DCU

Faculty of Engineering and Computing Final Year Projects
Expo 2014

Final Year Projects
Class of 2014

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Welcome

Welcome to the Final Year Projects Display by us, the graduating classes of 2014 from the Schools of Computing, Electronic Engineering, and Mechanical and Manufacturing Engineering. Our details and respective projects can be found within this booklet.

The projects demonstrate how we put into practice the knowledge gained during our time here in DCU. They cover many areas within computing, electronic engineering and mechanical and manufacturing engineering and are inspired by time spent on *INTRA* (work placement), staff research interests, collaboration with companies and original concepts. The projects clearly demonstrate our hard work and innovation.

We would like to extend our thanks to lecturers, supervisors and the support staff for all their help and assistance throughout our time here. Without their support we would not be here today.

We would also like to thank the main sponsor of this event, SAP and those companies sponsoring prizes. Through their sponsorship they are showing a belief in the ability of Irish graduates and a commitment to the future of Irish industry.

And last, but not least, we thank you, the visitors and the companies you represent, for showing an interest in our work – we hope you enjoy it!

Graduating Class 2014
Computing, Electronic Engineering and Mechanical and Manufacturing Engineering
Faculty of Engineering & Computing

Message from the Dean

On behalf of the Faculty of Engineering and Computing, I would like to welcome you all to this year's Final Year Projects Display of the Class of 2014.

Today, we have the opportunity to recognise and celebrate the work of these students. We all go through many stages in our careers and lives, and today, for these students, marks an important milestone, where they display this major highlight of their academic achievements for their peers, their academic mentors, and for the many guests who join us from industry and the wider DCU community.

We believe that the range of Final Year Projects on display here today reflects the great opportunities for these young graduates to contribute to the advancement of Irish society over coming years. Many of the projects displayed represent products with immediate commercial potential; all demonstrate ingenuity, skill and technical capability of the highest calibre.

To the students, congratulations and well done! Some of you will now go on to careers within the engineering, computing or other sectors of the Irish economy; others will continue your formal education either here in DCU or elsewhere; some may travel across the world; and some may choose develop your careers into new and different directions – management, accounting, consultancy, maybe even politics! But we hope that all of you will look back with fondness at your time here at DCU, and also – and perhaps more importantly – at the friendships you have made here.

We here in the Faculty always enjoy hearing how former students are developing their careers. Do please stay in touch, and come back and visit from time to time – you will always be welcome!

To our guests, thank you for taking the time to join us here today. We hope that you enjoy your visit and are impressed with the depth and breadth of the work that our students are presenting. Impressive though they are, these projects still represent only a small sample of the learning that the students have achieved in the course of their studies at DCU. Do please engage with them directly and explore more fully what the DCU education experience represents.

DCU is well-known for its strong relationship with industry, and we hope the students you meet here today will go on to have a strong impact on the various industries and sectors you represent.

The staff and students of the Faculty look forward to meeting you and sharing these projects with you, and we hope you all enjoy your visit to the Faculty and DCU.

Prof Barry McMullin
Dean, Faculty of Engineering and Computing

Information for Industry – Computing/Electronic Engineering/Mechanical and Manufacturing Engineering

Taking Students on INTRA Work Placement

Relevant work experience through DCU's INTRA (INtegrated TRAining) programme is a central feature of education at DCU and an integral part of most of the University's undergraduate degree programmes. Students from all of our programmes are required to complete a six month INTRA placement at the end of third year, from April to September inclusive. In many cases, students return to work with their INTRA employers after they have completed their undergraduate studies.

Why Hire a Student?

Every year, employers in Ireland and overseas hire more than 800 students from DCU for an INTRA placement. Ranging in size from the largest multinational, to the sole trader start up, these employers are convinced of the merits of choosing DCU students and come back to INTRA year after year. INTRA provides the following opportunities for an employer:

- Access to a supply of highly motivated young people who have proven that they can make a real contribution
- An opportunity to evaluate and train possible future employees
- Frees existing staff from time-consuming but essential tasks
- Allows relief or assistance during seasonal peak work loads
- Permits new projects to be undertaken
- Develops existing staff by providing mentoring opportunities
- Raises awareness of your company and products/services on campus
- Provides an ideal opportunity for employers and academics to establish long-term relationships and the potential for working together on projects
- Provides an opportunity for involvement in the development of graduates with the required key skills essential to the Irish economy
- Helps to promote and reinforce a lifelong learning culture within an organisation through the establishment of strong links with a third level institution

Employing Graduates from the School of Computing/ Electronic Engineering/Mechanical and Manufacturing Engineering

DCU's Careers Service offers a comprehensive employment service for companies wishing to recruit graduates from our Engineering programmes as well as providing a crucial link to students from a range of other disciplines including Computing, Business, Humanities, Science and Education.

As an employer, you have the opportunity to reach excellent DCU students and graduates through availing of the following:

- Advertising vacancies online, which are seen by up to 1,000 students and graduates per week. Check out: www.dcu.ie/careers

- Participating in an annual Employer Recruitment Fair, which allows companies to meet up to 2,000 talented DCU students and graduates in October every year as well as students from a range of other Irish Universities and Third Level Colleges

- Visiting Employer Programme: To recruit competent, highly-educated DCU students and graduates from relevant courses, you may wish to make presentations on campus or even conduct interviews here. The Careers Service runs a Visiting Employers Program and provides opportunities for companies to come on campus and advertise their vacancies and meet plenty of enthusiastic DCU students

- Opportunity to advertise your vacancies to a range of DCU Alumni in conjunction with DCU Careers Service and DCU Alumni

- Raise your company profile on campus: DCU Careers Service can email company information on vacancies of relevance to DCU students and graduates directly into the mail accounts of the appropriate students

To learn more about how DCU Careers Service can assist you in recruiting high calibre graduates, visit **www.dcu.ie/careers** or contact Contact Ger Lardner, acting Head of Careers, email: ger.lardner@dcu.ie.

Collaboration on Undergraduate Projects

An interesting way in which companies can raise their profile among graduating students is by putting forward projects which students can work on as part of their course. Companies are also invited to provide in-house support for projects undertaken by students, or to provide financial support for projects assigned to students. There are several benefits to the company, not least of which is the opportunity to get valuable research undertaken that might not be possible within the company due to company commitments. If you are interested in finding out more about possible collaboration with students in our Schools here are the contact details:

The School of Computing contact Patricia Lacey at Tel: +353 (01) 7008980 or
Email: **patricia.lacey@computing.dcu.ie**

The School of Electronic Engineering, contact Breda McManus at Tel: +353 (0)1 7005131 or
Email: **mcmanusb@eeng.dcu.ie**

The School of Mechanical and Manufacturing Engineering contact Suzanne Dockery at
Tel: +353 (01) 7005104 **suzanne.dockery@dcu.ie**

The School of Computing

Student Knowledge and Aptitudes

The objective of the *B.Sc. in Computer Applications* and *B.Sc. in Enterprise Computing* degrees
is to produce qualified computing professionals who:

- Have a capacity to adapt, change and keep abreast of new developments
- Have a sound understanding of computer hardware, software engineering and computer
  programming
- Have a sound understanding of the techniques of systems analysis and design and of quantitive
  methods
- Are thoroughly familiar with the use of computer technology in various administrative systems,
  in manufacturing systems and in management decision making
- Have a sufficient understanding of the ideas underlying areas such as artificial intelligence,
  robotics and computer-integrated manufacturing

Career Possibilities

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Students from the B.Sc. in Computer Applications and the B.Sc. in Enterprise Computing have/will
have the ability to work in many computing roles, some of which are listed below:

The B.Sc. in Computer Applications allows graduates to prepare for a career in software development.
Graduates are able to design and implement software solutions. Graduates have learned to use
techniques from disciplines, such as software engineering, databases, multimedia, computer
graphics, artificial intelligence and computer security, to write computer programmes that can be
used in real world applications in computer games, financial services and mobile phones. The B.Sc. in
Computer Applications has a strong practical focus. Graduates have learned how to apply knowledge
gained in the course and they will have developed key practical skills. The degree incorporates a six
month work placement (INTRA) to provide graduates with a greater in-depth understanding of how
software is used in the modern commercial world.

The B.Sc. in Enterprise Computing provides the foundation for a career in information technology for
the modern business enterprise. This degree educates high-end IT professionals, with practical skills
in information systems, web technologies and IT systems networking management. It provides an
understanding of how software engineers develop software solutions to address real world computing
problems and how computing technology can be used to allow people to work together and give
companies a competitive edge in the marketplace. Graduates have learned how to use and manage
information technology and systems to improve and design the way they do business.

Computational Problem Solving and Software Development (CPSSD) Degree – see information on
our new degree on page 196 (special project 175).

The School of Electronic Engineering

Student Knowledge and Aptitudes

The objective of our taught BEng/MEng programmes in Electronic Engineering is to produce qualified engineering professionals who will:

- Have a sufficient understanding of basic sciences and mathematics appropriate to developing their careers as professional engineers
- Be competent in electronic circuits, systems and software design
- Have a detailed knowledge of the most important sub-disciplines related to their programme of study
- Have a capacity to model and analyse the dynamics of a range of technological systems
- Understand the overall requirements of product design
- Understand the structure and organisation of industry and have relevant industrial experience as a support to attaining the previous objectives
- Be capable of approaching problem-solving in a creative and innovative way
- Have developed a range of communication skills – oral, written and visual
- Have sufficient personal and inter-personal skills to enable them to be effective contributors to technology-based industrial development
- Be critically aware of the impact of engineering on society
- Embody the professional qualities of discipline, discrimination and application
- Be aware of the need to update or deepen their knowledge and skills and have an ability to do so through research, academic or professional training

Work Areas

Students from our taught BEng/MEng Engineering programmes have the ability to work in a range of different engineering areas, some of which are listed below.

BEng/MEng in Electronic Engineering

- Hardware design and development of embedded systems
- Development of optical communications systems
- Semiconductor and nanoelectronic materials and device manufacturing
- ASIC design/testing
- Development of power supplies and converters for industrial applications
- Design, verification and implementation of analog/digital SoC solutions
- Building real time distributed system infrastructure and applications software
- Development of computer and machine vision solutions
- Analysis, development, refinement and optimisation of DSP algorithms

BEng/MEng in Information and Communications Engineering

- Network design and operation for public telecom operators
- Private network design and operation for utility companies or Government organisations
- Design of networks for financial services applications
- System design, concentrating on hardware, software or both
- Technical marketing, including network design
- Telecommunications research organisations
- Telecommunications consultants
- Telecommunications software development

BEng/MEng in Digital Media Engineering

- Systems development for diverse database-backed web services
- Hardware design of Digital Media Devices (phones, PDAs, mobile robots etc.)
- Service creation for tomorrow's mobile networks
- Development of virtual reality, tele-presence and visualisation applications
- Web applications and interfaces for delivery of content to diverse environments
- Systems architecture design for e-commerce/B2B applications
- Designing automated computer vision systems for medical imaging and visual inspection
- Developing archival or browsing systems for libraries of multimedia content

BEng in Mechatronic Engineering (in collaboration with the School of Mechanical and Manufacturing Engineering)

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The School of Mechanical and Manufacturing Engineering

Student Knowledge and Aptitudes

The objective of our taught BEng/MEng programmes in Mechanical and Manufacturing Engineering disciplines is to produce qualified engineering professionals who will:

- Have a sufficient understanding of basic sciences and mathematics appropriate to developing their careers as professional engineers
- Be competent in design, professional development, dynamics and control, solid mechanics, fluid mechanics, materials and manufacturing, sustainable manufacturing systems, biomedical engineering and business
- Have a detailed knowledge of the most important sub-disciplines related to their programme of study
- Have a capacity to model and analyse the dynamics of a range of technological systems
- Understand the overall requirements of product design
- Understand the structure and organisation of industry and have relevant industrial experience as a support to attaining the previous objectives
- Be capable of approaching problem-solving in a creative and innovative way
- Have developed a range of communication skills – oral, written and visual
- Have sufficient personal and inter-personal skills to enable them to be effective contributors to technology-based industrial development
- Be critically aware of the impact of engineering on society
- Embody the professional qualities of discipline, discrimination and application
- Be aware of the need to update or deepen their knowledge and skills and have an ability to do so through research, academic or professional training

Work Areas

Students from our taught BEng/MEng Engineering programmes have the ability to work in a range of different engineering areas, some of which are listed below.

BEng/MEng in Mechanical and Manufacturing Engineering

- Design of engineering materials, processes and components, and related developing technologies
- Create models (CAD or otherwise), deriving appropriate equations and specifying boundary conditions and underlying assumptions and limitations.
- Use of appropriate mathematical methods for application to new and ill-defined mechanical and manufacturing engineering problems

- Investigate the performance of systems and components through the use of analytical methods and modelling techniques, and develop software tools including numerical techniques to solve engineering problems
- Product design and development of mechanical systems
- Sustainability of manufacturing processes
- Project management skills

BEng/MEng in Biomedical Engineering

- Modelling and design, production technology, biomaterial science and the requirements for regulatory compliance
- Understanding of Anatomy and physiology, and biomechanics, image processing, sensors, statistics, and the requirements for regulatory compliance
- Evaluation of the latest technology in the Bio Engineering field of interest and use of the appropriate technologies where desired
- Development of computer-based design to mimic bio engineering problems
- Application of ethical standards and duty-of-care towards the end-users of biomedical products

BSc in Manufacturing Engineering with Business Studies

- Design, manufacturing and marketing of engineering products
- Management of manufacturing processes and systems coupled with the awareness of business opportunities.
- Synergistic approach to solving engineering challenges (designing, manufacturing, engineering products and managing manufacturing processes)
- Application of appropriate business skills (marketing, plant operation, project management and business management) within the broad discipline of manufacturing engineering.

