UCD Engineering Programmes

*BSc, BE, ME*

Mechanical Engineering Students

March 2017
UCD Engineering Degree Programme Pathways
DN150

**Year 1**

Stage 1 (60 Credit)

**Year 2**

Stage 2 (60 Credit)

Year 3

Stage 3 (60 Credit)

**Choose one of:**
- Biomedical
- Chemical & Bioprocess
- Civil
- Electronic & Electrical
- Mechanical

**Year 4**

Bachelor of Engineering
- Chemical & Bio.P.
- Civil
- Electrical
- Electronic
- Mechanical

**Year 5**

Graduate after 3 years with BSc (Engineering Science)

Graduate after 4 years with BE

**BSc**

**BE**

Single-Stage ME (2-years, 120 Credit)

Master of Engineering (ME)*

specialising in:
- Biosystems
- Civil / Structural / Envir.
- Electronic & Electrical
- Biomedical
- Energy Systems
- Engineering with Business
- Materials Sc. & Engr.
- Mechanical

Graduate after 5 years with both BSc (Eng. Sc.) and ME

**BSc**

**ME**
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1300</td>
<td>Overview BSc, BE &amp; ME</td>
<td>Dr. Donal Finn</td>
</tr>
<tr>
<td>1320</td>
<td>ME Mechanical Engr.</td>
<td>Dr. Malachy O’Rourke</td>
</tr>
<tr>
<td>1325</td>
<td>ME Materials Sc. &amp; Engr.</td>
<td>Dr. Ken Stanton</td>
</tr>
<tr>
<td>1330</td>
<td>Engineering with Business</td>
<td>Dr. Nikolaos Papakostas</td>
</tr>
<tr>
<td>1335</td>
<td>Energy Systems Engr.</td>
<td>Dr. David Timoney</td>
</tr>
<tr>
<td>1340</td>
<td>Biomedical Engineering</td>
<td>Dr. Eoin O’Cearbhaill</td>
</tr>
<tr>
<td>1345</td>
<td>Q&amp;A</td>
<td></td>
</tr>
</tbody>
</table>

**UCD School of**

**Mechanical and Materials Engineering**
BSc (Engineering Science) Degree

- Bachelor of Science degree  Level 8
  - 3 years, 180 credits
  - not a professional engineering qualification
  - GPA basis 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 (typically 2 years)
  - *third cycle* = PhD (minimum 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
The BE Degree Programme

- You entered the BE degree programme
  - you can continue with Mechanical
  - you graduate with BE degree: 240 credits
Bachelor of Engineering (BE) Degree

- Traditional qualification in Engineering
  - still respected in the workplace
  - 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 additional barriers to progression to Stage 4
  - normal progression rules apply
  - you need 50 credits in stage 3 to progress & register for project module in stage 4
BE - Mechanical Engineering (Stage 4)

- **Core Modules**
  - BE Project
  - Process Instrument. & Control or Control Theory
  - Mechanics of Fluids II
  - Manufacturing Engineering II
  - Computational Continuum Mech. I
  - Thermodynamics III
  - Materials Science & Engineering III
  - Professional Engineering (Mmgt.)

- **Option Modules (Choose 2)**
  - Energy Systems and Climate Change
  - Technical Ceramics
  - Materials Thermodynamics and Kinetics
  - Medical Device Design
  - Advanced Metals/Materials Processing
  - Composites and Polymer Engineering
  - Nanomaterials

- **BE Project (over both semesters):** 15 credits
- **9 taught modules: 9 x 5 credits = 45 credits**
BE Project Module

• Project choice and allocation
  – a list of projects is proposed (Week 1, Semester 1)
  – you choose your preferences
  – allocation according to Stage 3 GPA
  – option to propose your own project – act early (Aug)!

• Independent work through both semesters
  – research and/or design, putting theory into practice
  – guided by supervisor – meet typically weekly
  – work in parallel with 4 or 5 taught modules
  – time management is critical

• Assessment through the year
  – interim report (Jan), final report (Apr)
  – oral presentations (end of Semester 1 & Semester 2)
  – interview with supervisor and second examiner
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
  - substantial thesis, original work
  - fees payable, but usually scholarship available
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
    - Master’s level or equivalent
  - development of competence in practice
    - minimum 4 years responsible experience
  - continuing professional development - CPD
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 (6-8 months)
  – includes major project at Master’s level (25 credits)

• Entry requirement
  – based on stages 2 and 3, weighted 3 and 7
  – currently, minimum GPA 2.8 (equivalent to C grade)
  – GPA of 2.8 or higher recommended!
    ▪ no easy way back to BE - if finding ME too hard...
Master of Engineering (ME) Degree

• Full tuition fees payable for Students Registered for ME
  – 2017 €7490 - EU students
  – “Student Contribution” (€3000) only applies to bachelor degree years.

