

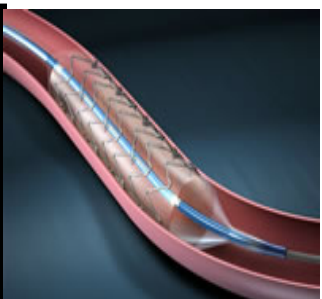
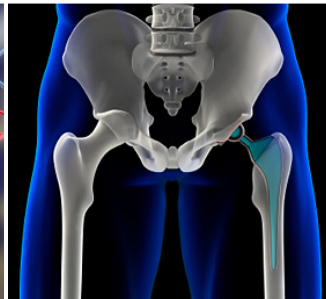
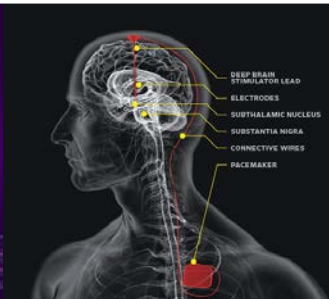
ME Biomedical Engineering

Prof. Madeleine Lowery

UCD School of Electrical and Electronic Engineering

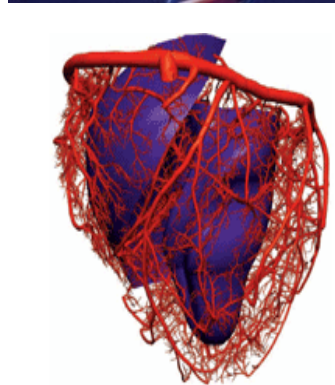
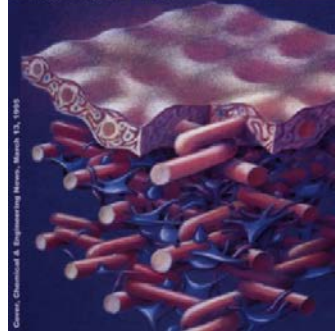
Dr. Eoin O’Cearbhaill

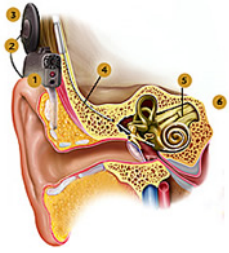
UCD School of Mechanical and Materials Engineering



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





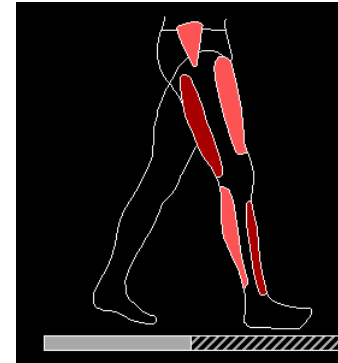
Cochlear implants



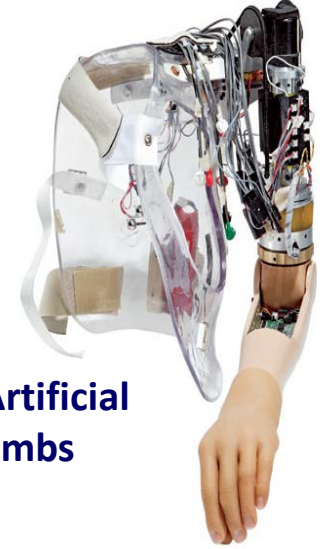
Pacemakers



Deep brain stimulation



Gait analysis



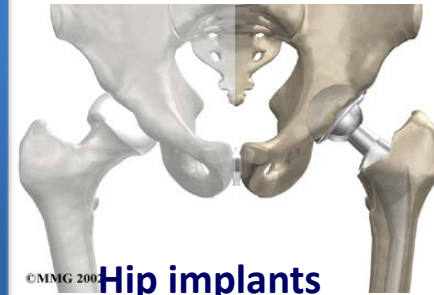
Artificial limbs



Rehabilitation robotics

Biomedical Engineering

The application of engineering principles to understand, modify or control biological systems



