level	6
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

The module will develop an understanding of the modelling, simulation, design, selection and programming of robotic manipulators and mobile robots. The student will gain an understanding of kinematics, dynamics and control of mechatronic and robotic systems as well as practical experience of programming a manipulator. In addition they will gain practical experience of working with software architectures for complex robotic systems and will develop an understanding of issues in mobile robotics such as mapping and navigation.

Learning Outcomes

Knowledge

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

1. demonstrate knowledge and an in-depth understanding of the modelling and control of robotic manipulators;
2. demonstrate an in-depth appreciation of the issues of designing and controlling mobile robotics.

Skills

This module will call for the successful student to:

3. use specialist knowledge to develop a model of a robotic manipulator;
4. program a robotic manipulator to carry out a set task;
5. demonstrate competence in the use of a software architecture for complex robotic systems.

Syllabus

- Denavit-Hartenburg description of kinematic chains
- Coordinate systems as applied to manipulators (World, Joint, etc)
- Forward and inverse kinematics. Introduction to dynamics.
- Use of modelling tools for mechatronic and robotic system design.
- Characteristics of manipulators (workspace, accuracy, repeatability, load capacity). Compliance in actuators.
- Classification of manipulators. Selection of manipulators to suit specific applications.
- Programming in an appropriate language for manipulator control
- Software architectures for robotics (concurrency, message passing, etc.)
- Introduction to mobile robots. An appreciation and experience of issues such as navigation, sensor fusion, SLAM, collision avoidance, path-planning, tele-operation, latency, real-time operating systems, etc

Learning, Teaching and Assessment Strategy

The module will be delivered through a series of lectures, which are supported by guided hands-on exercises and lab sessions.

Students are required to attend two 3 hour learning sessions per week. Attendance, participation and progress on all exercises and projects will be monitored throughout the module in these sessions.

Assessment scheme

Formative Assessment: Student progress on assessment will be continually formatively assessed and feedback given at appropriate stages. Formative feedback will be given throughout the module on all activities by tutors.

Assessment comprises of three components

1. Learning outcome 1 and 3 will be assessed by a project to develop a model of a manipulator to meet given specifications. The model will be simulated using appropriate software. (20%, submission in week 12)
2. Learning outcome 4 will be assessed by programming an industrial manipulator to carry out a set task. (30%, submission in week 14)
3. Learning outcomes 2 and 5 will be assessed by a series of in-class tests of competence in using mobile robots, as well as a written report. (50%, submission in week 13).

To ensure that students are able to demonstrate they have achieved learning outcomes there is an expectation that students attend all scheduled sessions.

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE4400
Module Title	Team Project
Level	7
Credit	60
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module aims to contextualise, exemplify and consolidate the analytical and technical knowledge and skills in relevant subject areas through engineering group projects. It will provide the student with the opportunity to develop their competence in undertaking group projects and engaging in formal project management. It also aims to develop abilities in problem solving, team working, written and oral presentations.

Learning Outcomes

Skills

This module will call for the successful student to:

1. demonstrate and implement a practical exemplification of advanced knowledge and specialist skills in the subject area of the project;
2. apply analytical, systematic and innovative approaches to problem solving for engineering design;
3. model and critically analyse complex engineering design problems and use computer-based tools when appropriate;

4. develop engineering products/designs by employing high level analytical skills and taking in to account a wide range of commercial, social, environmental issues and relevant industrial regulations and standards when appropriate, and to critically evaluate products in terms of cost and economic analysis;
5. apply formal project management methods to plan and manage long term complex projects and work constructively and supportively in a team;
6. present complex design solutions through professionally written technical reports and oral presentation.

Syllabus

- Analytical, systematic and creative approach to problem solving.
- Computer-based engineering design package such as CAD.
- Modelling and analysis of complex engineering design problems.
- Product development process.
- Cost and economic risks analysis.
- Materials and manufacturing processes selection techniques.
- Project management and appropriate software skills in project planning and monitoring.
- Team working and issues related to teams.
- Report writing skills.
- Presentation skills.
- Regulatory framework and industrial standards.

