

10 April 2013  
(Talks given to Stage 3 students on 28 March 13)

## UCD Engineering Programmes for Mechanical and Flexible Option Students BSc Eng, BE ME



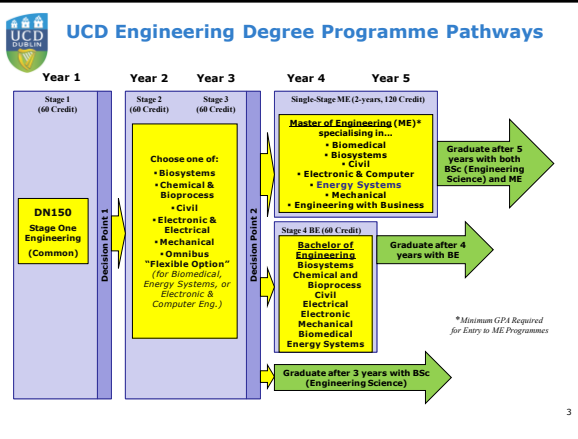
UCD School of Mechanical and Materials Engineering



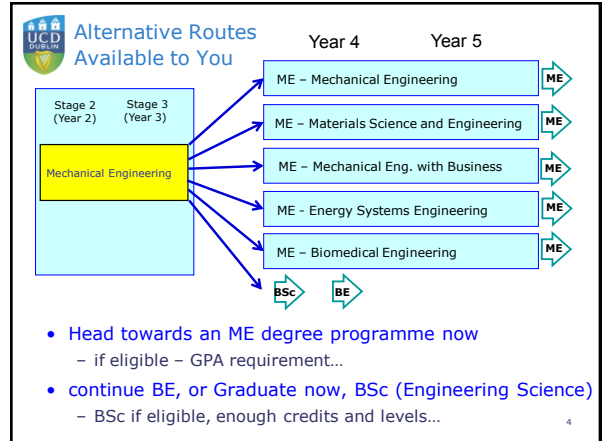
## Programme Coordinators

- Dr. William Smith [william.smith@ucd.ie](mailto:william.smith@ucd.ie)
  - BSc Eng, (BE) Flexible Options
- Mr. Pat Connolly [pat.connolly@ucd.ie](mailto:pat.connolly@ucd.ie)
  - BSc Eng, BE Mechanical Engineering
- Dr. Malachy O'Rourke [malachy.orourke@ucd.ie](mailto:malachy.orourke@ucd.ie)
  - ME Mechanical Engineering
- Dr. David Timoney [david.timoney@ucd.ie](mailto:david.timoney@ucd.ie)
  - ME Energy Systems Engineering
- Dr. Ken Stanton [kenneth.stanton@ucd.ie](mailto:kenneth.stanton@ucd.ie)
  - ME Materials Science and Engineering
- Dr. Eamonn Ambrose [eamonn.ambrose@ucd.ie](mailto:eamonn.ambrose@ucd.ie)
  - ME Engineering with Business
- Dr. Madeleine Lowery [madeleine.lowery@ucd.ie](mailto:madeleine.lowery@ucd.ie)
  - ME Biomedical Engineering

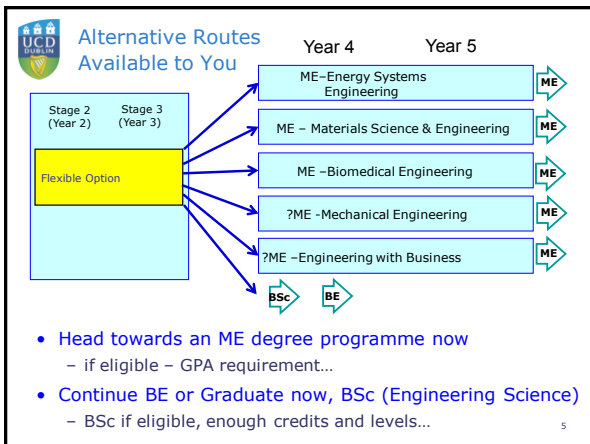
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## Master of Engineering (ME) Degree

- Professional qualification for the future
  - level required to become Chartered Engineer
  - level expected in most of Europe
- Two years of specialised study in chosen field
  - making five years in total
  - includes work placement (up to 7 months)
  - includes major project at Master level
- Entry requirement
  - based on stages 2 and 3, weighted 3 and 7
  - from 2013, minimum GPA 2.8
  - GPA of 2.8 or higher recommended!
    - no easy way back to BE if finding ME too hard...