BEng in Mechatronic Engineering (in collaboration with the School of Electronic Engineering)

- An understanding of the principles of fundamental sciences, engineering sciences, technology and mathematics.
- An understanding that a few powerful unifying principles govern the function of many different mechatronic systems.
- A thorough knowledge of modelling and design, system integration, actuators and sensors, intelligent systems, robotics, computer integrated manufacturing and automation, motion control and image processing.
- A capacity to take a problem and redefine it in an engineering context; in the course of designing a system, component or process to meet specified needs.
- Proficiency in the design and running of experiments and the analysis and interpretation of data.

- A knowledge of the resources required to put in place a solution to an engineering problem taking into account the practical constraints from a technical, human resources and financial perspective.

- The capability of efficient project management maximising use of available resources to produce a successful outcome in a pre-defined time frame.

- An ability to demonstrate professional conduct in diverse, complex and unfamiliar situations at all times being aware of the implications of their work.

- An understanding of the need for high ethical standards in the practice of engineering, including the responsibilities of the engineering profession towards people and the environment.

- An understanding that sustainability, recycling and product life cycle must be considered at the design stage.

- An ability to work as part of a multidisciplinary team using their hybrid mechatronic training to integrate technologies in a synergistic manner.

- An awareness of the need to update or deepen their knowledge/skill set and an ability to conduct further training through research, academic or professional training.

- An ability to independently acquire further expertise and to ensure that the use of this expertise complies with the ethical standards of the profession.

- An understanding of the importance of the engineer's role in society and the need to communicate effectively within this environment and to other engineers.

- An ability to embrace all modern media for the purposes of communication, with a strong emphasis on visual computer aided design methods.

- An understanding of the need for the highest ethical standards of practice.

- An understanding that, as part of a team, it is important to consider the opinions of other members and to put in place a plan/design/process that is cognisant of these opinions.

Full details of the DCU INTRA programme are available at: *www.dcu.ie/intra.*

Message from our Sponsor

SAP as ever, is delighted to be here again to celebrate this final step of your undergraduate journey. I'd like to congratulate each of you on this significant life achievement and wish you well on the next phase of your career.

Technology continues to be one of the positive notes in a difficult global economic climate and SAP is at the centre of this technology revolution, developing innovations that not only help businesses run like never before, but also improve the lives of people everywhere. As the market leader in enterprise application software, we help companies of all sizes and industries run better. From back office to boardroom, warehouse to storefront, desktop to mobile device – SAP empowers people and organisations to work together more efficiently and use business insight more effectively to stay ahead of the competition.

There is a world of opportunities out there today for graduates in Cloud, Mobile and Analytics and I hope the skills and competencies you have learned here in DCU will serve you well on the road ahead and that our paths cross again in the future.

Dr Tony O'Donnell
Director Business Intelligence R&D
SAP

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Programmes:

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2	Bump – Pothole Detection	David O'Connor
3	Rave Star	Raymond Michael Odeyemi
4	Characterisation of Tensile Deformation of Random and Aligned Electrospun Biomaterials	Laura Cunningham
5	Virtual Music Using Hand Gesture Recognition	Alan Bowden
6	Capricorn – A Workflow Analytics Solution	Karen Emmett/Lorraine Surlis
7	Extracting Questions from Factual Text	Edward Ryan
8	A Flexible Internet Controlled Robot Platform	SinÈad Murtagh
9	VocabWidener	Onchie Villaver
10	Development of a Low-Cost, Portable Photoacoustic Apparatus for Solid Samples Using High Power Light Emitting Diodes	Fiachra Kenny
11	Time Tool	Richard Elworthy/Sarah Jane Ryan
12	CarDealz	David O'Regan
13	Develop the Conceptual Framework for the Creation of an e-Supply Chain Management System for Small-to-Medium Enterprises	Brian Hourihane
14	Lean Warehousing	Denise Kelly
15	Automation of a Transfer System	Claire Corrigan
16	DiscoverCity	Nicholas Carroll
17	EyeStudy	Emma O'Mahony/Pamela Carey
18	WebGL Based Medical Imaging Application	Kerrie McDonnell
19	Dublinked	Niall Kennedy
20	The Analysis and Simulation of a Reverse Supply Chain	Cillian Shields
21	Linux Rootkit – Development and Investigation using Systemtap	Ciaran McNally
22	Whereable	Yevgeny Abramov/Sinead Gallagher
23	Automation of a Weighing Device	Kilian Sullivan
24	Family Photo Tree	Helen Mun Ting Tai
25	Implementation of Six-Sigma Tools to Eliminate Waste and Reduce Labour Content	Mohamad Abdelsalam
26	Gotta Sync 'em All	Conor Broderick
27	Festiphile	Nicholas Duggan/Oliver Jon Conaty
28	Safe Return	Martin Jeffers
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30	Upgrade to M01 on 1209 Assembly Line to Identify Module on Counter Assembly	Hannah Daly
31	Rogue Runner	Aaron Riddell
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33	elect.io – A Responsive e-Voting Web App	Owen Gannon
34	Project Manager	Slava Feoktistov
35	Enigma Simulator	Donn Sidharth John
36	Test Method Design for Consistent Belt Tension Measurement	Abbey McGarrigle
37	Pixel Champ	Karl Roe

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39	Microbubble Generation for Aeration by means of a Spinning Disk Method	Ciaran O Brien
40	Indoor Propagation Modelling for Wireless Systems	Ian Kavanagh
41	Android Network Monitoring	Oladele Mashaun
42	Piezo Fan Blade Control	Andrew Grant
43	Design of Capacitive Touch Screen Sensors	Pauric Reddan
44	EMBARK – A Nature Application	Daniel Burke/Colin O' Sullivan
45	Fantasy Premier League Team Creator	Fearghal Eighan
46	Virtual Try-on on a Smartphone	Drew Healy
47	Development of Computer-Based Leaning Tools for Statics	Jerson Santhosh
48	FleetOnRails	Alan Kehoe/Krystian Jankowski
49	Loopman	John Wynne
50	Letter Checker	John Sheridan
51	PY20 – Electric Powered Loading Shovel	James Donegan
52	Project YouLearn	Craig Duff
53	Manufacturing Flow Dashboard	Glen Malone
54	Pacemakr	Brian Motherway/Raymond Kelly
55	Word spotting in handwritten manuscripts using shape matching	Shikhar Mathur
56	Crixus of Gaul – A 3D Game	Jinnyre Malazarte
57	Design of educational on-line games and activities for Primary School children.	Aoife Hannigan
58	AirMenu	Maximilian Hoffmann/Robert Lis
59	To investigate the effects of ambient light on the quality of meditation	Vincent Browne/Robert Healy
60	Ninja Connection	Cian Keogh
61	Microbubble generator using Venturi Tube and Rotation Chamber	Dzmitry Laurynovich
62	Music of Life	Feargal Karney
63	The Design of a Wrist Splint for Manufacture using Rapid Prototyping	Sarah Kelly
64	In Case of Emergency (I.C.E.)	Peter Ashton/Áine Rafferty
65	Electrospun Scaffolds for Tissue Engineered Blood Vessels Manufacture and Mechanical Properties	Jonathan Fallon
66	M:NTis – A Mood Monitoring and Analysis Tool	Ruaidhri Moran
67	An Online System for Developing/Debugging Android Applications	Anoop Sebastian
68	Comissioning of a Laminar Flow Table	Anthony Fitzpatrick
69	Social Puzzle Alarm	Patrick Flynn
70	Paperless Tickets	Paul McGrath
71	Stop-Motion and Mechanism Animation	Paul Stanley
72	PACBetting – The World's Front Page to Betting	Paddy Keogh-Goode/Conor Cassin
73	Work Well Management System	Mark Sullivan/Kevin McGee
74	Energy Analysis of a Building; B.I.M. and Solar Energy	David Gallagher
75	Gherkin – A Web Automation System	Meng Li
76	Installation and Validation of a New Purified Water Generation System	Andrea O'Doherty

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77	Rotate – Workforce Management Software	Andrew Brennan
78	Keep Fit	Evan Dolan
79	Design and Build a Rig for Twisting and Stretching Elastic Bands	Eoin Mooney
80	Lockbox – Quantum Proof Encrypted Cloud Storage for Android	Richie Roche
81	Concepts to Improve the Security Features of a Charity Clothes Bank	Christopher Lawson
82	Design and Development of an Incubation and Detection System using Image Analysis for Enumeration of Faecal Indicator Bacteria i	Mitchel Egboko
83	PID Control – Ball and Beam	Yuan Qu
84	Optimisation of Chassis for Electric Vehicle	Devon Nanaekow Fynn
85	Now Watch These – Sentiment Analysis Application	Fergal Brady/Shane Sunderland
86	Archer Zone	Mark Sharvin
87	Zero Gravity	Desmond O'Flaherty
88	Lotto Ticket Scanner	James Redmond
89	CampusNav	Ross Barnett/Rory Assandey
90	Virtual Wardrobe for your Android Device – Androbe	Niamh Morgan/Eoin McDonnell
91	AI Sports Game	Robert Evers
92	Driver Sleep Detection	Alan Blake
93	Design and Manufacture a Stand to Position Two Video Cameras for Stereo Vision	Conor Kavanagh
94	Design and Development of a Testbed for Sensor Fusion	Marc Denmead
95	Experimentation on POV displays	Keith Moffatt
96	Design of an Experimental Rig to Investigate Bubble Flow for the Purpose of Gas Sparging Filtration Units	James Power
97	Development of Computer-Based Learning Tools for Mathematics	Eimear Sutcliffe
98	Numerical Methods for Computing Solitons	James Conlon
99	Mechanical Ventilation Heat Recovery System	Eoin Butterly
100	Solar Air Heater for SODIS Water Disinfection	Valdis Klava
101	Finite Element Analysis of a Total Hip Arthroplasty	Ivana Hayes
102	Electronic Table Football Video Game using a Nintendo Wii Controller	Eoin Ffrench
103	Commissioning of a Sectioned Car Engine for Display Applications	Rory Ward
104	Real Time Emulation of an LTE Network	Tom Molloy
105	A Computer Game for Teaching GAA Skills	Cillian Charles Lyons
106	Crypto Clear	Seán Fitzgerald/Rory O'Donnell/Eoin Connolly
107	Development of an Automatic Ink Dispensing System	Andrew Davis
108	GP Talk	Sean Smith
109	PlayerTracker	Philip Scanlon/Ciaran O'Grady
110	Investigation of the Suitability of Variable Frequency Drives in Irish Wastewater Treatment Plants	Brian Geoghegan
111	M&M Water Management System	Michael Mahon/Gareth Mc Gonagle

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113	Artificial Life Simulation Game	Meabh Landers
114	Design Aspects of the Hoka One One Running Shoe Concept	Jayme Rossiter
115	FRProject – Penalty Points Database	Filip Napiorkowski/Romas Eidukas
116	SHout – System Notifications	Vadim Clyne-Kelly
117	Modelling and Improvement of Assembly Line Operation	Christopher Brennan
118	Ultrasonic Surgical Cutting of Soft Tissues	Osafamen Agbonyinma
119	SportsHub	Conor Lavelle/Eric McCann
120	Comparison of Fabrication Methods of Immunoassay Well Plates Via Injection Moulding and Laser Processing	Gilbert Power
121	Exerciser	Fintan Dunleavy
122	CollegeHub	Alan Hollowed/Ross Gregory O Reilly
123	Final Commissioning of Thermal Spray Facilities with Health and Safety Implementations and Audit	Andrew Murray
124	Fabrication of Disposable Microfluidic Chips with Integrated Chemical Reagents for Microfluidic Analytical Applications	Gillian Carty
125	ComputeTY Store	Karl Treacy
126	Implementation of 2D Elements in a FEA Smartphone App	Andrew McGrane
127	Development of an Aircraft Traffic Awareness System based on Software-Defined Radio	Allan Healy
128	Design and Development of a Low Temperature Deposition Gun for Coating Applications	Philip Marlborough
129	Robust Deconvolution and its Applications	Jonathan Maxwell
130	StreetFixr	Niall Lennon
131	Automated High Security Steel Door Assembly	Kevin Conway
132	Mechanical Control of a Horizontal Axis Wind Turbine	Michael McCabe
133	Reducing Process Variation in a Multi-Product Manufacturing Site, through the Visualisation of Data and Process Improvement	Jake Jackson
134	Finite Element Analysis of a Mechanism for an Electric Vehicle	CÈin Sheridan
135	TechDesk	Conor Burke
136	Location Based History App for Android	Baris Batiege
137	Age of Empires for iPad and iPhone	Dan Malone
138	The Investigation of Lean Replenishment Optimisation Strategies	Ronan O Byrne
139	SimpleLife – Third Level Student Discount Service	Declan Clarke
140	High Saturation Power Semiconductor Optical Amplifier	Joseph Byrne
141	Event Mapping and Tracking	Declan Thomas Sweeney/Aaron Doherty
142	Injection Moulding of Composite Materials for Biomedical Applications	Fiachra Cleere
143	Vinyl Record Scratch Detection and Classification	Daniel Irwin
144	Complete Farm Management	John McDonnell/Robert Fullam