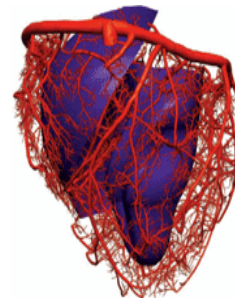
©MMG 2008 **Hip implants**



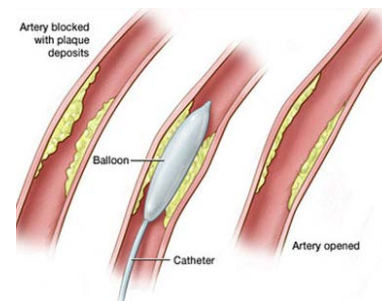
Biomedical signal processing



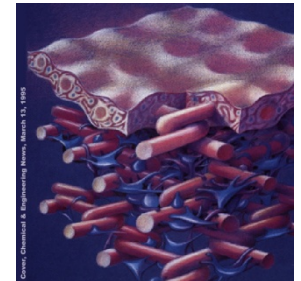
MR imaging



Physiological modelling



Angioplasty

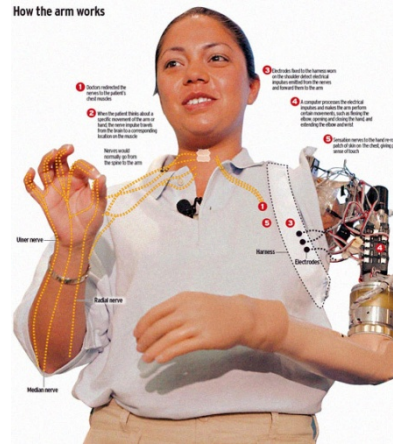


Tissue engineering

Applications of Neural Engineering



Rehabilitation Robotics



Prosthetics



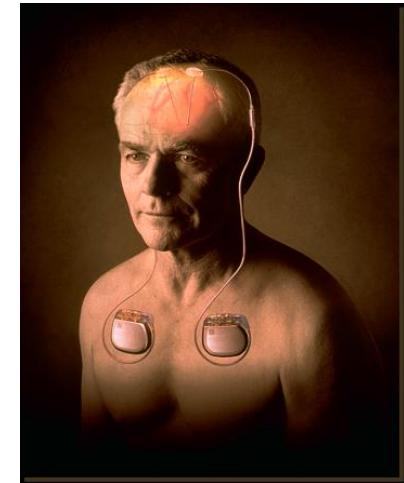
Neuromuscular Stimulation



Cochlear implants

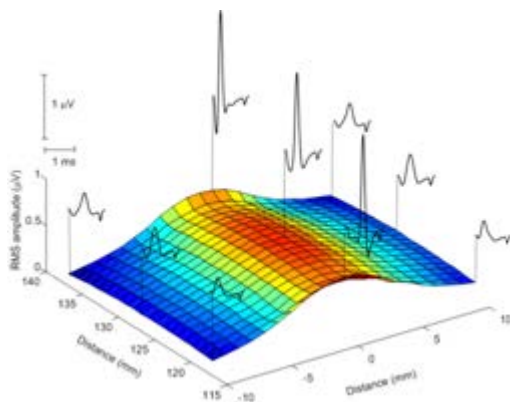
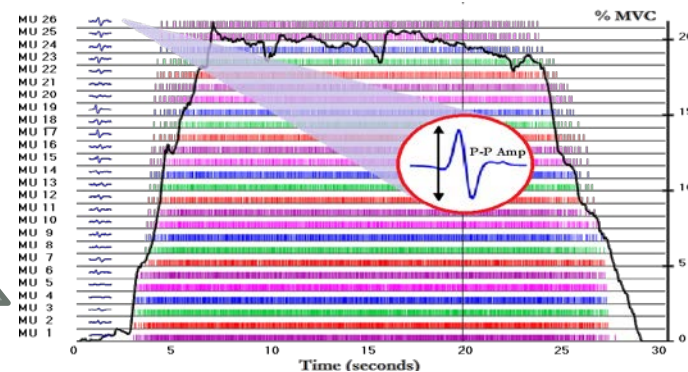
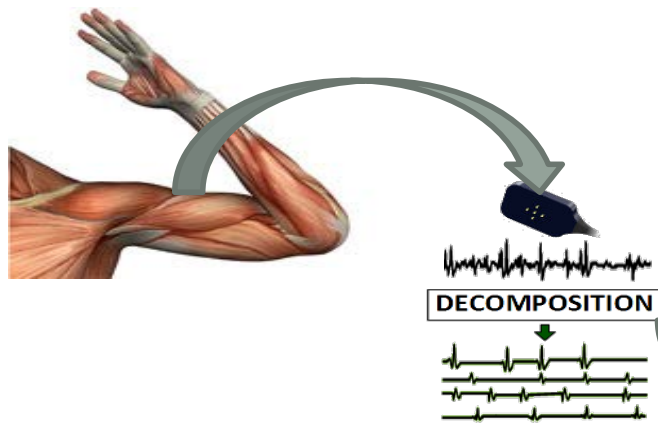