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## Master of Engineering (ME) Degree

- Full tuition fees payable for one year
  - currently €6300 per year for EU students
  - "free fees" only applies to Bachelor degree
    - i.e. only pay "student contribution", not full tuition fee
- In September 2013 Register as Engineering Science undergrad. student
  - until end of stage 4
  - take modules appropriate to ME...
  - then graduate with BSc degree
  - enter ME programme in September 2014
    - use surplus credits from stage 4
    - complete ME in 1 year
    - pay tuition fees for final year only

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## Master of Engineering (ME) Degree

- Work Placement options
  - 30 credit, 6-7 months, start January 2014
    - replaces entire spring semester
    - Different for ME Engineering with Business
  - 10 credit, summer 2014
    - take modules in spring 2014 to make up credits
  - UCD helps to arrange placements
    - each student picks four companies from list of employers
    - selected CVs sent, meetings/ interviews in Oct. and Nov.
    - you may propose your own placement
- ME Project
  - runs through last two semesters
  - 25 credits, (15 for ME with Business)
  - similar arrangements to BE project
  - but expect Master's-level work...

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## Chartered Engineer – CEng

- Used in Ireland, UK, India, ...
  - US, Canada: PE = professional engineer
  - Australia, NZ: CPEng = chartered prof. engineer
- Registered title, protected by law
  - required by law for certain engineering activities
- Awarded by professional body
  - Engineers Ireland, must also be member!
- Requirements:
  - education to suitable standard - accredited degree
    - from 2013, Master's level or equivalent
  - development of competence in practice
    - minimum 4 years responsible experience
  - continuing professional development - CPD

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## Your Choices in Brief...

- Graduate with BSc (Eng. Sci.) in 2013
  - for work or further study
    - e.g. ME in Europe, qualification in a different field
  - not professional Engineer
- Continue in BE programme
  - could graduate in 2014
  - could work as professional Engineer
  - could do further postgraduate study
  - but further master qualification needed for Chartered Engineer
- Continue towards ME in UCD (if eligible)
  - could graduate in 2015
  - different modules in stage 4, to support ME
- Decision by end of semester...
  - return form to Programme Office by 26 April

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To Stage 3 students on 28 March 2013

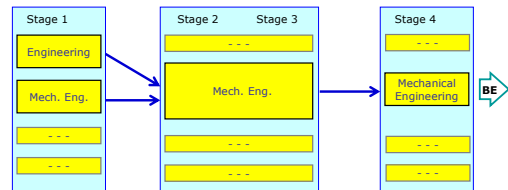
## UCD Engineering Programmes for Mechanical and Flexible Option Students BSc Eng, BE

Mr. Pat Connolly pat.connolly@ucd.ie  
 BE Mechanical Engineering Coordinator  
 Dr. William Smith william.smith@ucd.ie  
 Flexible Options Coordinator



UCD School of Mechanical and Materials Engineering

## The BE Degree Programme

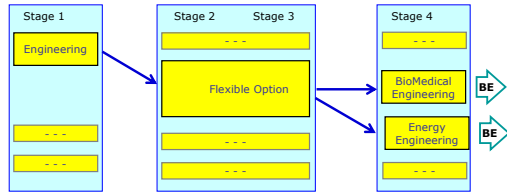


- You entered the BE degree programme
  - you chose the Mechanical major
  - you graduate with BE degree



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## The BE Degree Programme



- You entered the BE degree programme
  - you chose Energy or BioMedical major
  - you graduate with BE degree