No.	Project Title	Student Name
145	SmartCast	Ervin Slavotic
146	Automation of a Dust Sampler	Philip Brady
147	Develop a New Method of Determining the Setting Time and Adhesive Properties of a Novel Hydrogel Composition	Sarah Brady
148	Educational Platform Development for Control Theory	Ian Carey
149	GrandJob.ie	Daniel Grimes
150	Gym Buddy – Phone Application that Uses NFC tags	Joe Finnerty/Alan Lawton
151	G.A.A. Match Stats	Conor Smith
152	Gomoku	David Hand
153	Deals Companion App	Adam Goodison/Gary Delahunty
154	Sensor Subsystem for an Aircraft Attitude/ Heading Reference System (AHRS) Demonstrated on a Self-Leveling/Orienting Platform	Eoin O'Hobain
155	Design and Fabrication of an Arduino-Based Solar Tracker	Shaahad Shaamile
156	Development of a Simple CAD Smartphone App	Conor Traynor
157	Quantifying Exergy Losses in the Thermo-Fluids Lab	Edward Condon
158	Electrical Contractor Management System	Conor Murphy
159	MouseFree	Donal Anglin
160	The Development of Cross Industry Fraud and Non-Compliance Management Information Reports Aimed at C-Suite Clients	Eimear O'Grady
161	An ARM Controlled Internet Camera Dolly	Tom Byrne
162	Investigation of Potential Methane Yield from Irish Biomass Resources	Emmet Hogan
163	Anodising of Aluminium for Anti-Corrosion Applications	Catherine Sirafim
164	Cloud-FUSE – A Distributed Filesystem	Mario Borisov
165	Bio-Fouling Mitigation Using Surface Micro Topographies	Luke Cully
166	Development of Game-Based Learning Tools for Mechanics	Emmet Higgins
167	BuildingBlocks	Jake Kelly
168	Finite Element Analysis of Fracture Fixation	Robert Gaul
169	WizardVR	Andrew O Hart
170	"Go Out" Event Apllication For Android	Adrian Gray/Renatas Gorodeckas
171	Thermographic Image Analysis of Building Fabric Heat Loss	Colin Fennessy
172	CFD Investigation into Artificial Heart Valves	Aisling Rehill
173	RewardMe	Cian O'Brien/Ciaran Patrick O'Grady
174	Microbubble Generation for Aeration (Project III)	Coilin Smyth
175	Special project CPSSD	

Project Title:	Spark – Booking Management System
Name:	Brian Fanning
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Programme:	Computer Applications
Supervisor:	Monica Ward

Project Number: 1

This web application is designed to be used by a business who repair/service vehicles on a daily basis. The system creates and saves bookings, generates timetables for mechanics, and manages inventory. Bookings saved in the system are assigned to a mechanic, who can view their timetable for the day on their homepage. The timetables are generated by the system based on the bookings assigned to mechanics.

The system can be used by different types of users, who can be granted specific access privileges based on their role in the business.

■ Receptionists can create new bookings and assign them to mechanics. They can also view and print out invoices created by a mechanic for a booking.

■ Mechanics can view their timetable for a particular day, and they can also search through the inventory system to remove any inventory items which where used on a vehicle, and add them to the invoice for that booking.

■ Managers/System Administrators can add/remove inventory from the system, add/remove users from the system, and adjust access privileges for each user.

The frontend pages were designed using Bootstrap CSS, so that the system can be used on both PCs and smartphone/tablet devices while maintaining a consistent look and feel to the application.

Project Area: Web Application

Project Technology: Spring MVC + Spring Security, MySQL, Hibernate, Bootstrap CSS, JSTL, JUnit, Selenium

Project Platform: Unix/Linux

Spark

Project Title:	Bump – Pothole Detection
Name:	David O'Connor
Email:	david.oconnor65@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Prof Alan Smeaton

Project Number: 2

Bump is a mobile application that utilises sensors found in smartphones to automatically detect and identify potholes on a road surface. The app records data from the GPS and accelerometer sensors during a users car journey and identifies locations of potential potholes on a map, which can be accessed by local councils who can then schedule repairs.

Detecting potholes on roads and deciding when they need to be repaired is a labour-intensive task. Currently the public report potholes through forms on county councils websites, by email or by phone. These all require manual user input and are prone to human error. Bump takes a participative sensing approach to this.

An app, running on an iPhone or Android smartphone, is started when the user starts a car journey. The app records the GPS location and the accelerometer motion. When the journey is completed the user signals this and the app processes the movement data to detect what are most likely to be potholes. The user can also be prompted to confirm potholes to further improve accuracy. The intensity and location of the potholes identified are then placed on a map. The map interface will access a database of all potholes identified from the app, and will be maintained by local councils. The council can then analyse and schedule repairs based on the number of reports at a specific location.

The potential market for this system is vast. There is a constant issue with road conditions nationally and internationally. The cost of repairs and compensation due to poor road conditions is in the millions for local councils. Bump aims to reduce these costs by enabling efficient data recording and more relevant data to be used in prioritising pothole repair.

Project Area: Sensor Technology

Project Technology: Java

Project Platform: Android

Project Title:	Rave Star
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Programme:	Computer Applications
Supervisor:	Alistair Sutherland

Project Number: 3

The game Rave Star is a 3 dimensional side scrolling platforming game for Android devices. The game will deal with artificial intelligence since it is intended to be primarily a single player game. The objective of the game is for the player to navigate a series of challenging obstacles while gathering collectibles and reach the goal.

The basic project consists of the following:

- Frame containing a playing surface. The player only has to worry about two axes (x, y)
- A camera that can be either fixed on the player or adjusted for perspective view of the level
- Platforms for the player to navigate
- Required collectibles to complete a stage
- Enemies.

Programming Tools:

- The project is being developed on the Unity Game Engine.
- Interactive objects are created in the game engine with the 3-D modelling tools: 3D Studio Max 2013 and Blender.

Project Area: Game Development

Project Technology: C#

Project Platform: Android
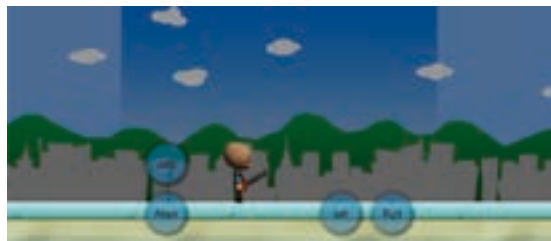
Project Title: Characterisation of tensile deformation of random and aligned electrospun biomaterials

Name: Laura Cunningham

Email: laura.cunningham23@mail.dcu.ie

Programme: Biomedical Engineering

Supervisor: Dr Garrett McGuinness

Project Number: 4

Tissue engineering has been at the centre of the media's gaze in recent years, with the promise of 'replacement body parts' and cures for many ailments and diseases, a replacement for many medical devices or a ticket off the organ transplant list. It has the capacity to save an incomprehensible amount of lives and to improve the quality of many more and while the process has not yet been perfected there have been many processes identified which may make it all the more achievable. One such process is electrospinning.

Electrospinning is defined as a process by which a charged polymer jet is extruded through an electric field to grounded collector, resulting in a fibrous membrane which mimics the diverse micro-architecture of the extracellular matrix, a natural support for cells in vivo. Due to the large array of stresses and strains experienced by the extracellular matrix in vivo it is imperative to understand how these electrospun membranes behave in similar circumstances. This study explored how these electrospun membranes of both random and aligned fibers behave under tensile strain by way of tensile testing and imagery under an SEM. The application of tensile strain within the SEM was made possible due to a custom device designed and fabricated for the purposes of this study.

It was found that the deformation witnessed was more complex than first imagined. Some membranes deformed as expected resulting in elongated fibers and a reduced fiber diameter however some membranes also showed no visible change in morphology possibly indicating a variation of strain levels across the membrane.

Project Area: Tissue Engineering

Project Technology: Solidworks

Project Platform: Windows

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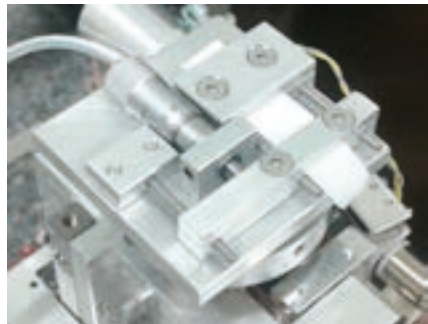
Project Title:	Virtual music using hand gesture recognition
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Programme:	Electronic Engineering
Supervisor:	Paul Whelan

Project Number: 5

The overall goal of this project is to develop a robust program using MATLAB (and the VSG/Image Processing toobox in conjuntion with the Image Acquisition Toolbox) that is capable tracking a user's hand movements, gestures. and positions. Working with these gestures and movements the program should be able to use the information acquired to map to different musical instruments and different tones/notes of these instruments in a real time environment. It is also important to note that the project will also deal with a music generation aspect to this particular field. Whereby the overall goal would be to be able to create sounds and tones with no external mapping to WAV or MP3 files. These generated sounds should also be subject to manipulation of their sound properties through hand gesture, movement and positioning.

Project Area: Image Video Processing

Project Technology: Matlab

Project Platform: Windows

Project Title:	Capricorn – A Workflow Analytics Solution
Name:	Karen Emmett
Email:	karen.emmett3@mail.dcu.ie
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Programme:	Enterprise Computing
Supervisor:	Dr R. V. O'Connor

Project Number: 6

Capricorn is a workflow analytic solution. This project took on the task of investigating a real problem that an IT company was having with their IT infrastructure and the employee interactions with it.

The scope of the project involved assessing current software usage and employee workflow resulting in implementing a configuration management plan and developing a custom solution to meet the identified need. As a result our project has many different components to be delivered.

Capricorn was built to assist bug and issue tracking software (Gemini). It focuses on the software becoming self-manageable and providing an enhanced level of transparency in the work staff are conducting.

It is a web-based application that is run on top of the Gemini software. Information is extracted, as required by management, from the database of the software and is used as the basis for the Reporting and Analytics side of the project.

Capricorn provides management with custom built Reports, these use the extracted information from the database and distribute via email, by the emailer program, periodically. Analytics is displayed in a dashboard format on a monitor on site. An employee calendar is provided, by the production of a web application, to allow staff to input hours so that this can be taken into consideration when the reporting and analytics are conducted.

Project Area: Workflow & Configuration Management

Project Technology: NET, C#, REST, SQL

Project Platform: Windows

Project Title:	Extracting questions from factual text
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Programme:	Computer Applications
Supervisor:	Dr Jennifer Foster

Project Number: 7

Automatic question generation from text is an application of natural language processing (NLP) that allows questions to be automatically generated from declarative statements. It is very useful in the educational domain since there are plenty of factual texts available online which can be used in an educational environment but these often do not have exercise sheets associated with them to help the reader retain information. This product gives the user (both students and teachers) an automatic way of generating questions from any piece of factual text. As more education is provided through computers and the movement towards a 'smarter planet' gains pace, this open source software will have a wide variety of usages.

The main function of this product is to take a piece of text as input, apply syntactic and semantic analysis (using statistical NLP techniques), extract questions and display the resulting question-answer pairs to the user. These questions-answer pairs are displayed to the user in the form of a "question sheet" or an "exercise sheet". The exercise sheet allows the user to input answers to the generated questions and retrieve feedback on accuracy/relevance.

This product is hosted as a JSF web-app on a tomcat server for increased accesibility. The algorithms developed make use of the Stanford CoreNLP toolkit and WordNet to perform syntactic and semantic analysis. These resources are open source, along with this product.

Project Area: Natural Language Processing

Project Technology: Java, JSF, Maven

Project Platform: Windows

Project Title:	A Flexible Internet Controlled Robot Platform
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Programme:	Electronic Engineering
Supervisor:	Dr.Derek Molloy

Project Number: 8

With the recent availability of cheap microprocessor development boards such as the Raspberry Pi and Beaglebone Black, cheap robots with a huge range of capabilities are fast becoming popular.

In this project, a remote, flexible and customisable software platform has been designed with a Beaglebone Black, which enables users to change and personalise the hardware on their robots (wheels, sensors etc.), without any coding skills. Instead, they select their hardware from a range of options on a remote interactive display (installed on their desktop), which is also used to control the robot.

Many benefits can be gained from the availability of cheap, customisable robots, for example in war zones, where robots are already being used to detect landmines. Unfortunately, developing these robots requires strong software skills, making them inaccessible to the general public.

Because of the time constraints of this project, software was only written to control a small range of hardware devices (one sensor, one set of motors), but the robot's software infrastructure and the remote interactive display is in place so that the project can easily be expanded to incorporate a wide range of hardware devices, which more experienced users could develop by themselves. All of the software for this project is designed using C++ objects, and remote communication between the robot and desktop display is achieved via a webserver.

This project has also brought to light the difficulty of creating a customisable platform such as this for commercial deployment. No hardware device is the same, and designing software for each new device brings different challenges – as demonstrated in this project. Designing a platform for every single hardware device available on the market is impossible because there are just too many, but a product with a finite set of options could prove very useful, especially for educational purposes.

Project Area:	Embedded Systems
Project Technology:	C/C++
Project Platform:	Unix/Linux

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Project Title:	VocabWidener
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Programme:	Computer Applications
Supervisor:	Monica Ward

Project Number: 9

The VocabWidener toolkit consists of tools that are designed to aid language learning for Primary school students. The tools are aimed at improving their vocabulary and learn new words of a language. Some techniques outlined by Tschichold from University of Swansea are incorporated into the toolkit to make the tools reusable, language independent and interesting.