Brain Machine Interfaces

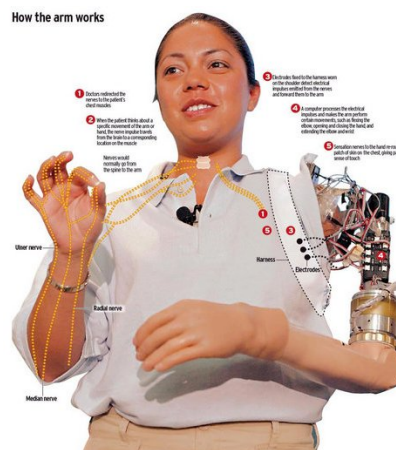


Deep brain stimulation

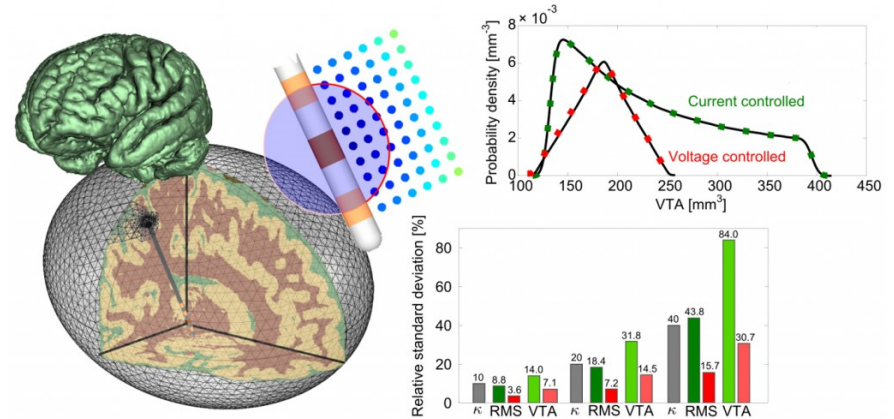
Sample research areas: Neural Control of Movement



How the arm works



Sample research areas: Deep Brain Stimulation



Sample research areas

Medical Device Design (E O'Cearbhaill)



Children's Hospital,
Boston
Cardiac Patch Delivery
Growing Annuloplasty Ring
Right Ventricular Remodeling