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## BSc (Engineering Science) Degree

- Bachelor of Science degree**
  - not a professional engineering qualification
  - 3 years, 180 credits
  - 30% based on Stage 2, 70% on Stage 3
- To be compatible with European system:**
  - first cycle = Bachelor degree (often 3 years)
  - second cycle = Master degree (typ. 2 years)
  - third cycle = PhD (min. 3 years)
  - could choose now if want ME programme in Europe...
- To provide exit from Engineering**
  - provides strong technical foundation
  - to pursue career in another field
  - to continue studies in another area

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## Bachelor of Engineering (BE) Degree

- Traditional qualification in Engineering**
  - still respected in the workplace
  - will be accredited for MIEI
    - membership of Engineers Ireland, professional body
  - no longer sufficient for Chartered Engineer
    - further study would be needed (later in career?)
- Four years study in total**
  - stage 4 mostly core modules, two options
  - project module – 15 credits
  - no formal work placement
- No extra barrier to progression**
  - normal progression rules apply
  - need to progress (50 credits in stage 3) to register for project module

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## BE - Mechanical Engineering

- Core Modules**
  - BE Project
  - Process Instrumentation and Control or Control Theory
  - Mechanics of Fluids 2
  - Manufacturing Engineering 2
  - Computational Continuum Mechanics 1
  - Thermodynamics 3
  - Materials Science and Engineering 3
  - Professional Engineering (Management)
- Option Modules (Choose 2)**
  - Mechanics of Solids 3
  - Mechanics of Fluids 3
  - Computational Continuum Mechanics 2
  - Fracture Mechanics
  - Energy Systems and Climate Change
  - Technical Ceramics
  - Materials Thermodynamics and Kinetics
  - Medical Device Design
  - Advanced Metals/Materials Processing
  - Composites and Polymer Engineering
  - Nanomaterials



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## BE Project Module

- Project choice and allocation**
  - we propose a list of projects
  - you choose your preferences
  - allocation according to Stage 3 GPA
  - option to propose your own project – act early!
- Independent work through both semesters**
  - research and/or design, putting theory into practice
  - guided by supervisor – meet at least weekly
  - work in parallel with 4 or 5 taught modules
  - time management is critical...
- Assessment through the year**
  - interim report, final report
  - oral presentation, poster presentation
  - interview – supervisor and another examiner



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## After the BE...

- Work**
  - often with further training, specific to employer
  - maybe a higher degree later in career?
- Taught Master's degree**
  - in engineering or another area
  - minimum 90 credits (three semesters or full year)
  - fees payable
- Research Master's degree**
  - 18 months to 2 years...
- PhD**
  - typically 4 years research, can be more...
  - substantial thesis, original work
  - fees payable, but often scholarship available...

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**UCD Taught Masters Programmes**

## ME in Mechanical Engineering

**Prof Alojz Ivankovic**  
Programme Director


**Dr. Malachy O'Rourke**  
Programme Coordinator



## ME Mechanical Engineering

### Presentation Outline

- Programme Overview
- Programme Structure
  - Module Choice
  - Work Placement
  - Research Project
- What are the entry requirements?
- How do students external to UCD apply?
  - Accreditation




## ME Mechanical Engineering

### Programme Overview

*Aims to provide students with the opportunity to gain advanced theoretical, conceptual and practical knowledge in the application of Mechanical Engineering*

Emphasis is placed on

- core subject areas such as continuum mechanics, solid mechanics and fluid dynamics
- acquiring the skills required to generate new knowledge through research
- independent and project based learning while working with UCD academics and researchers on contemporary research projects
  - professional engineering practice during work placement



## ME Mechanical Engineering

### Programme Structure

**2-Year Full Time Programme (120 ECTS Credits)**

**Year 1**


- 30 credits (6 taught modules) in semester one
- 30 credit work placement in semester two

or

4 taught modules in semester two + 10 credit work placement either during semester 2 or summer semester