The tools are:

■ Dictionary – User picks a language and enter words to get their definition. More words and definitions can be added into the system.

■ Thesaurus – Displays the synonyms of the word entered. A word can be associated to a word.

■ Games Menu – Composed of Definition and Synonym games. A word will be shown and player picks the correct answer. Contains different levels which is customisable by the teacher. In the Definition game the word will be displayed along with its image and a button to sound how the word is pronounced.

VocabWidener is designed to be language independent, i.e. any language can be stored into the application and learned which is helpful for languages that are endangered or close to extinction.

VocabWidener is written in C++ using the QT Framework. MySQL is used to store and retrieve words, definitions, synonyms, image and sound from the database.

Project Area: Language Learning Resource Toolkit

Project Technology: C/C++, SQL

Project Platform: Windows

Project Title: Development of a Low-cost, Portable
Photoacoustic Apparatus for Solid Samples
Using High Power Light Emitting Diodes.

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Programme: Electronic Engineering

Supervisor: Prof Patrick McNally

Project Number: 10

Photoacoustic spectroscopy is a method of examining gases liquids and solids by measuring a photoacoustic signal which is produced by the absorption of light in the sample.

The goal of this project was to develop, build and test a portable photoacoustic setup for solid samples using high power LEDs. The aim in the development of this setup is to simplify a conventional photoacoustic setup, reduce the cost and increase its portability.

A large factor in achieving these goals is the use of high power LEDs as a light source instead of a conventional source such as a laser or Xenon lamp.

The photoacoustic setup developed includes a photoacoustic cell where samples are housed along with a LED light source and an electret microphone to acquire the photoacoustic signal.

This project outlines all the steps involved in the design, fabrication and assembly of the photoacoustic chamber as well as the design and use of the signal acquisition electronics and software. It also details the setup and procedure to run photoacoustic measurement experiments on solid samples.

Using the developed setup photoacoustic measurements and quantitative analysis of Carbon black, Silicon and Graphite was performed using a number of LEDs with wavelengths ranging from 395nm-875nm.

Project Area: Photoacoustics

Project Technology: High Power LEDs

Project Title:	Time Tool
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Name:	Sarah Jane Ryan
Email:	sarah.ryan64@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Liam Tuohey

Project Number: 11

This project is a proof of concept called Time Tool. Time Tool is an employee management solution that will track individuals via GPS on a handheld device. It will record the location and duration spent at a particular location. Time Tool is aimed at companies that primarily have mobile employees who work across various locations but can also apply to companies with employees who work in a single location. It aims to provide multiple benefits to both employers and their respective employees. The features of the time tool application are as follows:

- User log in
- Portal page
- Location based clock in and clock out.
- Live employee GPS tracking
- Job List
- Instant messenger
- Employee expense submission
- Customer invoicing
- Cloud sync

The benefits that can be expected from using Time Tool are as follows:

- Increased communication
- Increased awareness of employee location
- Reduction in employee 'Time Theft'
- Better job management
- Reduction in administration
- Increased overall productivity

Time Tool will be available to download on mobile and tablet devices running the apple iOS mobile operating system and the Google Android mobile operating system.

Project Area: Mobile App

Project Technology: Java

Project Platform: Multi-platform

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Project Title:	CarDealz
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Programme:	Computer Applications
Supervisor:	Dr Darragh O'Brien

Project Number: 12

Overall CarDealz has three main goals: gather car price information from public websites, model the car price data in order to identify good deals and, finally, relay that information to the end user. Our target audience would be car enthusiasts and car buyers that lack knowledge of the market but want to be automatically notified of any potentially good deals as they arise.

The CarDealz project consists of three main parts: The first part of this project is to develop a web scraper that can successfully pull large amounts of data from public online car selling web sites. One challenge here will be to download the data efficiently so that advertisers' web servers are not overburdened with requests. Data captured will include features like car name/model/year/price/engine size/mileage etc. These are the main qualities that will affect the sale price.

The second part of this project is storing the downloaded data on a web server and developing a model from it. A machine learning algorithm is trained to predict car sale prices from the stored features in order to spot likely deals (where there is a mismatch between the predicted and the actual selling price).

The third and final part of the project is to display the best deals to a user via a front end application on an Android system.

Project Area: Artificial Intelligence

Project Technology: Python

Project Platform: Android

Project Title:	Develop the conceptual framework for the creation of an e-Supply Chain Management System for small-to-medium Enterprises
Name:	Brian Hourihane
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Programme:	Manufacturing Engineering with Business
Supervisor:	Dr John Geraghty

Project Number: 13

This project investigated the area of Supply Chain Management (SCM) and identified how a simple multi-tier, internet based, platform could potentially provide Small to Medium sized Enterprises (SMEs) with a source of competitive advantage. The goal was not to actually produce the product, but to develop the conceptual framework to support the production of an e-Supply Chain Management (e-SCM) system using advanced product-design techniques and open source visualisation tools.

Despite Ireland's recent recessionary difficulties, SMEs account for 98% of all businesses and employ two-thirds of all private sector workers, thus the country depends on them to generate the jobs that will contribute to our sustained economic recovery.

Through interviews and interaction with local SMEs it was found that many firms did not comprehend the potential benefits technology could have on their business. The project focused on these firms and their failure to implement technology, undertaking a detailed research review and market analysis identifying the rewards to be gained by the use of hi-tech tools particularly within the area of SCM. The Stanford D design framework was used to analyse this research and create the conceptual design of an e-SCM system. The concept was then tested, a business model canvas was created and potential funding options assessed in order to support the future development of such a product.

The conceptual system identified Demand Management as a particular area for commercial opportunity of an e-SCM tool for SMEs. It highlighted how, through increased information sharing, firms can reduce variance across their supply chain networks. Thus, these measures can save SMEs money and enhance relationships with both customers and suppliers. This conceptual system has the potential to provide Ireland's SMEs with the affordable tools and information needed to grow and develop through optimisation of their supply chain and in turn contribute to the growth and recovery of the Irish economy.

Project Area: Suppy Chain Management

Project Technology: N/A

Project Platform: Multi-platform

Project Title: Lean Warehousing

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Programme: Mechanical and Manufacturing Engineering

Supervisor: John Geraghty

Project Number: 14

In the case study company, there was an on-going problem of 'Found in Warehouse' products, which are classed as any products which do not make it to the shipping stage of the picking process. Therefore, the order does not reach the customer on time, as promised. This problem costs the company approximately .Ç¨350,000 per annum. Following discussion with staff of the case study company, it was decided that improvements in the picking process were essential to fix this problem.

Using the Six Sigma and Lean Manufacturing methodologies of DMAIC, the problem was measured and analysed, in order to determine the most affected areas. Pareto's rule states that 80% of the problems are as a result of 20% of the causes; therefore, working on the most affected areas would result in a more efficient outcome. These areas underwent a further analysis to detect the root causes of the problem, using Fishbone Diagrams.

An implementation plan was drawn up for the company to implement changes to the two most affected areas in the warehouse. Some changes have been made accordingly and have already shown improvements to the reduction of Found in Warehouse products.

The implementation plan has been predicted to reduce the Found in Warehouse products by at least 40%. Further developments have been suggested to the company to focus on the other areas of the warehouse, to further reduce the problem.

Project Area: Lean Six Sigma

Project Technology: N/A

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Project Title:	Automation of a Transfer System
Name:	Claire Corrigan
Email:	claire.corrigan6@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Harold Esmonde

Project Number: 15

The use of automation for increased efficiency and safety is widespread in most modern industries. This project outlines the steps taken to automate the transfer system of a prototype Mass Calibration System for the Nation Standards Authority of Ireland (NSAI).

Masses up to 50kg can be transferred via conveyors and mechanical arms to and from the calibration station. Mechanical and optical switches track the movement of the mass and its progress can be followed on the screen of the controlling computer. Each stage of the machine can be initiated by a user control button when in manual mode, or the machine can be set to full automatic mode where no user input is required.

Each approach taken in the attempt to reach full function has been outlined and solutions were considered and implemented where suitable. A program designed in LabVIEW to automate the transfer system has been detailed with features of the development process described. This project will be integrated in the future with the project of automating the calibration system for a fully functional machine that can be used by the NSAI.

Project Area: Automation

Project Technology: LabVIEW

Project Platform: Windows

Project Title:	DiscoverCity
Name:	Nicholas Carroll
Email:	nicholas.carroll24@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Alistair Sutherland

Project Number: 16

For the last few years smartphones have seen a huge uptake in users. The simplicity and nature of smartphones have made many old technologies obsolete, for example, music players and cameras. Having all a user's needed functionality in one piece of hardware has eased smartphone user's lives tremendously. My application aims to allow travelling smartphone users to do away with physical travel guides. Using crowdsourcing my application will allow a user to see nearby landmarks and sights. This crowdsourcing is achieved by the user actively engaging in building the database, For a user to get back results they have to help in building the information by contributing to it. A user will take an image of a place or a landmark and upload it to a MongoDB database. The user will then receive the top 5 results (landmarks, restaurants or other amenities) closest to them. This allows a user to discover their way through a city simply and organically. Using the power of tagging and image processing algorithms, my application aims to deliver the highest quality pictures and results to the user. These algorithms aim to stop the user being shown blurry, out of focus, or over saturated images. The user will see only the best quality crowdsourced images. This technique will not only provide the best quality images but also the most popular destinations through a city allowing the user to navigate through the city and find the best spots in town.

Project Area: Mobile App, Multimedia

Project Technology: Java, Node.js

Project Platform: Android

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Project Title:	EyeStudy
Name:	Emma O'Mahony
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Programme:	Enterprise Computing
Supervisor:	Prof Alan Smeaton

Project Number: 17

In the current economic climate there is an increased expectation on students to acquire a third level education after completing their leaving certificate. The tertiary education market is highly competitive with universities and institutes looking to distinguish themselves with a unique selling point to draw in and retain students.

EyeStudy is an application that involves the use of Data Analytics and Data Mining techniques in the education sector. These advanced techniques are used to identify key classifiers/features that impact the probability of a student's successful completion of a module. This data driven approach enables EyeStudy to predict how likely a student is to pass or fail their examinations based on their own activity with the Virtual Learning Environment. EyeStudy trains a Support Vector Machine with data of previous cohorts of students who have taken the same course and through various kernels identifies patterns of student behaviour which lead to the success and failure of a module. The identification of these various classifiers and real time predictions gives a lecturer the opportunity to step in and aid students toward success. EyeStudy has the ability to increase student retention, as well as enhancing a student's academic performance.
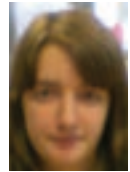
Project Area: Data Analytics

Project Technology: Support Vector Machine

Project Title: WebGL Based Medical Imaging Application

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Programme: Digital Media Engineering

Supervisor: Dr Robert Sadleir

Project Number: 18

Medical imaging is increasingly important in our society for visualising patient anatomy in a non-invasive way. Medical imaging began with two-dimensional data in the form of x-ray images but then moved on to volumetric datasets, generated by modalities such as MR and CT, which are generally viewed as individual slices. The aim of this project is to use an online rendering API, WebGL, to create a remote access tool for viewing medical image data in 3D. The Marching Cubes algorithm was chosen as the surface extraction algorithm for this project. The Marching Cubes algorithm uses an imaginary cube consisting of 8 voxels, 4 voxels from two adjacent slices. An 8-bit index is calculated for each cube and this is used to look up triangle edges from a table. After it has determined how the surface intersects with the first cube location, it then moves to the next cube location and repeats the process until the entire volume has been traversed. In this way, the algorithm generates a mesh representation of the surface of interest which can then be rendered using conventional 3D graphics hardware. This project uses WebGL to visualise the data so that radiologists can access the data remotely to give a diagnosis quickly and easily.

Project Area: 3D Modelling

Project Technology: Eclipse, Java, JavaScript

Project Platform: OSX

Project Title:	Dublinked
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Programme:	Computer Applications
Supervisor:	Dr Darragh O'Brien

Project Number: 19

With mobile device numbers constantly increasing, so is the market for mobile applications. While many services exist in a web environment, integrating mobile specific versions in a single app is desirable. This project delivers a mobile application for DCU students. While there is an existing DCU app, it is aimed at prospective students, with features such as a CAO points calculator.

This project delivers an app which allows students to access Moodle content along with general DCU information and real time information for Dublin Bus and Bus Éireann services in the area surrounding DCU along with real time information for Heuston Station and Busaras.

The app is currently for iOS devices only. A Moodle site was built and hosted remotely and filled with sample content in order to mirror DCU's Moodle site. The real time passenger information is obtained through access to the Real Time Passenger Info (RTPI) service provided by Dublinked (http://www.dublinked.ie).

Project Area: Mobile App

Project Technology: Objective-C

Project Platform: iOS

Project Title:	The Analysis and Simulation of a Reverse Supply Chain
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Programme:	Manufacturing Engineering with Business
Supervisor:	Dr John Geraghty

Project Number: 20

The aim of this project is to assess the impact that alterations within a reverse supply chain system will have upon the bullwhip phenomenon within a closed-loop supply chain. This project provides of a comprehensive literature review which assesses key issues within a supply chain, focusing on the bullwhip phenomenon and means in which to dampen its effects.

A simulation model was developed to imitate a supply chain with a reverse logistics aspect. The simulation developed for this project was created using ExtendSim which a commerical software tool for creating simulation models of discrete and continuous systems. The potential for this simulation model to be used as an educational tool was also analysed by creating an interface within Microsoft Excel which allows users to vary certain factors within the simulation model.