Harvard/UCD
Islet Cell Delivery for
treatment of diabetes

MIT/BWH, Boston
Improve method of fistula access for
dialysis patients

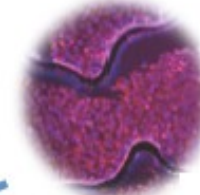
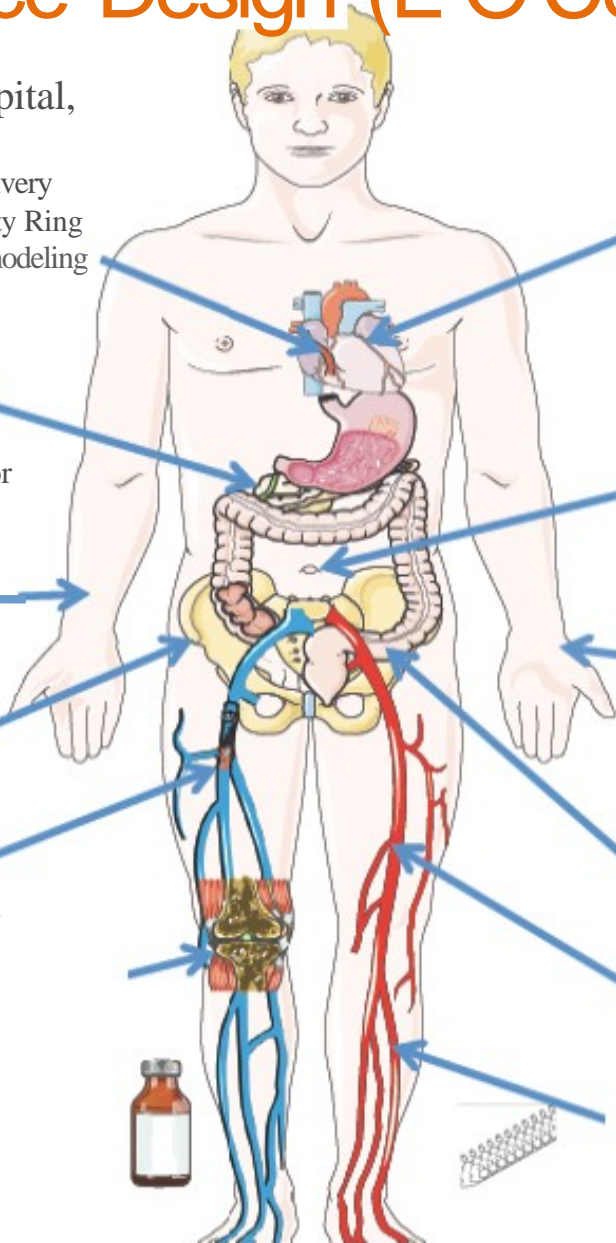


UCD
Reducing pain in
marrow aspiration

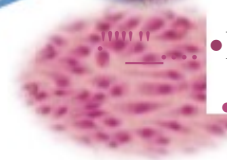
Vetex, NUIG
Venous Thrombus Extraction

Harvard
Improved Drug Delivery to
Synovium & Cartilage Repair

Harvard
High throughput analysis of
chemotherapeutics in vivo



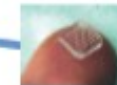
PhD,
NUIG
Vascular



• Biomechanics



MGH, Boston
Safer laparoscopic access
*11th Annual MIT-Sloan
Bioinnovations Conference
2012*