**Year 2**


- Year long 30 credit research project + research skills and techniques
- 30 credits (6 taught modules) distributed across semesters 1 & 2



## ME Mechanical Engineering

### Module Choice

<b>Core Modules</b>	<b>Option Modules</b>
<ul style="list-style-type: none"> <li>• Computational Continuum Mechanics 1</li> <li>• Computational Continuum Mechanics 2               <ul style="list-style-type: none"> <li>• Mechanics of Solids 3</li> <li>• Mechanics of Fluids 2</li> <li>• Mechanics of Fluids 3</li> </ul> </li> <li>• Materials Science and Engineering 2               <ul style="list-style-type: none"> <li>• Fracture Mechanics</li> </ul> </li> <li>• Professional Engineering Management               <ul style="list-style-type: none"> <li>• Manufacturing Engineering 2</li> <li>• Engineering Thermodynamics 3                   <ul style="list-style-type: none"> <li>• Control Theory</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Energy Systems and Climate Change               <ul style="list-style-type: none"> <li>• Applied and Computational Mathematics</li> <li>• Technical Ceramics</li> </ul> </li> <li>• Kinetics and Thermodynamics of Materials               <ul style="list-style-type: none"> <li>• Technical Communications</li> <li>• Advanced Metals/Materials Processing</li> </ul> </li> <li>• Advanced Composites and Polymer Engineering               <ul style="list-style-type: none"> <li>• Nanomaterials</li> </ul> </li> </ul>















## Work Placement

**tfi** technology from ideas Technical Engineering Group  
Precision you can trust

- Takes place during semester 2 of year 1
- Students apply for positions during semester 1 of year 1

Companies involved in work placement to date include:

								
<ul style="list-style-type: none"> <li>• Accenture (Dublin &amp; UK)               <ul style="list-style-type: none"> <li>• BD Medical</li> <li>• BMR</li> </ul> </li> <li>• Boston Scientific</li> <li>• Caterpillar (UK)</li> <li>• CCM (Delaware, USA)               <ul style="list-style-type: none"> <li>• CTS (USA)</li> <li>• De Puy</li> <li>• Dublin Port</li> </ul> </li> <li>• Eirecomposites</li> </ul>	<ul style="list-style-type: none"> <li>• Element 6</li> <li>• Henkel</li> <li>• Irish Rail</li> <li>• Jaguar Landrover (UK)               <ul style="list-style-type: none"> <li>• MSD</li> </ul> </li> <li>• Nypro Healthcare               <ul style="list-style-type: none"> <li>• PCH (China)</li> <li>• ProCut</li> <li>• Tech Eng Tools</li> <li>• Technology from Ideas</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li> <b>MSD</b> Be well</li> <li></li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>					



## ME Mechanical Engineering

### Research Project

Research project includes

- Research Project, allocated at beginning of year 2 (25 credits)
- Research Skills and Techniques, taught modules (5 credits)

Research projects are

- proposed by academic supervisors within the School, or
- arise from work placements and/or involve industrial collaboration

Assessment based on

- oral examination and research thesis (80%)
  - oral presentation (10%)
  - poster presentation (10%)



## ME Mechanical Engineering

### What are the entry requirements?

**Entry Requirements:** Candidates holding a Bachelors Degree in Engineering (or an equivalent) with a minimum of 2H1 honours level engineering qualification will be considered.

### How do students external to UCD apply?

Applications for this programme are through UCD Online Applications [www.ucd.ie/apply](http://www.ucd.ie/apply)



## ME Mechanical Engineering

### Accreditation

- The UCD ME Mechanical Engineering degree programme will soon be fully accredited at Masters level by Engineers Ireland (<http://www.engineersireland.ie/>)
- NB: Accreditation will be sought during the 2013-2014 academic session, once our first cohort of students graduate from the programme



## ME Mechanical Engineering

### Programme Co-ordinator & Contact Details

Dr. Malachy O'Rourke  
 School of Mechanical and Materials Engineering  
 UCD Engineering and Materials Science Centre  
 University College Dublin  
 Belfield  
 Dublin 4  
 Ireland  
 email: malachy.orourke@ucd.ie