The results found that within the supply chain, the bullwhip effect is magnified within companies situated previous to the re-entry location of the recycled products. It was also found that the rate at which these products are re-entered into the system does not have a significant impact on inventory turnover rates. The significant variable found was the percentage of materials which are reintroduced into the system.

It was concluded that the educational tool worked to highlight the mechanisms of the bullwhip phenomenon to students with a basic prior knowledge of the effect but would require a degree of optimisation to adequately educate those lacking any knowledge of this area.

On completion of this project, there remain areas in which future study can be conducted. The simulation model could be developed to allow multiple re-entry locations throughout the supply chain along with improved flow of information between activities to further represent their reaction to alterations in demand. As for the educational tool aspect of this project, it is recommended that further development be conducted on the excel interface so that it will clearly explain the impact of variations within a reverse supply chain on the bullwhip phenomenon.

Project Area: Simulation modelling of a reverse supply chain

Project Technology: ExtendSIM

Project Platform: Windows

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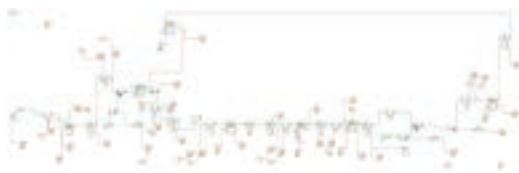
Project Title:	Linux Rootkit – Development & Investigation using Systemtap
Name:	Ciaran McNally
Email:	ciaran.mcnally3@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Dr Darragh O'Brien

Project Number: 21

A large part of this project is to code the various methods employed by modern rootkits. This was done using Systemtap and loadable Linux kernel modules. The project involved developing and researching commonly found rootkit functionality. It demonstrates research into how rootkits can leverage the Linux kernel and subvert regular operating system control flow. The goal was to ultimately provide a learning resource or toolkit that could be used by amateur or professional security enthusiasts. Many different interesting ideas and techniques are explored along the way.

The main rootkit functionality researched and developed is the following:

- Installation of a rootkit

- Accessing the system call table

- Modifying system calls

- Implementing a key logger

- Hiding the rootkit module and files

- Network traffic sniffing

- Data exfiltration

- Remote hidden access

- Affecting user space functions

- Privilege escalation

- Detection/mitigation

The final tool is called maK_it and was created on the CentOS linux distribution. It allows a party to maintain root access to a Linux host computer in a stealthy way once installed. It can be used for information reconnaissance and remote hidden access to a compromised machine. It employs multiple techniques to avoid detection.

Project Title:	Whereable
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Programme:	Enterprise Computing
Supervisor:	Heather Ruskin

Project Number: 22

Whereable is an android based application focused on retail. The customer facing application scrapes web servers for real time information regarding stock levels and provides it in a user friendly interface. The main purpose of the application is to allow users to query stock levels of items that are not available on display. This is done through scanning the barcode of an item, selecting the required size, shape or colour and querying the retailers' database. The benefit of the application is that customers will not require staff to individually check for item availability.

Some retail chains exist as franchises of each group therefore stock levels are not shared between the individual locations. Since the data for items is identical stock information for multiple locations will also be provided. One of the key features will also allow users to find the nearest location where an item is available if the current store does not have the particular item in stock. Using the smart phones GPS position and the coordinates of the nearest store.

The benefit to the retailer is that it will highlight missed opportunities with regards to sales. It will also provide exclusive data for business intelligence analysis that would otherwise would not be accessible.

Project Area:	Mobile App
Project Technology:	Java
Project Platform:	Android

Project Title:	Automation of a Weighing Device
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Programme:	Mechatronic Engineering
Supervisor:	Harold Esmonde

Project Number: 23

The project is based on the automation of a Mass Calibration System (MC50k) for the National Standards Authority of Ireland (NSAI). The MC50k is to be used to calibrate 20kg masses, for this, 20kg masses will be put on a conveyor leading to a mass comparator, where they will be tested against a 20kg reference weight, and then moved to an output conveyor.

This project concerns the automation of the mass comparator. This involves the swapping of test and reference masses and reading in data from the mass comparator. This data is then analysed following either ABBA or ABA methodology. The analysed data is then compiled into a report along with other details entered about the mass.

This is all done using the graphical programming language LabVIEW. A programme is developed in LabVIEW to communicate with both the mass comparator and the motor which controls the swapping of masses. The programme controls which mass it is measuring according to the ABBA or ABA protocol. The LabVIEW programme analyses the data from the mass comparator, combines it with user entered information about the mass and exports a report to MS Word.

Project Area: Automation

Project Technology: LabVIEW

Project Platform: Windows
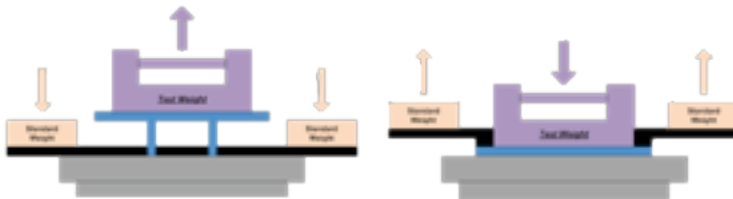
Project Title:	Family Photo Tree
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Programme:	Computer Applications
Supervisor:	Alistair Sutherland

Project Number: 24

This project, Family Photo Tree, is inspired by existing social networking websites which allow people to connect and interact with each other on the internet. They help people keep updated with news of family and friends even if they don't meet often or if they are living abroad.

Based on this concept, this application implements a simple scheme similar to a family tree with a photo gallery. Through an account they create, people are able to view other members' accounts, a profile with some basic information. Only family related members can browse each others' photo albums. The system allows users to update their personal information and upload photos, managing their album(s) at their own convenience. As part of this project, there is also a search function provided so users can expand and build their family tree by adding more family members.

This project puts emphasis on potential users that may not have an extensive knowledge of computers. Therefore, the system is developed to be intuitive to use and user-friendly.

Project Area: Social Networking

Project Technology: Ruby

Project Platform: Windows

Project Title:	Implementation of Six-Sigma tools to eliminate waste and reduce labour content
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Supervisor:	John Geraghty

Project Number: 25

A pharmaceutical company encountered an issue regarding one of their injection moulding machines. Upon inspection it was discovered that the machine produced aspects of TIMWOOD waste. In consultation with the company, it was determined that best course of action would be to implement a lean approach to resolve the issue.

The issues that were identified are a consequence of poor chute design and an incompetent sample collection process. The chute design leads to acceptable parts becoming contaminated, and labelled as waste parts. The sample collection process was found to be inaccurate and inconsistent, which lead to over processing for the operator, causing additional labour content.

A DMAIC approach was used to define the problem, measure its impact, analyse possible solutions, improve the current design and ensure the implemented solution operates as intended. Concepts such as air blades, an indexing belt and a slide were considered to help eliminate the waste and improve the sample shot collection process. Automating the process however seemed like a more appropriate solution.

Using the combination of a slide and a conveyor belt to automate the process of capturing a sample shot helped eliminated human interactions with the machine. This eradicated the waste and the labour content associated with the process, potentially saving ‚Ç¨23,660 on product waste per annum and reducing labour content by 223.9 hours per annum allowing for the allocation of more hours for the operator to perform further tasks.

In conclusion a lean approach was applied to an issue arising in a pharmaceutical company, the DMAIC cycle was used to identify the problem and produce a suitable solution to resolve the issue, part waste and labour content were reduced as a result.

Project Area: Mechanical Design and Manufacture

Project Technology: Solidworks

Project Title:	Gotta sync 'em all
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Programme:	Computer Applications
Supervisor:	Dr Stephen Blott

Project Number: 26

Currently, if a User has more than one Android device and they want to maintain a single copy of a particular app's data they are at the mercy of that application's developers. Mobile games are a prime example of this problem. A User can be on one level of a game on one device and a higher or lower level on their second device. Some apps try to solve this problem by allowing the User to connect to social networking sites and synchronise their data that way however, in some cases, this can result is features of the game being hidden away.

Gotta sync 'em all is an Android application whose main purpose is to allow Users to select any of their apps and synchronise the data to a cloud storage service. At present, there is a higher chance that Users will have more than one device operating the same app. Gotta sync 'em all works by allowing the User to select an app on one device, send their data to the cloud where it can be pulled down by the User's other devices at a later date. In this instance that service is Google Drive. When the User next goes to use another device, the apps they have selected for synchronisation on that device will have their data downloaded from the cloud and stored on the device for modification i.e. in the game example the User would continue from where they left off.

The app also allows Users to temporarily share a selected app's data with friends using Near Field Communication (NFC) where it is present on both devices and then roll back to their own data should they wish to.

Project Area: Mobile App

Project Technology: Java

Project Platform: Android

Project Title:	Festiphile
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Email:	oliver.conaty2@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Monica Ward

Project Number: 27

Our app is called Festiphile. Festiphile is a proof of concept project which means that we prove the concept of the app will work through extensive research but do not develop the app in full. The app provides users with an easy way of searching for information on all European music festivals using a range of search filters such as festival name, location, genre, dates, price, rating, language, weather and festival type to refine the results to meet their needs.

It provides users with a place to rate and review festivals they have been to and also a place to view reviews written by people who have experienced these festivals so they can get a better feel for what the festival is all about. Users have the option of sharing festivals that they are interested in on their own social media sites.

The same way people use such apps as trip advisor, this app is not be about the actual booking of festivals but it does provide users with a way to refine results to suit their requirements and to provide useful information and reviews from real people who have been to these festivals. There are links to the festivals' main sites so users can book their festivals this way.

Project Area:	Mobile App
Project Technology:	HTML5
Project Platform:	Android
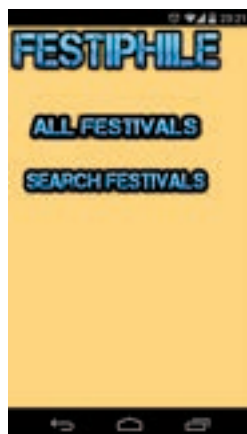
Project Title:	Safe Return
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Email:	martin.jeffers3@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Donal Fitzpatrick

Project Number: 28

Safe Return is two iOS applications to aid family members in the safety of a relative with dementia.

Tracking Application:

The goal of this app is to track the user and constantly learn their routine. I implemented this with Apple maps and various data mining algorithms. The application is able to recognise what the user's normal behaviour is and what would be deemed as irregular. The behaviour of the user is based on their location and time. This information is constantly tracked and stored in a mySQL database on the iOS device to create the users profile.

Companion Application:

The goal of the companion app is to retrieve notifications immediately if irregular behaviour had been determined by the tracking app. The companion app can also add events like doctor appointments, social events etc. to the tracking application remotely.

Client-Server:

The communication between the two apps is carried out with a ruby-on-rails API. Through this, users can create a new account, log in with authorisation and send information to each other in the form of a 'message'.

The project is a proof of concept to prove that the underline technologies are there for an application to be implemented in the real world with off the shelf technology.

Project Technology: Objective-C, Ruby

Project Platform: iOS
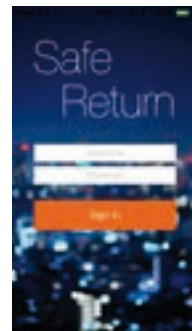
Project Title:	Hockey 1v1 Shootout Analysis and Application
Name:	Rachel O'Brien
Email:	rachel.obrien32@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Prof Alan Smeaton

Project Number: 29

Hockey 1v1 Shootouts – Android Application

This is a proof of concept project for an Android application which aims to provide users with helpful tips, tricks and analysis on how to improve in 1v1 hockey shootouts. This includes access to drills and exercises that have been proven to help improve accuracy and likelihood of scoring. Each exercise contains a video demostration, breakdown and written guidelines detailing how to perform it. The official rules that are applicable for 1v1 shootouts are easily accessible through the application and give a breakdown and explanation of each important line. Examples of good 1v1 shootouts from international professionals will also be easily available to users through the application.

The 1v1 shootout format is a relatively new replacement for the traditional penalty flick shootout in hockey. The Irish Hockey Association introduced the new format into the IHL (Irish Hockey League) and into all school competitions. 1v1s will be introduced into all competitions over the next few years, following the guidelines laid out by the FIH (international governing body).

In order to provide high quality tips and drills an extensive trial was carried out using sensor technology such as Tobii eye tracking glass, equivital life monitors and visual aids such as goPro cameras. The eyetracking glasses follow the gaze of the attacker as they participate in the shootout. The finding of this research are available for users to review and analyse through the android application.

Project Area: Mobile App, Sensor Technology

Project Technology: Java

Project Platform: Android

Project Title: Upgrade to M01 on 1209 assembly line to identify module on counter assembly

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Programme: Mechatronic Engineering

Supervisor: Dr Paul Young

Project Number: 30

In the automated medical device industry, as in most industries, it is essential to be able to track and identify the origin of components in products. If a quality issue was to arise, not being able to pin point the source of the issue quickly can cause a costly period of downtime or the liability of running the machines at risk.

This project is running in liaise with a Medical device production company. On the automation line, with which this project is related, there are a number of machines that assemble identical components which feed into a larger assembly machine. At present, deciphering which machine produced the small assembly involves the complete destruction of the assembly. This project aims to develop a method to identify which machine the small assembly was produced on, with minimal destruction to the components or products.