• Details...
  – Register as Engineering Science undergraduate student in September 2017, until end of Stage 4
    ▪ take modules appropriate to your chosen ME pathway
    ▪ then graduate with BSc degree in September 2018

  – Enter ME programme formally in September 2018
    ▪ use surplus credits from Stage 4 of BSc
    ▪ complete ME in 1 added year
    ▪ pay ME tuition fees for final year.
Master of Engineering (ME) Degree

• **Work Placement**
  - 30 credit, 6-8 months, start Jan 2018
    ▪ replaces entire spring semester
    ▪ May to Dec 2018 Semester 1 for ME Eng. with Business
  - 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, through UCD
  - Alternative: 10 credit  2-3 months (Jun-Aug 2018)
    ▪ take additional 4 modules in Year 2 of ME

• **ME (Mech) Project**
  - runs through last two semesters
  - 25 credits, (15 for ME with Business)
  - but expect Master’s level work ...
Available ME Routes

Stage 2 (Year 2)  Stage 3 (Year 3)

Mechanical Engineering

Year 4

ME – Mechanical Engineering
ME – Materials Science and Engineering
ME – Engineering with Business
ME – Energy Systems Engineering
ME – Biomedical Engineering

Year 5

ME
ME
ME
ME
ME
Summary - Your Options

- Graduate with BSc (Eng. Sci.) in 2017
  - for work or further study
    ▪ e.g. ME in Europe or qualification in a different field
  - not professional Engineer

- Continue in BE programme
  - graduate in 2018
  - work as engineer
  - further postgraduate study
  - but further master qualification needed for C.Eng

- Continue towards ME in UCD (if eligible)
  - graduate in Sept 2019 with fully accredited degree

- Decision required by Thursday 13th April, 2017
  - Online submission to Programme Office
Programme Coordinators

• Dr. Donal Finn  donal.finn@ucd.ie
  – BSc Eng, BE Mechanical Engineering
• Dr. Malachy O’Rourke  malachy.orourke@ucd.ie
  – ME Mechanical Engineering
• Dr. David Timoney  david.timoney@ucd.ie
  – ME Energy Systems Engineering
• Dr. Ken Stanton  kenneth.stanton@ucd.ie
  – ME Materials Science and Engineering
• Prof. Madeleine Lowery  madeleine.lowery@ucd.ie
  – ME Biomedical Engineering
• Dr. Nikolaos Papakostas  nikolaos.papakostas@ucd.ie
  – ME Engineering with Business
UCD Taught Masters Programmes
ME in Mechanical Engineering

Prof. Alojz Ivankovic
Programme Director

Dr Malachy O’Rourke
Programme Coordinator

Malachy.ORourke@ucd.ie
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
Programme Structure

2-Year Full Time Programme (120 ECTS Credits)

Year 1

– 30 credits (6 taught modules) in semester 1
– 30 credit work placement in semester 2

or

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

Year 2

– Year long 25 credit research project + research skills & techniques (5 cr.)
– 30 credits (6 taught modules) distributed across semesters 1 & 2
UCD School of Mechanical and Materials Engineering

YEAR 1

Semester 1
• Computational Continuum Mechanics I
• Engineering Thermodynamics III
• Fracture Mechanics
• Manufacturing Engineering II
• Mechanics of Fluids II
• Mechanics of Solids III

Semester 2
• Professional Work Experience (30 credits)

YEAR 2

Semester 1
• Computational Continuum Mechanics II
• Research Skills and Techniques

Semester 2
• Mechanics of Fluids III
• Professional Engineering (Management)

Semester 1 and 2
• ME Mechanical Thesis (25 credits)

Semester 1 or 2
• Control Theory or Process Instrumentation
• Option modules 1 & 2

All semesters are 30 credits.
All modules are 5 credits unless otherwise stated.
5 Credit Modules (Core & Option)

Core Modules (11)
- Computational Continuum Mechanics I
- Computational Continuum Mechanics II
- Engineering Thermodynamics III
- Fracture Mechanics
- Manufacturing Engineering II
- Mechanics of Fluids II
- Mechanics of Fluids III
- Mechanics of Solids III
- Professional Engineering Management
- Research Skills & Techniques