## UCD Taught Masters Programme ("ME") in Energy Systems Engineering

**Dr. David Timoney**

Programme Director



UCD School of Mechanical and  
Materials Engineering



## Master of Engineering (ME) in Energy Systems Engineering

- Aims to prepare graduates to meet the engineering, economic and environmental challenges facing the energy systems of developed countries in the future.
- Will focus on the interdependence between;
  - **The electricity system,**
  - **Building energy systems,**
  - **The industrial production system,**
  - **The food supply chain, and**
  - **The transport system,**
- taking account of security of supply and climate impact / CO<sub>2</sub> emissions.



## Master of Engineering (ME) in Energy Systems Engineering

Not restricted to renewable energy systems - aims to take a holistic or full-systems view. Includes modules dealing with nuclear power, with fossil fuel extraction, processing, combustion and carbon sequestration and storage.

Inputs to the programme are provided from;

- Mechanical Engineering
- Electrical Eng. & Electronic & Communications Eng.
- Civil Engineering and Biosystems Eng.
- Chemical & Bioprocess Engineering
- Geological Sciences
- Physics
- Economics
- Business

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## ME (Energy Systems) at UCD - Modules

- Energy Systems & Climate Change
- Fossil Fuels, Carbon Capture & Storage
- Engineering Thermodynamics II & III
- Chemical Process of Sustainable & Renewable Energy
- Wind Energy
- Power System Operation
- Energy Systems in Buildings
- Energy in Transport
- Air Pollution / Environmental Engineering Fundamentals
- Energy Economics / Entrepreneurial Management
- Control Theory / Process Instrumentation & Control
- Electrical & Electronic Circuits / Electrical Energy Systems II
- Power System Design / Power System Engineering
- Power Electronics and Drives / Applications of Power Electronics, Nuclear Physics
- Research Skills and Techniques, Technical Communication
- Research Project / Thesis

<http://www.ucd.ie/graduatestudies/coursefinder/taughtprogrammes/me-energy-systems-engineering/>

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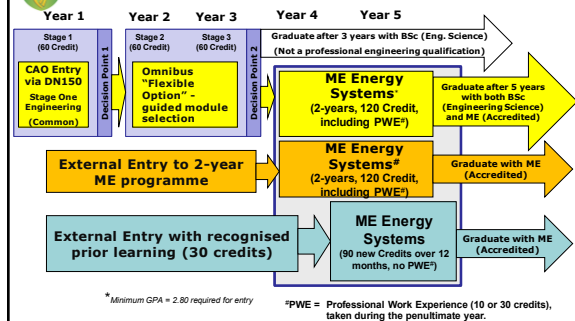
## Master of Engineering (ME) in Energy Systems Engineering

- The UCD ME (Energy Systems) degree programme is fully accredited at Masters level by Engineers Ireland <http://www.engineersireland.ie/>.
- Awarded the EUR-ACE® Label as a Second Cycle Accredited European Engineering Programme under the EUR-ACE Framework of Standards for Accreditation of Engineering Programmes (<http://www.enaee.eu/eur-ace-system>).

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## ME (Energy Systems) Pathways



## ME (Energy Systems) - Pathways

- Entry to 120 credit, 2-year programme for UCD students who have been enrolled for last 3 years on BE (Mechanical), BE (Electrical / Electronic) and BE (Chemical) programmes or "flexible option" {BSc (Engineering Science) will be awarded for years 1-3}.
- Students who have previously completed a 4-year BE (or equivalent) may be eligible to complete the ME (Energy Systems) programme over 12-months (90 additional ECTS credits).