Learning, Teaching and Assessment Strategy

One team project will be issued by the supervisory team of staff. The supervisory team will meet with the student group on a weekly basis (one 3-hour session) to undertake the project briefings, critiques and project presentations and evaluations required to complete this project. These meetings will provide regular contact points to check on, and stimulate, project progress.

This contact model will provide the support structure to stimulate and enable students to work towards these targets with a high degree of personal procedural autonomy. It will require students to identify and undertake the learning needed to complete these tasks successfully.

Assessment scheme

Formative Assessment: Student progress on assessment will be continually formatively assessed and feedback given at appropriate stages.

Summative Assessment: The grade for the module will be awarded based on the overall academic profile of the submission, rather than weighting each individual piece of work, because the submissions are so closely inter-related.

Learning outcomes 1,2,3,4,5 will be assessed by:

1. Formal written project reports (including, but not limited to: Introduction, Background, Literature Review, Implementation, Testing/Evaluation, Conclusion, References). An interim report (of about 20 A4 pages)

submitted in week 18 and a final report (of at least 60 A4 pages) in week 12.

2. The production of a design prototype with a video documenting it. Submitted in week 12.

   Learning outcome 6 will be assessed by

3. Group formal oral presentations of 15 minutes (plus questions) to a panel of tutors. Interim presentation in week 18, final presentation in week 12. The presentation involves assessment of the individual's contribution as well as of the group as a whole.

Students MUST submit all elements of summative assessment in order to pass the module.

To ensure that students are able to demonstrate they have achieved learning outcomes there is an expectation that students attend all scheduled sessions and meet with their supervisors regularly.

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE4410
Module Title	Embedded Multimedia Systems
Level	7
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module aims to enable the student to specify, design and implement embedded multimedia systems and will give them the opportunity to gain familiarity with current multithreaded operating systems for mobile devices. Many modern embedded systems (e.g. smart mobile phones, consumer products, medical devices) need to handle multimedia content such as images, video and sound and must be able to communicate with wireless networks.

Learning Outcomes

Knowledge

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

1. demonstrate an in-depth understanding of human-machine interfacing and interaction design, as applied to embedded multimedia systems;
2. demonstrate detailed knowledge of the core issues of multimedia systems, including handling of images, video, audio and connectivity, both wired and wireless;

3. demonstrate a high level of knowledge of existing systems, their limitation in use and future trends in embedded multimedia systems.

Skills

This module will call for the successful student to:

4. analyse and critique existing systems;
5. specify an embedded multimedia product;
6. implement all aspects of an embedded multimedia product, both hardware and software.
7. Use an appropriate operating system (e.g. Android, Linux, Windows CE, etc.) proficiently and with confidence;
8. write appropriate technical documentation to industry standards.

Syllabus

- Introduction to multimedia applications of embedded systems
- Overview of current embedded multimedia platforms and applications.
- Image, video and audio file formats and encoding schemes (e.g. jpeg, mpeg, mp3)
- Image and video processing
- Synthesis of sound signals
- Device connectivity issues and protocols (e.g. WiFi, GPRS, Zigbee)
- Relevant Operating Systems (e.g. Android, Linux, Windows CE, etc.)
- Principles of human-machine interfacing, interaction design, human factors.
- Investigation and analysis of case studies of embedded multimedia systems.

- Investigation of future trends in embedded multimedia systems.

Learning, Teaching and Assessment Strategy

Students are required to attend two 3-hour practical workshops each week.
This module is focussed on developing high level practical skills. Given this, the emphasis will be on workshop sessions where students will learn in practical way.

The module will start with some standard exercises where students will learn basic skills and receive formative feedback. Once these are mastered the work will become more student-led.

Assessment scheme

Given the practical nature of the module, it will be assessed by coursework, which is designed to interrogate, develop and augment higher-order thinking and cognitive processing which are essential skills for the workplace. Such skills involve critical thinking and problem solving, including analysis, evaluation and synthesis. Also, much of the coursework will be self-led so will develop time-management and planning skills.