One of the following
- Control Theory (Semester 1)
  or
- Process Instrumentation (Semester 2)

Option Modules (2)
- Advanced Composites & Polymer Engr.
- Advanced Metals/Materials Processing
- Applied & Computational Mathematics
- Energy Systems and Climate Change
- Energy in Transport
- Kinetics & Thermodynamics of Materials
- Materials Science and Engineering II
- Nanomaterials
- Numerical Algorithms
- Technical Ceramics
- Technical Communications
- Other modules (on approval with MOR)
Work Placement

• 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:

- Accenture (Dublin & UK)
- BD Medical
- BMR
- Boston Scientific
- Caterpillar (UK)
- CCM (Delaware, USA)
- CTS (USA)
- De Puy
- Dublin Port
- Eirecomposites
- Element 6
- Henkel
- Irish Rail
- Jaguar Landrover (UK)
- MSD
- Nypro Healthcare
- PCH (China)
- ProCut
- Tech Eng Tools
- Technology from Ideas
ME: MATERIALS SCIENCE AND ENGINEERING

- Master of Engineering in Materials Science and Engineering
  - A materials science degree course with a focus on engineering applications of advanced materials
  - The only such course in the country

- 2-year full-time 120 credit (ECTS) programme

- Professionally dual accredited
  - Institute of Materials, Minerals and Mining (IOM3)
  - Engineers Ireland
    - A member of the Washington Accord signatory institutions
ME: MATERIALS SCIENCE AND ENGINEERING

- Fundamentals and applications of metals, ceramics, polymers, composites, semi-conductors and materials processing

- Options for programme focus on materials for:
  - Biomedical devices
  - Nanotechnology
  - Energy
  - Manufacturing

- Includes 6-month industrial work placement
ME MSE: Indicative 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

Programme Director
Associate Professor Nikos Papakostas
nikolaos.papakostas@ucd.ie
Multiskilled Employees Sought as Versatility Becomes a Workplace Virtue

By Bridget Testa  |  September 20, 2010  |  0 Comments

Related Topics: Downsizing, Performance Appraisals, Workforce Planning, Featured Article, Recruitment

As companies slashed their workforces during the recession, employee specialists became an endangered species. Firms needed generalists who could adapt quickly, think on their feet and competently perform duties often beyond their job description.

Those jack-of-all-trade workers remain crucial to companies for their ability to handle multiple assignments. And versatility has emerged as a key quality that recruiters say they consider when filling vacancies these days.
Why Engineering with Business?

• There is a perceived lack of “industry-ready” engineers coming out of 3rd level education.

• Industry leaders have been looking to recruit “T-shaped” individuals combining specialist skills with a broad understanding of the business environment.

• Acquiring skills related to advanced digital tools and automation (Digital Manufacturing, Robotics, Industry 4.0, ERP)

• The ME (Engineering with Business) produces fully qualified and accredited engineers

• ME (Engineering with Business) graduates can also consider careers in technical or management consulting, the financial sector and IT.
Internships
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
ME (Engineering with Business)

- Continuing discipline-specific engineering subjects: 30 credits
- Technology management and business subjects: 50 credits
- Work Placement/Research/Masters Project: 40 credits

- Civil, electrical, electronic or mechanical
- Entrepreneurship
- Marketing
- Operations Management
- Business Information Systems
- Organisational Behaviour
- Economics
- Project Management
- Supply Chain Design
- 6 month work placement, research methods, major project
<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sem 1</strong></td>
<td><strong>Sem 1</strong></td>
</tr>
<tr>
<td>Management and Org Behaviour</td>
<td>Work Placement (June to Dec)</td>
</tr>
<tr>
<td>Project Management</td>
<td>Research Methods</td>
</tr>
<tr>
<td>Supply Chain Design</td>
<td></td>
</tr>
<tr>
<td><strong>4 Technical Core</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sem 2</strong></td>
<td><strong>Sem 2</strong></td>
</tr>
<tr>
<td>Operations Management</td>
<td>Business Information Systems</td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>Marketing</td>
</tr>
<tr>
<td><strong>2 or 3 Technical Options</strong></td>
<td>Professional Eng. (Mgmt)</td>
</tr>
<tr>
<td></td>
<td>Masters Thesis</td>
</tr>
</tbody>
</table>
ME with Business – Mechanical Engineering

• Core Business Modules
  – Operations Management
  – Project Management
  – Supply Chain Design and Analysis
  – Mgmt & Org Behaviour
  – Professional Eng. (Mgt.)
  – Entrepreneurial Mgt.
  – Marketing Management
  – Research Methods / Thesis
  – Work Placement

• Technical Modules
  4 Technical Core
  – Manufacturing Engineering
  – Computational Continuum Mechanics I
  – Engineering Thermodynamics III
  – Process Instrumentation & Control
  2 or 3 Options (indicative)
  – Material Science and Engineering III
  – Technical Communication
  – Nanomaterials
  – ...