Harvard/UCD
Microneedle Adhesive
*ICiumE's Innovative
Product of the Year 2013*

UCD, St. Vincent's Hospital
Delivery devices to the Large Intestine

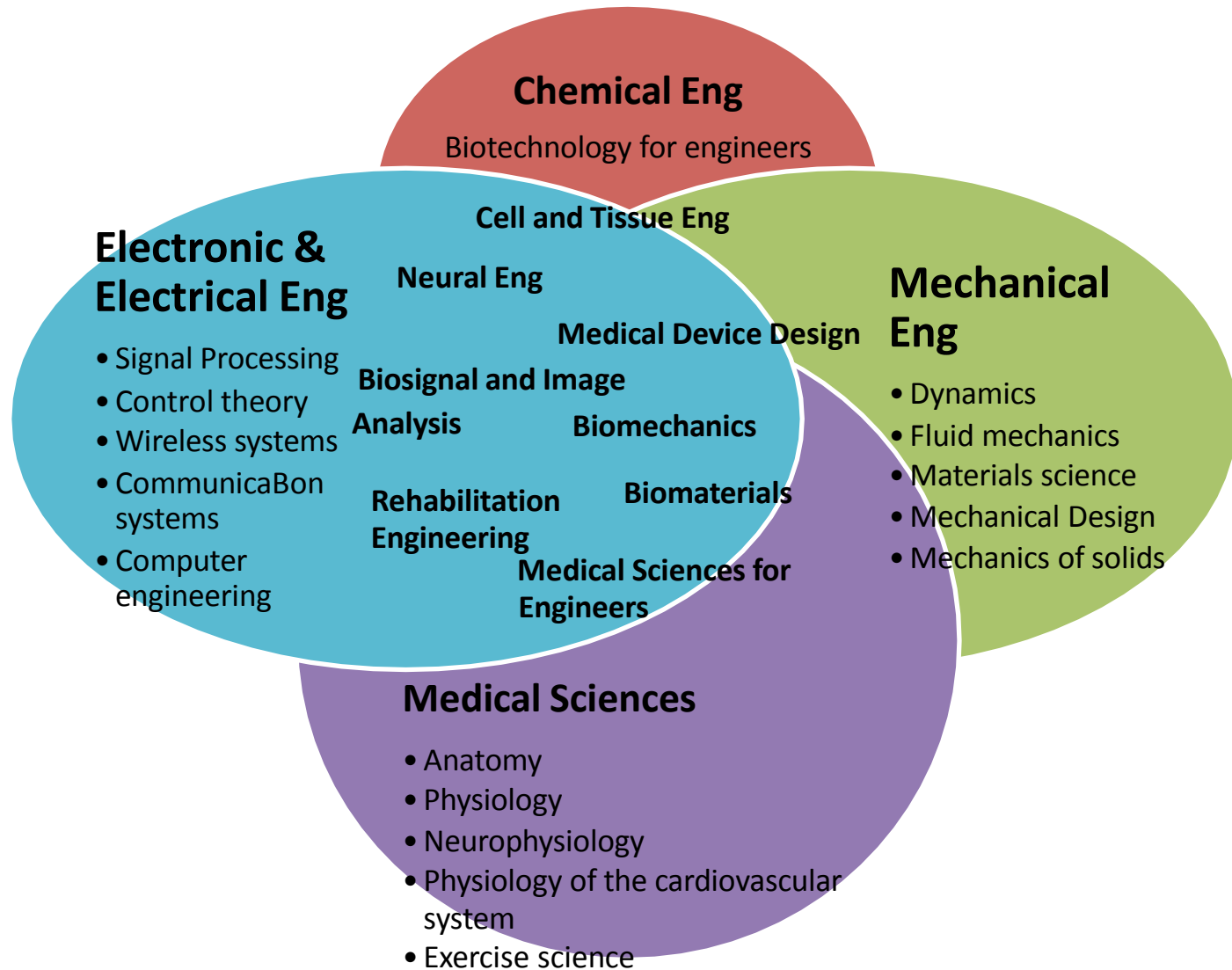


Veryan
SFA 3D Vascular Stent

Perflex, NUIG
Infrapopliteal Segmented
Stent Design



UCD Biomedical Engineering





UCD Biomedical Engineering Taught Masters Degree

ME Biomedical Engineering

2 Year degree

120 Credit

GPA greater than 2.8 in Biomedical/Electronic/ Electrical or Mechanical Eng.