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## ME (Energy Systems) - Previous Cohorts of Students

- Small number taking 120 credit, 2-year programme, who have been enrolled on the BSc (Engineering Science) programme at UCD for the last 3 years.
- ~30 p.a. who had previously completed 4-year BE (or equivalent) programmes and took the 90-credit, 12-month programme.
- Enrolment to date includes graduates from several Irish universities (UCD, TCD, DIT, CIT, UCC, UL, NUIG, QUB) and from several other countries (UK, Spain, France, Cyprus, China, Iran, Norway, Pakistan, USA, Libya, Germany, Brazil, Saudi Arabia).
- Includes Mechanical, Materials, Chemical, Electronic and Civil engineering graduates, some with several years of industrial experience.

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## Master of Engineering (ME) in Energy Systems Engineering

- Examples of employers include Mainstream Renewable Power (Dublin), ESB International (Dublin), ESB Networks (Dublin), Intel Ireland Limited, Arup (Dublin), CES Energy (Dublin), Dalkia Ltd (Dublin), Clearpower (Dublin), Fingleton White & Co (Irl.), RPS Group (Dublin), Accenture (Dublin), First Derivatives (NI), Enercon GmbH (Ireland and Germany), AptarGroup, Inc. (Galway), Tipperary Energy Agency, Zenith Technologies (Cork), ConocoPhillips (Cork), Imtech (UK), MCS Kenny (UK), Schletter UK Ltd, Schwenk Zement (Germany), KBR (UK), Sea Breeze Power Corp (Canada), KBR (Australia), and Independent Market Operator (Perth, Australia).
- Also, significant numbers have decided to pursue further study to PhD level, at UCD and elsewhere.

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## ME in Materials Science & Engineering

**Dr Kenneth Stanton**

Programme Director

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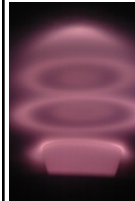
## ME Materials Science and Engineering



- **ME in Materials Science and Engineering**
  - A materials science degree course with a focus on engineering applications of advanced materials
- **2-year full-time 120 credit (ECTS) programme**
- **Professionally accredited**
  - Engineers Ireland (Washington Accord)



## ME Materials Science and Engineering



- Fundamentals and applications of metals, ceramics, polymers, composites, semi-conductors and materials processing
- Options focus on materials for:
  - Biomedical devices
  - Nanotechnology
  - Energy
  - Manufacturing
- Includes 6-month industrial work placement



## ME MSE: Modules

- **Core:**
  - Manufacturing Engineering I
  - Material Science and Engineering II
  - Technical Ceramics
  - Professional Engineering (Finance)
  - Solid-State Electronics I
  - Fracture Mechanics
  - Kinetics & Thermodynamics of Materials
  - Material Science & Engineering III
  - Advanced Composites and Polymer Engineering
  - Research Project
  - Research Skills and Techniques;
  - Professional Work Placement
- **Options:**
  - Computational Continuum Mechanics I
  - Energy Systems and Climate Change
  - Manufacturing Engineering I
  - Design and Innovation
  - Medical Device Design
  - Chemistry of Materials
  - Physics of nanomaterials
  - Advanced Metals/Materials Processing
  - Nanomaterials
  - Mechanics of Solids II
  - Solid State Electronics II
  - Professional Engineering (Management)



## Engineering with Business

- **Specialise in one branch of Engineering**
  - to level similar to BE degree
  - technical modules ~30 credits
- **Eamonn Ambrose**
- [eamonn.ambrose@ucd.ie](mailto:eamonn.ambrose@ucd.ie)

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**Why Engineering with Business?**

- There is a perceived lack of “industry-ready” engineers coming out of third level education.
- Industry leaders have been looking to recruit “T-shaped” individuals combining specialist skills with a broad understanding of the business environment.
- The ME (Engineering with Business) is designed to produce fully qualified engineers who have a particular interest in and understanding of the business context within which engineers usually operate.
- ME (Engineering with Business) graduates can also consider careers in technical or management consulting, the financial sector and IT.