Detailed Programme Presentation: Room 216 on March 29th, 13:00 – 14:00
Information Session for Stage Three Engineering Students

Energy Systems Engineering

Dr. David Timoney,
Programme Director, ME (Energy Systems)
World Energy Use (1820 to 2010) Exajoules ($10^{18}$) Per Year

https://gailtheactuary.files.wordpress.com/2012/03/per-capita-world-energy-by-source.png
World Energy versus world GDP (scaled to fit)

Energy is a proxy for world GDP

http://scottishsceptic.co.uk/2013/10/18/enerconics-the-relationship-between-energy-and-gdp/
World Primary Energy Consumption by Fuel (1989 – 2014)
(in MTOE or Million tonnes of oil equivalent)

Year

BP Statistical Review of World Energy June 2015
Recent Monthly Average Mauna Loa CO$_2$

August 2014: 397.01 ppm  
August 2015: 398.82 ppm

http://www.esrl.noaa.gov/gmd/ccgg/trends/#mlo_growth
Global Greenhouse Gas Emissions by Economic Sector

Source: IPCC (2014); based on global emissions from 2010.

- Electricity & Heat: 25%
- Agriculture etc.: 24%
- Buildings: 6%
- Transportation: 14%
- Industry: 21%
- Other: 10%

http://www3.epa.gov/climatechange/ghgemissions/global.html
These Politicians are Looking for Someone to “Sort all this out”

G7 JUNE 2015 – SCHLOSS ELMAU

“Emissions must be cut 40-70% by mid-century and phased out entirely by 2100”
ME (Energy Systems) Engineering

- Aims to prepare graduates to meet the **often conflicting** engineering, economic and environmental **challenges** facing the energy systems of developed countries in the future, taking account of security of supply and climate impact / CO₂ emissions.

- Inter-disciplinary approached needed because of the future interdependence between the electricity system, building energy systems, and transport systems.

- Inputs provided by Mechanical, Electrical, Civil & Chemical Engineering, and Geological (Earth) Sciences / Physics / Economics / Business

- ~150 graduates since 2010

- Also available as 12-month, 90-credit ME
ME (Energy Systems) Engineering

- Core Modules
  - Energy Systems & Climate...
  - Fossil Fuels & CCS
  - Eng. Thermodynamics II
  - Energy Systems in Buildings
  - Power System Operation
  - Wind Energy
  - Research Skills & Tech.
  - Professional Eng. (Mgt.)
  - ME Project
  - Work Placement
    - long or short
  + 4 or 8 options

- Example Options
  - Energy in Transport
  - Instrumentation & Control
  - Eng. Thermodynamics II
  - Heat Transfer
  - Mechanics of Fluids II & III
  - Nanomaterials
  - Environmental Engineering
  - Air Pollution
  - Entrepreneurial Mgt.
  - Energy Economics & Policy
  - Nuclear Physics
  - Appl. Power Electronics
  - Power System Design
  - Power Electronics & Drives
  - . . .
ME (Energy Systems) Engineering

Work Placement
Semester 2 of year 1

Companies involved in work placement to date include:

- ESB International
- CES Energy
- Energia
- Eirgrid
- AbbVie
- Mainstream Renewable Power
- Enernoc
- Endeco Technologies
- RPS
- Aecom
- Murex Advanced Technologies
- Dublin Port Company
- Irish Water
- Jones Engineering

- Fingleton White
- Glanbia
- Meinhardt (UK) Ltd.
- Dennison Trailers
- Precision Heating
ME Biomedical Engineering

Dr Eoin O’Cearbhaill
School of Mechanical and Materials Engineering
What is Biomedical Engineering?