Accredited by Engineers Ireland

6-8 Month Professional Work Experience and 25 credit project

ME Biomedical Engineering

Year 1	
Semester 1	
ANAT40010	Medical Sciences for Biomedical Engineers (unless already taken)
MEEN40620	Biomechanics
MEEN40630	Biomaterials
MEEN40600	Medical Device Design
<i>2 or 3 Modules From Below or Equivalent Engineering Modules</i>	
EEEN30160	Biomedical Signal and Image Analysis
EEEN40010	Control Theory
EEEN40050	Wireless Systems
EEEN40030	Photonic Engineering
EEEN40150	Radio Frequency Electronics
MEEN30030	Mechanical Engineering Design II
MEEN40060	Fracture Mechanics
MEEN20010	Mechanics of Fluids I
MEEN40020	Mechanics of Fluids II
MEEN30100	Engineering Thermodynamics II
EEEN40300	Engineering Entrepreneurship
EEME 30040	Professional Engineering (Finance)
<i>Modules from outside Engineering</i>	
PHYS20040	An introduction to Physiology: Human cells and tissues
PHYS30010	Physiology of the Cardiovascular System
NEUR30080	Neuromuscular and membrane biology
PHYC40430	Nanomechanics - from single molecules to single cells
STAT30240	Linear Models I (Statistics)
ACM40290	Numerical Algorithms



ME Biomedical Engineering Year 1

Semester 2 : 30-Credit Professional Work Placement

January – August



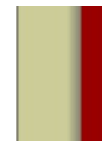
Abbott
A Promise for Life



Delivering what's next



UNSW
THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY • AUSTRALIA



Vasorum
Medical Device Research & Development



Helping all people
live healthy lives



ME Biomedical Engineering

Year 2			
Semester 1		Semester 2	
MEEN40610	Research Project / Thesis	MEEN40610	Research Project / Thesis
MEEN40560	Research Skills and Techniques		
3 Modules From Below or Equivalent		3 Modules From Below or Equivalent	
<i>Engineering Modules</i>		MEEN40350	RehabilitaBon Engineering
EEEN40010	Control Theory	EEEN40070	Neural Engineering
EEEN40050	Wireless Systems	CHEN40470	Cell Culture and Tissue Engineering
EEEN30030	ElectromagneBc Waves	<i>Engineering Modules</i>	
EEEN40150	Radio Frequency Electronics	MEEN30020	Mechanics of Solids II
MEEN30030	Mechanical Engineering Design II	MEEN40040	Materials Science and Engineering III
MEEN40060	Fracture Mechanics	MEEN40180	Nanomaterials
MEEN40020	Mechanics of Fluids II	MEEN30010	Applied Dynamics II
MEEN30100	Engineering Thermodynamics II	MEEN40070	Advanced Metals/Materials Processing
MEEN30090	Materials Science and Engineering II	MEEN40430	Professional Engineering (Management)
MEEN30030	Mechanical Engineering Design II	MEEN40670	Technical CommunicaBon
		EEEN30050	Signal Processing Theory and ApplicaBons
		EEEN40130	Advanced Signal Processing
<i>Modules from outside Engineering</i>		EEEN40060	Digital CommunicaBons
PHYS30010	Physiology of the Cardiovascular System	EEEN30060	CommunicaBon Theory
NEUR30080	Neuromuscular and membrane biology	EEEN30120	Analogue Electronics
PHYC40430	Nanomechanics -- from single molecules to cells	<i>Modules from outside Engineering</i>	
STAT30240	Linear Models I (StaBsBcs)	PHYS20020	Neurophysiology
ACM40290	Numerical Algorithms	7 PHYS20030	Physiology of the internal environment of the human body