The project investigates different methods of identifying the components. Concepts are developed to combat the problem statement and the concepts are analysed. The best fitting concept was selected and the idea was prototyped and tested in order to aid further development of the concept. Data taken from the testing of the prototype was analysed and the findings were returned to the company.

This project touches on different methods of problem solving and the design and development of manufacturing concepts for the engineering industry.

Project Area: Mechanical Design and Manufacture

Project Technology: Solidworks

Project Title:	Rogue Runner
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Programme:	Computer Applications
Supervisor:	Dr Darragh O'Brien

Project Number: 31

Rogue Runner is a top down 2-dimensional dungeon-crawler with melee and ranged combat built using OpenGL. It falls under the 'rogue' category as it provides a consistent challenge to a player's increasing skill level as they play and learn more about the intricacies of the game but it provides a couple of its own twists on the genre with permanent death still the key.

Follow our mysterious shady protagonist as he traverses randomly generated levels, trying to escape the darkness that threatens to swallow him up, into a future that remains unclear. Make use of a myriad of items to power him up, deal with random events, gather money to spend at shops, combat foes that get in the way, solve puzzles, and evade traps. Each level generated per playthrough will be different than it was the last time so you cannot entirely rely on what you remember from last time you played. This also provides for a unique experience during each playthrough to keep you coming back. Deal with obstacles thrown your way as you choose, but beware the repercussions, they may not be as obvious as they seem.

Project Area: Gaming

Project Technology: OpenGL

Project Platform: Windows

Project Title: Digital Modelling of Analogue Guitar Effects on an Embedded Platform

Name: Kevin Larney

Email: kevin.larney2@mail.dcu.ie

Programme: Digital Media Engineering

Supervisor: Ronan Scaife

Project Number: 32

The aims of this project were to design a digital guitar effects pedal using an embedded computer, and to model existing analogue distortions using DSP techniques. There are a vast number of analogue effects pedals available for the electric and bass guitars but they can be quite expensive and although there is a great selection they still might not meet your specific musical needs. Instead of buying several analogue pedals one could purchase a relatively inexpensive embedded computer and programme the effects, offering a greater degree of customisation. The 'pedal' was designed on the Beaglebone Black, a Linux based development platform, using ALSA and JACK to communicate between the board and an USB audio I/O device. The filtering codes were written using SuperCollider, which was also installed on the device, and which can process and affect the guitar signal from the USB device in real time. The distortion effect can be toggled on and off as well as altered during play, using external buttons on a breadboard attached to the Beaglebone Black which communicates with SuperCollider using code written in Python. This is a desirable rig for any music fan or hobbyists with an interest in coding, who want a greater degree of control over their effects, or simply want to save money on high end distortion pedals.

Project Area: DSP

Project Technology: SuperCollider

Project Platform: Beaglebone Black

Project Title:	elect.io – A Responsive e-Voting Web App
Name:	Owen Gannon
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Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 33

elect.io is a modern, fast, secure and responsive e-Voting Web Application. It is aimed at organisations, such as DCU's Student Union, who want to easily set up elections and capture student's votes.

The app allows students to login using their DCU credentials and view elections (such as referenda or the SU elections) and their candidates before they anonymously vote for their candidate of choice. After voting, they may share on Facebook and Twitter that they have just used the app to vote in a student election (but without revealing who they voted for).

The app's administrators, i.e. the SU, will be able to create, modify and delete elections, candidates and their campaigns after logging in as an admin. Administrators also have the option to view analysis from elections. Other than the election results, they can see specific voter data, such as location and time of vote in order to better gauge how the students are voting.

The app is built using Node.js with Express.js and Handlebars.js as well as MongoDB and Nginx. HTML5, CSS3 (with Twitter Bootstrap), Ajax and jQuery are used to build the content that the end user sees.

Project Area:	Web Application
Project Technology:	HTML5, JavaScript, Node.js, NoSQL
Project Platform:	Multi-platform

Project Title: Project Manager

Name: Slava Feoktistov

Email: slava.feoktistov2@mail.dcu.ie

Programme: Computer Applications

Supervisor: Monica Ward

Project Number: 34

Project Manager is a Web App made for small to medium developer groups/companies for managing projects. This Web App allows users to track project details, tasks, issues, files and documentation within each project through a tidy Vaadin user interface which is easily traversable and has high user control for features. Each project and files related to the project are stored within MongoDB by the app.

Companies and developer groups usually have to deal with an issue of having documentation and other project related items being scattered around wiki's, hard drives and other areas. The application helps to organise these items and gives features to the user to assist in this. A big part of keeping projects organised is to standardise the project setup and layout by letting users with appropriate permissions create new projects from copies of other projects or blank project templates that are set up.

The benefit of keeping a project organised and contained mostly in a single location reduces the time sink that is created when searching for documentation and project related files that are spread between different websites, apps and other locations.

Project Area: Web Application

Project Technology: Java – Maven, Vaadin, MongoDB, XML, CSS

Project Platform: Multi-platform

Project Title:	Enigma Simulator
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Email:	donn.john2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Dr Geoff Hamilton

Project Number: 35

A cross-platform web application has been developed which simulates the Enigma Machine in all its functionality and mechanism, and has the added functionality of users being able to send encrypted messages to each other by creating an account and logging in with their credentials. The web app gives the user a very comprehensive look at how the Enigma Machine from the WWII worked.

The machine encrypts plain text, one letter at a time, as they are typed and indicates the encrypted letter by lighting it up on a panel. Each letter was encrypted with a different key setting and so was unlike any other encryption method prior to it. The particular model replicated is the Enigma M3, which uses 3 rotors, a plugboard and a reflector for scrambling which gives 158,962,555,217,826,360,000 (158 quintillion) possible setting combinations.

The front-end is built on the AngularJS Framework using HTML5, CSS3 and JavaScript whereas the backend uses the Ruby on Rails Framework.

Project Area:	Web Application
Project Technology:	HTML5, JavaScript, Ruby
Project Platform:	Multi-platform

Project Title:	Test Method Design for Consistent Belt Tension Measurement
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Email:	abbey.mcgarrigle5@mail.dcu.ie
Programme:	Biomedical Engineering
Supervisor:	Dr Brian Corcoran

Project Number: 36

This project aims to find a reliable way of measuring the tension of a toothed belt. These belts are contained within drives that are part of a gauging device called the "Equator" system. The Equator fixture is an innovative creation by Renishaw plc. Accelerated life testing is carried out in Renishaw to determine the machines true capabilities and limitations. Inconsistent results were being gathered from the tension tests carried out by the current method. It was hypothesised that these inconsistencies were related to the test method put in place, which involved plucking the belt with an Allen key.

The method was investigated and factors affecting the results were highlighted. A number of tests were conducted in order to find the optimum test conditions that would produce the most repeatable results. It was predicted that a plucking device would help eliminate human and technical factors that were affecting the results. Using a plucking device would also ensure the same force is applied at the same belt position every time. A variety of concepts were considered for the plucking device with the optimal design being manufactured. This device was tested in order to identify its capabilities and examine the readings produced.

To increase the reliability of the measurements, a number of modifications were made to the plucking device to improve its overall configuration. In accordance with the initial expectations, the plucking device reduced the measurement uncertainty in the readings gathered, which meant the statistical dispersion of the readings were reduced. The findings support the prediction that by substituting the plucking device for the Allen key in the procedure, that it would allow a verified test method to be put in place, thus improving the continuity of the belt tension readings. Future work is discussed with many suggestions provided on ways to further improve the plucking device. Further testing is recommended in order to determine the improvements over a prolonged time frame.

Project Area: Mechanical Design and Manufacture

Project Technology: 3D Modelling

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Project Title:	Pixel Champ
Name:	Karl Roe
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Programme:	Computer Applications
Supervisor:	Prof Joseph Morris

Project Number: 37

Pixel champ is a 2D side scrolling action game that allows the player to completely customise their own character. The player is given a finite amount of pixels that they can use to design a character and two weapons; the player is then released into a world in search of more pixels to add to their character. The game is based around per pixel collision detection, so many of the obstacles in the game can be overcome with a particular character design, such as making the character small to fit in narrow gaps or making the character large to fight off enemies. Different designs also have different benefits; larger characters are slow and can't jump very high but have high defence while small characters are fast with low defence. The player can acquire more pixels by killing enemies and finding "Pixel Packs", they can then add these pixels to their character or weapon designs or alternatively use them to increase their weapon strength or life bar. The game takes place in an underground world full of monsters and traps; the player must use their designs to solve puzzles, defeat enemies and bypass obstacles throughout the world in an effort to find their way back to the surface. The player is able to create multiple character and weapon designs and is capable of switching between these different designs on the go.

Project Area: Gaming

Project Technology: C/C++

Project Platform: Windows
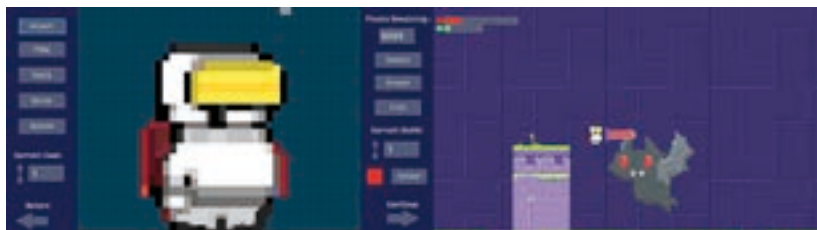
Project Title:	Development of String & Sticky Tape Experiments
Name:	Conor Woodgate
Email:	conor.woodgate2@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Dr Alan Kennedy

Project Number: 38

This project aims to design and develop a number of DIY experiments to supplement the material taught in mechanics and physics modules. The experiments are designed to be performed almost anywhere as they require no specialist equipment, using only commonly available items for the experimental set up. All experiments included in this report make use of widely available technology such as smartphones in an attempt to either increase the accuracy of existing experiments or to measure phenomena that would previously have required more expensive equipment.

Five experiments have been designed in total, each covering a different topic and each presenting a new experimental approach. For each of the five experiments, testing has been carried out to evaluate their accuracy and to determine their viability as a scientific experiment to aid student learning. All five experiments tested show potential but and could be improved upon with further experimentation and greater understanding of the sources of error.

This project found through extensive testing that DIY type experiments can be as accurate and, in some cases, more accurate than their traditional counterparts. The main conclusion of this report is that smart devices have a great deal of potential, and can be used effectively as a tool, replacing specialist equipment, in experiments that can aid learning.

Project Area:	Educational
Project Technology:	N/A
Project Platform:	Android
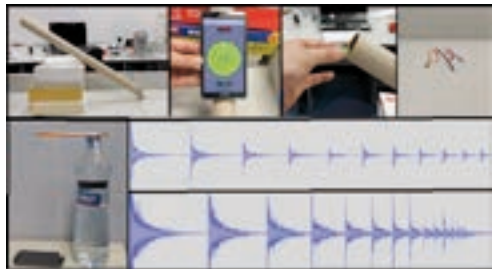
Project Title:	Microbubble Generation for Aeration by Means of a Spinning Disk Method
Name:	Ciaran O'Brien
Email:	ciaran.obrien68@mail.dcu.ie
Programme:	Biomedical Engineering
Supervisor:	Dr Yann Delauré

Project Number: 39

This project involves the design and creation of a microbubble generator for the purpose of aeration and the study of the effects of varying operating conditions such as air flow rate and rotation speed. This design must incorporate a spinning disk element as a means of generating the microbubbles but this is constrained by a fixed budget, a limited time frame and the manufacturing capabilities of the workshops in DCU.

Microbubbles are defined as having a diameter of less than 1mm but greater than 1Œºm. Microbubble technology is an expanding field and can be found in numerous industries throughout the world. These can vary from aeration for fish farming to ultrasound imaging and drug delivery in the medical sector.

An in-depth literature review was performed to understand what microbubbles actually are, what properties they have that make them desirable for industry, the various methods of generating them and the mathematical theory behind bubble generation.

After evaluating various concepts a final test rig was designed and manufactured. This rig did produce bubbles; however, these were too large to be classified as microbubbles. The test results indicate that the rig could potentially generate bubbles with a diameter less than 1mm by altering the operating conditions but further testing and experimentation is required.

Project Area: Mechanical Design and Manufacture

Project Technology: Solidworks
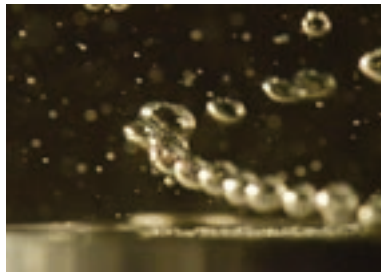
Project Title: Indoor Propagation Modelling for Wireless Systems

Name: Ian Kavanagh

Email: ian.kavanagh4@mail.dcu.ie

Programme: Electronic Engineering

Supervisor: Dr Conor Brennan

Project Number: 40

This project aims to achieve something which has never been completed before by developing a very accurate integral-equation based model for the propagation of electromagnetic waves in 2D and 3D indoor environments. As a result of this, conference publications have arisen out of this work. The indoor environment presents its own unique challenges due to the presence of clutter like tables and chairs. New developments in energy-efficient wireless communications and location and tracking algorithms have created a greater demand for accurate propagation models that can include as much of the physics of the environment as is possible but run in reasonable compute times. This model is based on the Volume Electric Field Integral Equation (VEFIE) formulation. Numerical techniques such as the Method of Moments and a weak-form discretisation are applied to produce a system of linear equations which can then be solved iteratively. We show how an iterative process accelerated by appropriate use of the Fast Fourier Transform is a superior method for the solution of these systems. In addition it is explained how a simple pre-multiplication step can force the iterative solver to focus on computing the solution for important values further accelerating the run time of the model. Numerical results are presented validating the model against the Mie series and Uniform Theory of Diffraction. Simulations showing the advantages of this model over conventional, ray tracing, models are presented along with sample building simulations.