‘The application of engineering principles to understand, modify or control biological (human and animal) systems’

J. Bronzino, Introduction to Biomedical Engineering
Examples

- Cochlear implants
- Pacemakers
- Deep brain stimulation
- Artificial limbs
- Rehabilitation
- Tissue engineering
- Gait analysis
- Hip implants
- Biomedical signal processing
- MR imaging
- Physiological modelling
- Angioplasty
UCD Medical Device Design Group

Vascular Devices
Cardiac Patch Delivery
Growing Annuloplasty Ring
Right Ventricular Remodeling

Islet Transplantation Devices

Access & Closure Devices
Novel introducer and suture systems

Aspiration Devices
Reducing pain of bone marrow aspiration

Venous Thrombus Extraction

Minimally Invasive Cartilage Repair

Endoscopic Delivery Devices

Ex vivo device models
Organ-on-chip and bioreactor device testing

Mechanical Clutch Needle
Safer laparoscopic access
1st Prize MIT-Sloan Bioinnovations Conference 2012

Bioadhesives
Photocurable Adhesives
Microneedle Adhesive
IChemE’s Innovative Product of the Year 2013

SFA 3D Vascular Stent
Infraopliteal Segmented Stent

http://mdd.ucd.ie/
Research Themes:

- Delivery & Sensing Devices
- Implantable Devices
- External Assistive Devices
Neural Engineering research areas:

Neural Control of Movement

madeleine.lowery@ucd.ie
# ME Biomedical Engineering
## Stage 1 Semester 1

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Name</th>
<th>Pre-Requisite</th>
<th>Core Credits</th>
<th>Option Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT40010</td>
<td>Medical Sciences for Biomedical Engineers</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MEEN40620</td>
<td>Biomechanics</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MEEN40630</td>
<td>Biomaterials</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MEEN40600</td>
<td>Medical Device Design</td>
<td></td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**YEAR 1, SEMESTER 1 = 30 CREDITS REQUIRED. CHOOSE TWO or THREE OPTION MODULES FROM THE LIST BELOW OR ELSEWHERE - AS AGREED BY THE PROGRAMME COORDINATOR & THE ENGINEERING PROGRAMME BOARD**

## Biomedical Engineering Modules

- EEN30160 Biomedical Signal and Image Analysis
- EEN30110 Signals and Systems
- EEN40010 Control Theory
- EEN40050 Wireless Systems
- EEN40150 Radio Frequency Electronics
- MEEN30030 Mechanical Engineering Design II
- MEEN40060 Fracture Mechanics
- MEEN40020 Mechanics of Fluids II
- MEEN30100 Engineering Thermodynamics II
- MEEN30140 Professional Engineering (Finance)
- EEN40300 Engineering Entrepreneurship

## Engineering Modules

- NEUR30080 Neuromuscular and membrane biology
- PHYC40430 Nanomechanics - from single molecules to single cells
- PHYS20040 An introduction to Physiology: Human cells and tissues (unless already taken)
- PHYS30010 Physiology of the Cardiovascular System
- STAT30240 Linear Models I (Statistics)

**SEMESTER CREDIT TOTALS**

| Credit Total | 20 | 10 |
Organisations in which Biomedical Engineering students placed to date include:
# ME Biomedical Engineering

## Stage 2 Semester 1

<table>
<thead>
<tr>
<th>Modules</th>
<th>Description</th>
<th>Pre-Requisite: UCD Module Code No.</th>
<th>Core Credits</th>
<th>Option Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEN40220</td>
<td>Biomedical Thesis - Part 1</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MEEN40560</td>
<td>Research Skills and Techniques</td>
<td></td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

YEAR 2, SEMESTER 1 = 30 CREDITS REQUIRED. CHOOSE FOUR OPTION MODULES FROM THE LIST BELOW OR ELSEWHERE - AS AGREED BY THE PROGRAMME COORDINATOR & THE ENGINEERING PROGRAMME BOARD

### Biomedical Engineering Modules

- **EEN30160**: Biomedical Signal and Image Analysis
- **EEN30110**: Signals and Systems
- **EEN40010**: Control Theory
- **EEN40050**: Wireless Systems
- **EEN40150**: Radio Frequency Electronics
- **MEEN30030**: Mechanical Engineering Design II
- **MEEN40060**: Fracture Mechanics
- **MEEN40020**: Mechanics of Fluids II
- **MEEN30100**: Engineering Thermodynamics II
- **MEEN30140**: Professional Engineering (Finance)
- **EEN40300**: Engineering Entrepreneurship

### Modules from outside Engineering

- **NEUR30080**: Neuromuscular and membrane biology
- **PHY40430**: Nanomechanics - from single molecules to single cells
- **PHYS30010**: Physiology of the Cardiovascular System
- **STAT30240**: Linear Models I (Statistics)