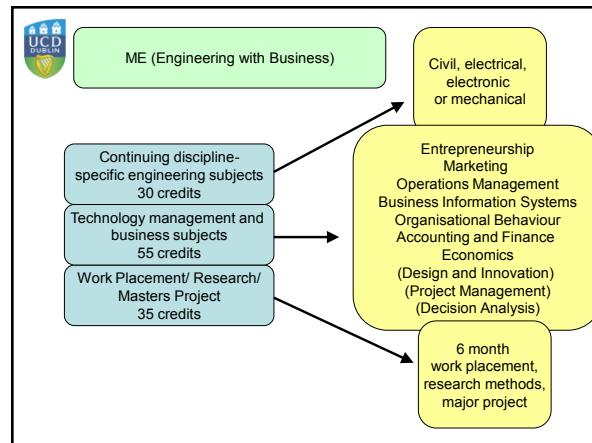
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**Engineering with Business**

- **Specialise in one branch of Engineering**
  - to level similar to BE degree
  - technical modules ~30 credits
- **Add business and management modules**
  - ~55 credits
- **Work placement**
  - June to December
  - 20 credits
- **Masters thesis 15 credits**
  - 15 credits in final semester
  - mix of engineering and business
  - industry based research thesis

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**ME Structure**


Year 1	
<b>Sem 1</b>	<b>Sem 2</b>
<ul style="list-style-type: none"> <li>▪ Management and Org Behaviour</li> <li>▪ <b>3 Technical Options</b></li> <li>▪ 2 Additional Options (Project Management/ Decision Analysis)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Professional Eng. (Mgmt)</li> <li>▪ Operations Management</li> <li>▪ Entrepreneurship</li> <li>▪ <b>3 Technical Options</b></li> </ul>
Year 2	
<b>Sem 1</b>	<b>Sem 2</b>
<ul style="list-style-type: none"> <li>▪ Work Placement (June to Dec)</li> <li>▪ Research Skills and Techniques</li> </ul>	<ul style="list-style-type: none"> <li>▪ Business Information Systems</li> <li>▪ Marketing</li> <li>▪ Masters Thesis</li> </ul>

**ME with Business – Mechanical Engineering**

- **Core Modules**
  - Manufacturing Engineering II
  - Computational Continuum Mechanics I
  - Engineering Thermodynamics III
  - Material Science & Engineering III
  - Operations Management
  - Professional Eng. (Mgt./Fin.)
  - Entrepreneurial Mgt.
  - Business Info. Systems.
  - Marketing Management
  - Research Methods/ ME Thesis
  - Work Placement
- **Four Options**
  - 2 technical e.g.
    - Control Theory
    - Fracture Mechanics
    - Technical Ceramics
    - Energy Systems & Climate Change
    - Renewable Energy Systems
    - Nanomaterials
    - .....
  - And 2 business e.g
    - Project Management
    - Decision Analysis
    - Design & Innovation

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# Biomedical Engineering


- **Dr. Madeleine Lowery**  
[madeleine.lowery@ucd.ie](mailto:madeleine.lowery@ucd.ie)

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# Biomedical Engineering

- **Biomedical Engineering**  
 'The application of engineering principles to understand, modify or control biological systems'
- **Wide variety of application areas**
  - Medical device industry
  - Biosignal and bioimage processing
  - Rehabilitation engineering, orthopaedics...
- **Foundation in Electrical/Electronic or Mechanical Engineering**
  - Complemented with relevant physiology and anatomy
  - Brought together in specialised Biomedical Engineering modules



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# ME – Biomedical Engineering

Example Modules

**Biomedical Engineering**

- Biomechanics
- Medical Device Design
- Biomaterials
- Neural Engineering
- Biosignal Processing
- Cell and Tissue Engineering
- Rehabilitation Engineering.....

**Life Sciences**


- Physiology of the Cardiovascular System
- Neuromuscular and membrane biology
- Neurophysiology. . .

**Mechanical Engineering**

- Mechanics of Solids II
- Materials Science and Engineering III
- Nanomaterials
- Applied Dynamics II
- Advanced Metals/Materials Processing
- Professional Engineering (Management)
- ....

**ME Project (25 credit)**  
**Work Placement**

- long or short



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