Project Area: Software Development, Electromagnetics, Propagation Modeling, Mathematical and Algorithmic Analysis

Project Technology: Matlab
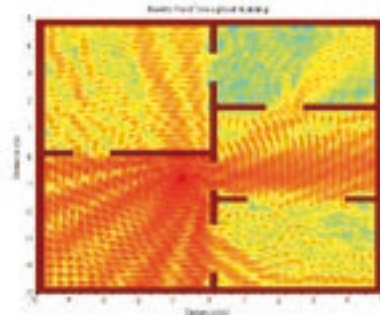
|	
Project Title:	Android Network Monitoring
Name:	Oladele Mashaun
Email:	oladele.mashaun2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Dr Darragh O'Brien

Project Number: 41

Android allows for very little or no analysis of the network behavior of installed applications. Users are not always aware of the network traffic each installed application transmits to and receives from external sources. This leads to a security issue whereby applications may transfer private data to a remote location anywhere in the world. This project aims to develop an application to monitor the network connections and traffic of particular applications on the device so that a user knows exactly where their data is going and where data is coming from. This app works for both inbound and outbound traffic by monitoring network behaviour and allows users to retrieve the traffic for personal analysis.

The business case for this application is strong given the rising privacy concerns of individuals in the face of intrusions by government agencies against citizens. This app would provide a sense of awareness to businesses and individual users by giving them an analysis of data usage of installed applications. This information would help understand the behavior of installed applications such as destination address of outgoing data, source of incoming data, volume of outgoing data etc. This would ultimately give some assurance to app end users concerned for their privacy.

Project Area: Network Applications

Project Technology: Eclipse, Java

Project Platform: OSX
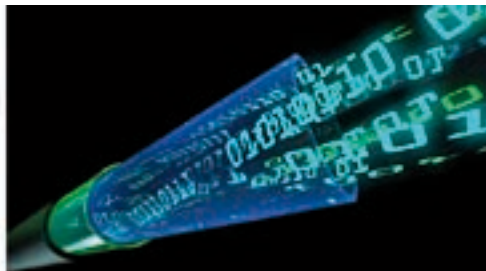
Project Title: Piezo Fan Blade Control

Name: Andrew Grant

Email: andrew.grant4@mail.dcu.ie

Programme: Mechatronic Engineering

Supervisor: Jennifer Bruton

Project Number: 42

The Piezoelectric fan actuator has come to the forefront of modern day thermal management for mobile devices and consumer electronics applications. The piezo-electric fan actuator solves the problem of thermal management with results showing increased air flow and heat dissipation, coupled with lower power usage and much lower noise pollution when compared to a rotary fan sized for the same application. Piezoelectric devices are not new to the world of technology, in fact their use is widespread across many industries such as measurement systems, telecommunications, to name but a few. The Piezoelectric fan is, however, relatively new. It is composed of a thin blade bonded to a PCB which incorporates a piezo-ceramic patch. The device is driven at resonance to provide maximum deflection and airflow. Testing is required to provide accurate scalability per application. This project illustrates the design and specification of a low cost microcontroller based test bed to investigate the control of a piezoelectric fan blade. Frequency and deflection measurements are presented along with a critical review of the latest development in the field. The detailed design of the final test bed is outlined along with the events that led to its creation. CAD modelling, system wiring and the theories behind the final test bed measurement systems are presented. The final system is shown to have a relatively high accuracy of 3.125-5.15 Hz with a 95% confidence.This work seeks to benefit the development of this exciting technology.

Project Area: Embedded Systems, Sensor Technology, Mechatronic Systems, Motion Analysis

Project Technology: Fast Fourier Transform, Matlab, Solidworks, Power Electronics

Project Platform: Arduino

Project Title:	Design of Capacitive Touch Screen Sensors
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Programme:	Electronic Engineering
Supervisor:	Dr C. Brennan

Project Number: 43

The title of the project is "Design of Capacitive Touch Screen Sensors". The project entails analysing competing designs of capacitive touch screen sensors. These types of touch sensors work either though self-capacitance, mutual capacitance or a mixture of both. There are many types of touch sensors but in recent years capacitive touch sensors have moved ahead of competing designs due to their higher accuracy, sensitivity and robust build quality.

The sensors were designed using a software package called Ansys Q3D extractor. The software does numerical analysis on the sensors designed through the Method of Moments or the Finite Element Method. Before touch screen sensors were designed a number of tests to check the accuracy of the solver were performed using simple devices, with known theoretical formulae. The solver values were plotted against theoretical values to determine how accurate the solver that the software uses was. Possible sources of error were taken into account.

Various different touch screens were then designed. The layers of these touch screens were then varied in size and material in order to come up with the most accurate value for each layer without impeding the build quality. Once these optimal values were gathered, they were then used to determine the sensing region at the centre and corner of the sensor. Both self-capacitance and mutual capacitance sensors were analysed. In the self-capacitance touch screens, the effects of bridge length on the sensitivity of the sensor were analysed.

Project Area: Sensor Technology

Project Technology: Ansys Q3D Extractor

Project Platform: Windows
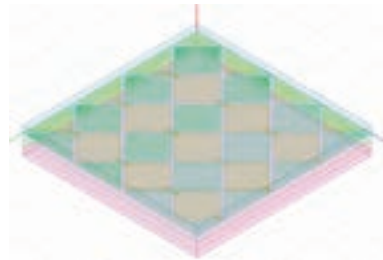
Project Title:	EMBARK – A nature application
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Email:	daniel.burke28@mail.dcu.ie
Name:	Colin O'Sullivan
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Programme:	Enterprise Computing
Supervisor:	Cathal Gurrin

Project Number: 44

EMBARK is an exciting new application which aims to increase the knowledge of its users in the area of nature. In particular the application will be targeted at increasing user knowledge of trees/plant life. This will be achieved by taking a picture of the leaf of a tree and having the EMBARK app identify the tree for them. Our application will also provide its users with locations and maps of nature trails, walks and hikes. Users will be able to mark the trees they identify on the map and will have the option to share their experiences with other users of the application. As users identify more trees and plants, they will receive rewards in the form of achievement badges. This aspect is designed to keep the user interested in improving their ranking, promoting learning in the process. The main goal of EMBARK is to encourage users to take a more active part in nature by raising their awareness of different outdoor activities available to them. The name EMBARK encapsulates our philosophy of encouraging people to embark on more walks, hikes and outdoor activities. The application is targeted at but not limited to secondary school students between the ages of 13-18. The reason for this is that they are still in full time education, and are likely to have access to smart devices. We feel that by introducing an app like EMBARK, it will encourage people to exercise and help combat weight issues, particularly among school goers.

Project Area: Mobile App

Project Technology: Java

Project Title:	Fantasy Premier League Team Creator
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Programme:	Computer Applications
Supervisor:	Monica Ward

Project Number: 45

The Fantasy Premier League is a hugely popular online game which allows players to assemble teams of their choosing and manage their team through each week of the Premier League season. A team's success or failure is based upon the real life performance of the players on each team.

Fantasy Premier League Team Creator is an application designed to automatically generate and upload teams for use in the Fantasy Premier League online game. Teams are created with an algorithm which takes into account the users preferences in things such as team formation and tactics.

This application functions by completing a number of steps. Firstly the application mines statistics relating to players and teams from an external website, these statistics are stored in a SQL Database. Then the team creation algorithm creates a team based on the mined stats and the user's tactical choices. Once a team has been created and cleared by the user, it is immediately uploaded onto an external website where it can be used to compete in the game.

Project Area:	Web Application
Project Technology:	Java, PHP
Project Platform:	Windows

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Project Title:	Virtual Try-on on a Smartphone
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Programme:	Digital Media Engineering
Supervisor:	Prof Noel O'Connor

Project Number: 46

There has been a recent interest in the idea of virtual fitting rooms among online clothing retailers. Virtual fitting rooms allow the user to see themselves 'wearing' their desired clothes in an augmented reality situation. Virtual fitting rooms are predominantly available using a computer and a camera.

The Style-Eyes project in DCU has developed an app for clothing recognition and recommendation. The app uses image processing to characterise the colour and texture of an item of clothing being worn by someone in a photograph taken on the Smartphone. This is used to match against a database of pre-indexed clothes.

This project allows the user access to a portable virtual dressing room, by using the Style-Eyes project as a starting point. It combines image processing techniques and the android Smartphone environment, giving the user a quick and easy way to shop for their favourite clothing retailers.

Project Area: Image Video Processing

Project Technology: Java

Project Platform: Android

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| **Project Title:**	Development of Computer-Based Leaning Tools for Statics
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Alan Kennedy

Project Number: 47

This project involves the development of a Computer Based Learning Tool (CBLT) for Statics utilising features in Microsoft Excel. It seeks to create a freely accessible, cognitively informed, learning tool for students. CBLTs can facilitate the education of large numbers of students with a small amount of human interaction, and allow both asynchronous and flexible learning at low cost. Other objectives of the project were to research the use of computer-based simulation in learning and determine its effect on engineering students. Existing tools were reviewed, and the tool developed in the project was tested with feedback gathered using a questionnaire. The Excel workbook has three worksheets, each one having a separate, but related, Statics question. Each question addresses a set of carefully articulated learning objectives. The concept of static equilibrium is explored in the workbook which capitalises on Microsoft Excel's ability to display graphical representations and to allow user interface development through VBA coding. Assessment is incorporated within each question, with the student choosing his/her own inputs and solving the problem with a click of a button. The worksheet also includes hints and can provide a full worked solution if the student requires further assistance.

Project Area:	Educational
Project Technology:	Excel VBA
Project Platform:	Windows
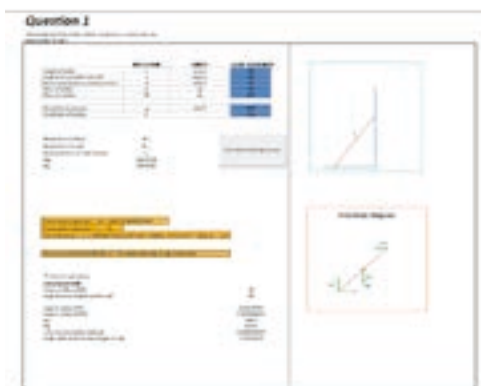
Project Title:	FleetOnRails
Name:	Alan Kehoe
Email:	alan.kehoe8@mail.dcu.ie
Name:	Krystian Jankowski
Email:	krystian.jankowski2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Prof Joe Morris

Project Number: 48

FleetOnRails is a complete fleet management system for businesses and for personal use.
The application will have the following features:

- Manage vehicle maintenance

- Record in-depth vehicle details

- Allow users to create reminders and expenses

- Save vendor information

- Log fuel records and calculate average fuel consumption

- Live GPS vehicle tracking

The first component of the system is a web application. This is the primary point of interaction for the user, and allows him/her (among other things) to edit and view the collection of vehicles in the fleet. It is implemented using Javascript, AngularJS, and Bootstrap.

The second component is an Android application which allows the user to view the location and speed of a vehicle in real time.

The third component is a Ruby On Rails API which provides restful endpoints for both the web application and the Android application. It uses MySQL for persistence (making use of Rails Active Record) and OAuth for authentication and security.

Project Area: Web Application

Project Technology: HTML5, Java, JavaScript, Ruby, REST, SQL

Project Platform: Multi-platform

Project Title:	Loopman
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Programme:	Computer Applications
Supervisor:	Dr Alistair Sutherland

Project Number: 49

This project is inspired by the many physical sampling and looping tools available today for use in music production, and the artists that use them. Loopman aims to bring comparable functionality to mobile Android devices by allowing you to record and generate multiple looping audio tracks and manipulate them individually during playback.

Initially you are provided with four blank tracks that can play simultaneously, which you can then record audio to using the devices microphone, or generate melodies using a variety of synthesizers and sequencers. You will also be able to manipulate different aspects of each individual track as well as apply effects to them, as they are looping.

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This app is intended for people who dabble in music production, whether with friends at a get-together or on your own in your bedroom, and can be used with a variety of instruments, such as keyboards, guitars or even your own voice.

Project Area:	Mobile App
Project Technology:	Java
Project Platform:	Android

Project Title:	Letter Checker
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Email:	john.sheridan34@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Monica Ward

Project Number: 50

Letter Checker is an application for android tablet devices. It is designed to be used for educational purposes. The application has a user login and there are two kinds of user: a standard user, the student, and an admin user, the teacher. The standard user sees a letter displayed at the top of the screen and has to draw and enter this, they are told whether they have drawn the letter correctly or incorrectly and are given the option to retry the same letter or move on through the rest of the alphabet.

The admin user is shown the statistics of each of the standard users and therefore can instantly see which user is struggling and which is thriving. The admin user is also responsible for creating all the standard users accounts. Letter Checker was designed and developed to solve a problem based on a real need identified by a primary school teacher. The teacher finds it difficult to check the writing of around 30 students in real time, and for letter writing, correct formation/sequencing is as important as the final product. Letter Checker enables the teacher to monitor each student individually and provide additional support where necessary. It also enables the teacher to tailor the learning resources to suit individual learning needs based on student ability.