### SEMESTER CREDIT TOTALS

<table>
<thead>
<tr>
<th></th>
<th>Core Credits</th>
<th>Option Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>
# ME Biomedical Engineering

## Stage 2 Semester 2

<table>
<thead>
<tr>
<th>4 Modules</th>
<th>Semester 2, Year 2</th>
<th>Pre-Requisite: UCD Module Code No.</th>
<th>Core Credits</th>
<th>Option Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEEN40220</td>
<td>Biomedical Thesis (C) - Part 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

YEAR 2, SEMESTER 2 = 30 CREDITS REQUIRED. CHOOSE THREE OPTION MODULES FROM THE LIST BELOW AS INDICATED BELOW OR ELSEWHERE - AS AGREED BY THE THE PROGRAMME COORDINATOR & THE ENGINEERING PROGRAMME BOARD

At least 1 module from the following Biomedical Engineering Modules

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEEN40350</td>
<td>Rehabilitation Engineering</td>
<td>5</td>
</tr>
<tr>
<td>EEEN40070</td>
<td>Neural Engineering</td>
<td>5</td>
</tr>
<tr>
<td>CHEN40470</td>
<td>Cell Culture and Tissue Engineering</td>
<td>5</td>
</tr>
<tr>
<td>EEN 30180</td>
<td>Bioinstrumentation</td>
<td>5</td>
</tr>
</tbody>
</table>

## Engineering Modules

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEEN30020</td>
<td>Mechanics of Solids II</td>
<td>5</td>
</tr>
<tr>
<td>MEEN40040</td>
<td>Materials Science and Engineering III</td>
<td>5</td>
</tr>
<tr>
<td>MEEN40180</td>
<td>Nanomaterials</td>
<td>5</td>
</tr>
<tr>
<td>MEEN30010</td>
<td>Applied Dynamics II</td>
<td>5</td>
</tr>
<tr>
<td>MEEN40070</td>
<td>Advanced Metals/Materials Processing</td>
<td>5</td>
</tr>
<tr>
<td>MEEN40430</td>
<td>Professional Engineering (Management)</td>
<td>5</td>
</tr>
<tr>
<td>MEEN40670</td>
<td>Technical Communication</td>
<td>5</td>
</tr>
<tr>
<td>EEEN30030</td>
<td>Electromagnetic Waves</td>
<td>5</td>
</tr>
<tr>
<td>EEEN30050</td>
<td>Signal Processing Theory and Applications</td>
<td>5</td>
</tr>
<tr>
<td>EEEN40060</td>
<td>Digital Communications</td>
<td>5</td>
</tr>
<tr>
<td>EEEN30060</td>
<td>Communication Theory</td>
<td>5</td>
</tr>
<tr>
<td>EEEN30120</td>
<td>Analogue Electronics</td>
<td>5</td>
</tr>
</tbody>
</table>

## Modules from outside Engineering

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDGY30440</td>
<td>Image Analysis in Matlab</td>
</tr>
<tr>
<td>PHYS20020</td>
<td>Neurophysiology: Physiology of Sensing and Responding to the Internal and</td>
</tr>
<tr>
<td></td>
<td>External Environment</td>
</tr>
<tr>
<td>PHYS20030</td>
<td>Physiology of the internal environment of the human body</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMESTER CREDIT TOTALS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>
Sector employs over 25,000 people. 18 of the world’s top 25 medical technology companies have a base in Ireland.
diagnostic
hospital and/or homecare products
Ophthalmic
orthopaedic
vascular
contract research, development,
connected health
service
Decision Time!

- Online form - to be completed by Thursday 13 April, 2017
  - continue in BE (default)
  - transfer to stage 4 Engineering Science
    - specify which ME programme
    - conditional on GPA – automatic fall-back to BE
  - graduate with BSc (Engineering Science) now
    - needs 180 credits at appropriate levels

- More information?
  - talk to relevant programme coordinators
  - Postgraduate open evening 5.30 pm Tues. 4th April
UCD ENGINEERING AND ARCHITECTURE
POSTGRADUATE OPEN DAY 2017

Tuesday, 4th April, 2017
UCD Student Centre, Belfield, Dublin 4

To register call +353 1 716 1781 or visit www.ucdpostgraduatevent.eventbrite.ie

https://www.eventbrite.ie/e/ucd-college-of-engineering-architecture-postgraduate-open-evening-registration-31714364518