The learning outcomes will be demonstrated by the student specifying, designing, implementing and documenting a multimedia embedded system of his/her own design. This module is 100% coursework submitted in week 14. The assessment is broken down into 4 elements.
Formative assessment: Student progress on assessment will be continually formatively assessed and feedback given at appropriate stages. Formative feedback will be given throughout the module on all activities by tutors in verbal and written form.

Project proposal and presentation 20% Students, working individually, will propose a particular multimedia embedded system with a specific product in mind. They will take into account all aspects of the product, including the usability, interaction design and physical design. They will present their proposals to tutors and other students as part of a creative conversation. (Addresses learning outcomes 3 and 4, Week 2).

Requirements and specification documents: 10%. Once the product concept is approved, students will go through all the stages of product design, with clear requirements, specifications and implementation documentation. They will implement the system to a professional standard. It is expected that students will spend a significant amount of time outside of the timetabled hours working on their projects. (Addresses learning outcomes 1, 2, 5 and 8, Week 4).

Project demonstration and presentation: 40% Students will demonstrate knowledge of the core concepts by incorporating them in the implementation of their multimedia products. (Addresses learning outcomes 1, 2, 6 and 7, Week 12).

Final written report: 30%. A short technical report describing the operation of the product. (Addresses learning outcomes 6. 7 and 8, Week 14).

Assessment Weighting
Coursework: 100%

Learning Materials
Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	PDE4803
Module Title	Advanced Topics in Mechatronics
Level	7
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module allows the student to study, in depth, an advanced topic in mechatronics. The subject of the module will change periodically reflecting the interests of staff in the department, and the interests of the students studying it. The module mirrors the dynamic nature of mechatronics and how it is applied, and serves to illustrate the ever changing character of the subject. This module will allow students to encounter cutting edge areas of mechatronics.

Learning Outcomes

Knowledge

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

1. demonstrate a clear and rigorous understanding of the module's topic;
2. critically evaluate the relevance of the module's topic in the broader context robotics;
3. apply the topic of the module to a range of relevant areas.

Skills

This module will call for the successful student to:

4. communicate expertly using a chosen platform;
5. draw on previous learning to synthesise an advanced topic;
6. demonstrate their ability to learn effectively.

Syllabus
There is no set syllabus for this module; instead the subject of the module will change periodically depending on the department's interests and the relevance of the topic in the wider context of mathematics. Topics will be chosen that advance and complement previous learning.

Learning, Teaching and Assessment Strategy

The nature of design engineering learning is that it is cumulative, and so in order to complete this module successfully students are expected to be actively and continuously involved in all the learning, teaching and assessment methods employed, to develop their appreciation of, and skills in, the application of design engineering.

Students are required to attend two 3-hour learning sessions per week. The purpose of these sessions will be to introduce new content in a systematic way, ensuring it is taught in the context of the students' prior learning and experience. Sessions are expected to have some practical element within them developing students' ability to apply their knowledge successfully to solve or gain a deeper understanding of problems. Students will be encouraged to develop independent thinking skills in this session using appropriate problems and discussion.

Assessment Scheme

Formative assessment in the form of problem or other independent work will be provided during the lecture to work on before the follow-up session. Students will discuss issues in class and be given immediate formative feedback.

Summative assessment will consist of two components:

The summative assessment components are:

1. Presentation (40%): students will work independently on a set problem and present their findings using a platform of their choosing, for example a web page, a poster, an oral presentation etc. Students will be marked on their ability to present their findings appropriately and the accuracy of their results, thereby ensuring consistency of assessment schemes between the different choices of platform, (week 12). This will assess learning outcomes 1,2,3, and 4.
2. Project (60%): Students will work independently on a practical project that will encapsulate their learning and demonstrate this through the use of an appropriate practical outcome. This may be in the form of a software development application as well building a physical system that demonstrates their new learning. The project deliverables for assessment will be agreed at the time of project selection. Project submission will be due at the end of the module (week 14). This will assess learning outcomes 1, 3, and 5.

Assessment Weighting
Coursework: 100%

Learning Materials
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area of UniHub. They highlight essential and recommended reading for all modules you are registered on.