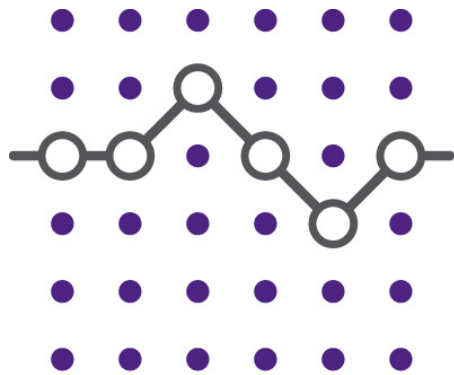
Biomedical Engineering Stream Stage 4

Stage 4				
Semester 1			Semester 2	
EEEN30170	BE Biomedical Project		EEEN30170	BE Biomedical Project
MEEN40600	Medical Device Design		CHEN40470	Cell Culture & Tissue Eng
MEEN40620	Biomechanics		EEEN40070	Neural Engineering
EEEN30160	Biomedical Signals and Images		EEEN40350	RehabilitaBon Engineering
MEEN40630	Biomaterials			
Plus 1 OpBon from :				
EEEN30110	Signals and Systems			
EEEN40010	Control Theory			
EEEN40050	Wireless Systems			
EEEN40300	Entrepreneurship in Engineering			
MEEN30030	Mechanical Engineering Design II			
MEEN30100	Engineering Thermodynamics II			
MEEN30140	Professional Engineering (Finance)			
MEEN40020	Mechanics of Fluids II			

Sample ME Projects 2013 and 2014

- The Left Heart Simulator: Measurement of Papillary Muscle Force in Porcine Mitral Valves
- Development of a Bioreactor for Monotonic and Oscillatory Stresses
- Determine optimal coating and performance for Flextome Cutting Balloon Protector Caps
- Design of needle system to reliably inject dye into the submucosa of the intestine via an elongate flexible endoscope
- Cannula Pull Strength of the Pen Needle Assembly
- The biomechanical effects of playing surfaces during specific activities in Rugby Union
- Biaxial testing of heart valve tissue
- Computer aided design and manufacture using the Mori Seiki CNC machine
- Nanostructured apatite-mullite glass-ceramic surfaces
- Bioreactor design for carotid artery graphs
- PMMA Bone cement – Analysis of influence of vibration on cement penetration into trabecular bone analogue
- Haemodynamics of mitral heart valves
- Design of a High Speed Micro-indentation Process for Micro-structuring Biomedical Surfaces
- Development of a test method for rotational impacts of sports helmets
- Image Processing of Digital Holographic Microscope Images of Cells
- Multi-class brain-computer interface
- Analysing brain signals during anaesthesia in human
- Analysing respiration in heart failure using contact and non-contact sensors
- Analysing brain signals during execution and imagination of a motor task
- Novel applications of the BiancaMed SleepMinder
- Myoelectric control schemes for multifunction prosthetic hands





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Medical
Devices**
Association

Sector employs over 25,000 people.
18 of the world's top 25 medical technology companies have a base in Ireland.



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Find out more





Irish Medical Devices Association

diagnostic

hospital and/or homecare products

Ophthalmic

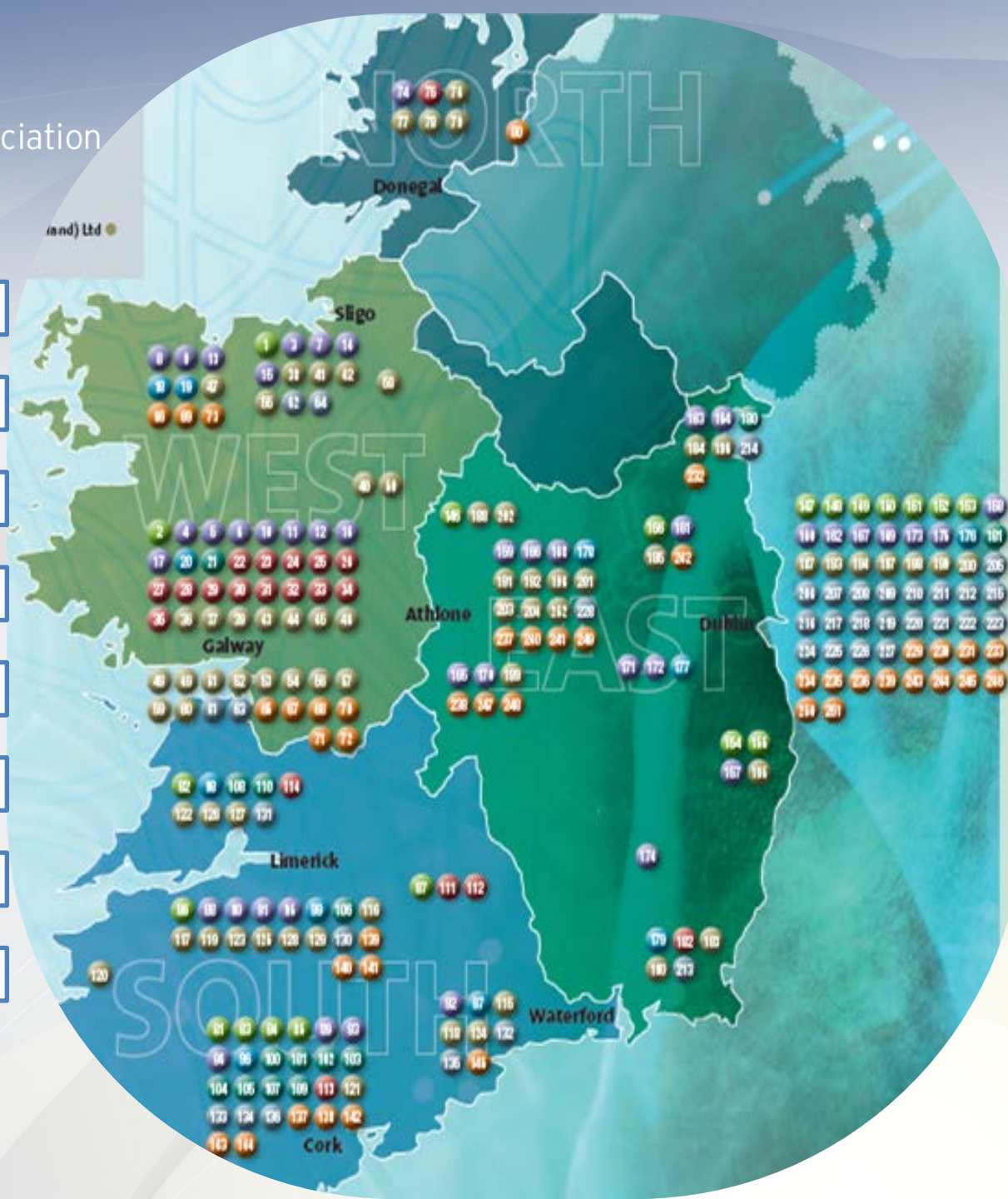
orthopaedic

vascular

contract research, development,

connected health

service



http://www.ucd.ie/biomedicalengineering/

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UCD Centre for Biomedical Engineering



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Applying interdisciplinary creativity to develop tomorrow's therapies


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Science
@scienmag

Biomechanics team discovers how insects repair their 'bones' scienmag.com/?p=1462630



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>> News & Events

Upcoming Events: >> [Click here](#)

Workshop: 'What is a real limb? Exploring boundaries between Art and Anatomy'
Published: 05 April 2016

The UCD School of Medicine in conjunction with the National College of Art & Design host an interdisciplinary workshop entitled 'What is a real limb? Exploring boundaries between Art and Anatomy'. This 'hackathon' event will be taking place on Friday, 29th April 2016 at the National College of Art & Design. More details on the workshop itself and how to apply may be found [here](#).

UCD/NCAD/IADT Creative Research Funding Workshop
Published: 29 March 2016

Registration for the UCD/NCAD/IADT Creative Research Funding Workshop is now open. This half-day funding workshop is aimed at active academic researchers who are interested in exploring funding opportunities in creative disciplines (broadly defined), and who may be new to developing collaborative applications. Attendance is open to active academic staff from UCD, NCAD and IADT. The workshop will take place on April 20th and attendance is open to active academic staff from UCD, NCAD and IADT. Registration closes April 15th. More info on the workshop itself and how to register may be found [here](#).

SSRA 2016: Call for Projects
Published: 30 November 2015

The SSRA 2016 Committee are now accepting project proposals from Principal Investigators for 8-week supervised student projects during Summer 2016. The purpose of this scheme is to give

>> Upcoming Events

April 2016 today

Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16

UCD Biomedical Engineering

Questions?