Project Area: Mobile App

Project Technology: Eclipse

Project Platform: Android

Project Title:	PY20 – Electric Powered Loading Shovel
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Paul Young

Project Number: 51

The aim of the project is to design a loading shovel mechanism that can be mounted to an existing electric dumper chassis.

The Ecovolve ED1000 is an electric-powered high-tip dumper, which is in its final stages of development. The dumper is a compact and highly manoeuvrable vehicle, designed for use in confined spaces. The ED1000 has the potential to bring a level of on-site efficiency not previously seen with existing diesel-powered machines.

By designing an electric-powered loading shovel to work in conjunction with the ED1000, Ecovolve can offer even greater levels of on-site efficiency and establish themselves firmly as a world-wide leader in indoor and outdoor construction machinery.

This report will document the comprehensive process undertaken to develop and design the loading shovel mechanism. The final output of the report will be an intelligent and very effective loading shovel mechanism that could be manufactured and produced at a very low cost.

Project Area: Mechanical Design and Manufacture

Project Technology: Solidworks
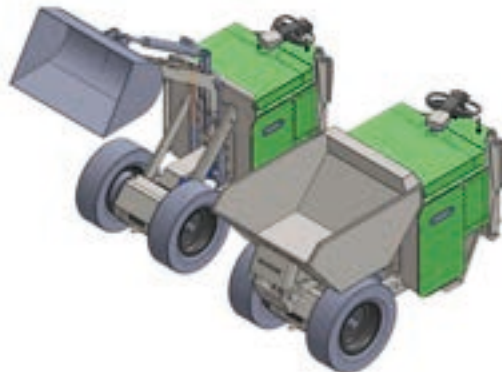
Project Title:	Project YouLearn
Name:	Craig Duff
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Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 52

Project YouLearn is a collaborative database of computer programming problems and challenges, developed in Python and powered by Django.

The aim of this project is to create a site which allows users to create and share their own computer programming problems and exercises. Each problem can be tagged based on the programming concepts that are involved, and on the difficulty of solving the problem. Other users can then search for problems based on these tags to aid them in learning these concepts. The users can then rate and give feedback on the problem.

Project YouLearn makes use primarily of Python and Django to deliver the site to the user.

This project is inspired by the site 'Project Euler', which awards users points for completing challenging mathematical and computer programming problems. Project YouLearn puts less emphasis on competition, and more emphasis on creating a solid learning environment for programmers of all levels.

Project Area: Educational, Web Application

Project Technology: Python

Project Platform: Multi-platform

Project Title:	Manufacturing Flow Dashboard
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Programme:	Biomedical Engineering
Supervisor:	Dr Paul Young

Project Number: 53

Manufacturing intelligence has become a large part of manufacturing facilities due to its ability to visually monitor a system and analyse it easily. A Manufacturing Flow Dashboard is a powerful system that gives a viewer the ability to analyse a system and make better analytical decisions. This FMS rig is a link up of six stations that is located in DCU, a flow dashboard has successfully been implemented on a static level to the FMS rig located in DCU which is made using a Microsoft Excel document. Data was taken from the FMS rig via controllers which are connected to it and macros were programmed using visual basic to work with this data to present it to a supervisor in a useful way to observe where optimisation could be made. The system made gives the viewer the ability to monitor the efficiency and the working time of each station of the FMS rig so problems can be spotted easily. This system will be able to spot possible problems that limit the FMS rig from being optimised or working at its best ability. A number of problems were also found while working on the rig between gathering the data from the rig to being able to use the data in the dashboard, which limited the potential of the project but possible solutions were identified for these problems in the future.

Project Area: Manufacturing Intelligence Systems/Manufacturing Operations

Project Technology: Microsoft Excel and PLC Programming

Project Platform: Windows

Project Title:	Pacemakr
Name:	Brian Motherway
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Name:	Raymond Kelly
Email:	raymond.kelly43@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Jennifer Foster

Project Number: 54

Recent years have seen a running boom around the world – more and more people are waking up to the health benefits of running and jogging, and in these recessionary times, expensive gym membership is no longer an option for many.

Marathon and half-marathon training requires many hours of often monotonous training, with many runners turning to the music on their smartphones to alleviate the boredom of a long run. The main aim of the PaceMakr app is to slow down/speed up the tempo of the user's music while they are jogging as their pace begins to deviate from their target speed supplied before the run. The change in tempo will make the user aware that they are below/above their target and motivate them to speed up/slow down. The music tempo will return to its original state as they return to their target speed/time.

The app will have two modes:

Speed – The user chooses the average speed they wish to achieve for the run. They also choose a warm up period for the start of their run where tempo changes will not apply. If the user drops below their chosen speed after this period, the music tempo will begin to change. The further their pace drops below/rises above this speed, the further the tempo will drop/rise. This mode is for training runs where consistency of speed is important.

Distance – The user chooses the distance they wish to run over the course of their jog. They also choose the time they wish to do it in. These two variables will be used during the jog to determine if the user is on course for completing their target distance within their target time. If they start to drop below/rise above this, the tempo of the music will gradually slow down/speed up. Again, this will motivate the user to speed up/slow down which will incrementally return their music tempo to the correct tempo as they return to their target speed.

Project Area:	Mobile App
Project Technology:	Java
Project Platform:	Android

| **Project Title:**	Word spotting in handwritten manuscripts using shape matching
Name:	Shikhar Mathur
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Programme:	Digital Media Engineering
Supervisor:	Noel O'Connor

Project Number: 55

Searching of digital documents and information on the web is mostly text-based and is done via search engines like Google. However, scanned handwritten documents, such as historical manuscripts that have been digitised, can only be searched on the basis of the meta-data associated with the scanned image, which is typically very sparse. Traditional OCR (optical character recognition) approaches to recognise words and index on this basis, will not work as they are optimised for printed characters.

In such documents, words are individually segmented and their shape is described based on their contour. The resulting shape description is then used to match the same word across a collection, providing a way to build 'hyperlinks across' a scanned collection so that it can be browsed based on occurrences of the same word. Thus the goal of this project was to apply this approach to a very small collection of scanned documents from the Irish National Folklore Collection and on this basis a demo system was build for browsing this small collection.

Project Area: Image Video Processing

Project Technology: Python

Project Platform: Windows
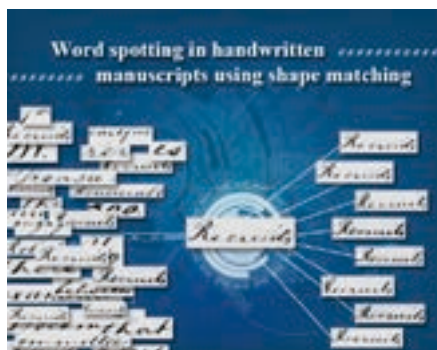
Project Title:	Crixus of Gaul: A 3D Game
Name:	Jinnyre Malazarte
Email:	jinnyre.malazarte2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Renaat Verbruggen

Project Number: 56

This project consists of a role-playing game (RPG) that is developed in Unity 3D with C# as the programming language. The main goal of this game is to hack and slash your way through multiple enemies until there are none left.

The game was inspired by 'Oblivion' and 'Skyrim' with the style of first person role playing game. Crixus is spawned in an arena which is a closed environment area. The arena contains objects and multiple enemies, with the use of C#, artificial intelligence is implemented to enhance the interaction with Crixus.

The enemies will chase or stalk Crixus whenever Crixus is within a certain range of the enemy. Once eliminating all the enemies, the level ends and Crixus is advanced to a new level. The game displays the basic functionality of AI attack and defense, such as where an object is obstructing the enemy's sight then the enemy will act as if he is not near Crixus.

Project Area: Gaming

Project Technology: C#

Project Platform: OSX

Project Title:	Design of educational on-line games and activities for Primary School children
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Programme:	Digital Media Engineering
Supervisor:	Conor Brennan

Project Number: 57

As technology becomes more and more prevalent in our day to day lives and devices such as laptops and tablets become more of an affordable possession, it is important that we incorporate them into our Education System. Primary School teaching through these mediums has become more of a regular occurrence over the past number of years leading to a greater demand for new innovative ideas for utilising them which will both entertain the children and provide an educational element.

The aim of this project is to develop online educational games for primary school children which are different from everything else that is currently on the market today. To do this the games incorporate an element of personalisation to keep the children engaged. This is done through the use of photos, audio recordings and individual interests. The games are designed in such a way that they will be compatible with computers, tablets and smartphone devices.

This project concentrates on the subjects of Irish, English and Mathematics and will be specifically tailored for Junior Infants to First Class. Testing was carried out within a primary school to ensure it would be successful in a real-world scenario. This project focused on the games being used as a teaching aid with the games being displayed on a projector for the whole class to be involved at once. With continued development, I feel this project will have potential marketability within the Irish Primary School education system.

Project Area: Educational, Web Application

Project Technology: HTML5, JavaScript

Project Platform: Multi-platform
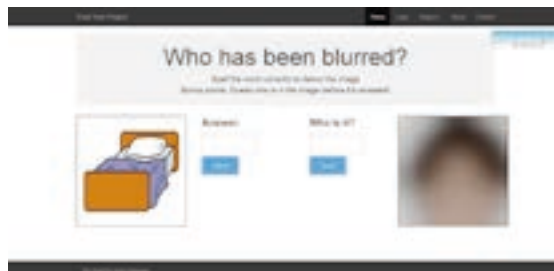
Project Title:	AirMenu
Name:	Maximilian Hoffmann
Email:	maximilian.hoffmann3@mail.dcu.ie
Name:	Robert Lis
Email:	robert.lis2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Renaat Verbruggen

Project Number: 58

AirMenu is an e-commerce product, which features a rich set of modern technologies recently introduced, such as iBeacons, that work through Bluetooth LE (also called Bluetooth 4).

With iBeacons, you can detect other Bluetooth LE enabled devices and notify them. The main goal is to redefine the experience for going out and getting food inside restaurants.

As a consumer you can, once you find a restaurant, order and pay through your device with a few taps. On the other hand, for owners/managers, we have a management tool for restaurants, which allows the management to set up companies, restaurants, and manage the staff. It also allows you to integrate older/existing software through webhooks and OAuth 2.0 authentication.

The front-end applications are built for iOS devices and a small HTML5 front-end has been set up for API documentation and other configurations.

The backend is built with Ruby on Rails and deployed to a Debian OS Machine, sitting behind VPN. This API is completely RESTful, which allows other platforms to be easily integrated with the existing system.

To facilitate the communications between the clients and the backend, we integrated Apple Push Notification Services.

The whole application forms a professional infrastructure, which includes, VPN, Deployment strategies, Continuous Integration, Test Driven Development, CSRF protection, APNS.

The design for the front-end applications has been developed with ease of use in mind, through advanced use of iOS SDK and open source UI components.

To assist the design process, wire frames have been constructed beforehand to foresee the end result before actual implementation.

Project Area: E-Commerce, Mobile App, Web Application

Project Technology: Objective-C, HTML5, JavaScript, JQuery, Ruby, REST, SQL, XCode

Project Platform: Multi-platform

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Project Title:	To investigate the effects of ambient light on the quality of meditation
Name:	Vincent Browne
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Name:	Robert Healy
Email:	robert.healy22@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Prof Alan Smeaton

Project Number: 59

Our project is a research based project, in which we are investigating the effects of ambient light on meditation. To investigate this, we used an 8 channel Electroencephalography (EEG) device which measures neuron activity in the brain along with three bluetooth ambient lights.

The project consists of two main phases, the first is the research phase in which we held a number of experiments to measure the effects of ambient lighting during a meditation cycle. We recorded the raw data which came from the EEG device and processed it to gain an insight into the effects of different colours during meditation, and secondly the effects of the rate of change of the said colours.

The second phase of the project was the development phase. For this phase we have developed two mobile apps (iOS and Android). The purpose of these apps is to work in real time with a single channel EEG device and the bluetooth lights to improve a persons meditation and provide feedback based on each meditation session they have. The apps process the data which is read from the EEG device and change the lighting colours in real time to enhance the users meditation. Meditation cycles are also recorded and users have the ability to look at trends over time and see how their meditation has been affected.

Project Area: Data Analytics

Project Technology: Python

Project Platform: Multi-platform

Project Title:	Ninja Connection
Name:	Cian Keogh
Email:	cian.keogh28@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Joseph Morris

Project Number: 60

Ninja Connection is a 2D side scroller that has a focus on fast paced combat. The player controls Noodle, a ninja for hire in a world where seemingly everybody is a gang member. Using only his/her sword Noodle is tasked with dispatching every enemy in a level in order to pass. Receiving all of his jobs from the 'Ninja Connection' network, Noodle hopes to uncover the truth behind the shady group.

Gameplay:

The gameplay is very fast speed, where the player dies quickly and often. Inspired by titles such as Super Meat Boy and Hotline Miami, the game hopes to addict players by offering instantaneous action with a low margin for error. While punishing and unforgiving, frequent checkpoints and fast respawn times ensure the player is given little time to be frustrated.

Technology:

The game is built in C++ using Simple Direct-media Layer (SDL). SDL is a cross-platform development library designed to provide low level access to audio, keyboard, mouse, joystick, and graphics hardware via OpenGL. The game's animations are all vector based which has a number of advantages over frame based (flipbook-like) animation. This means that there is less work for artsts as they don't have to draw each individual frame but instead just state each 'key-frame', and also that every animation will scale appropriately to the frame rate being displayed.

Project Area:	Gaming
Project Technology:	C/C++
Project Platform:	Windows
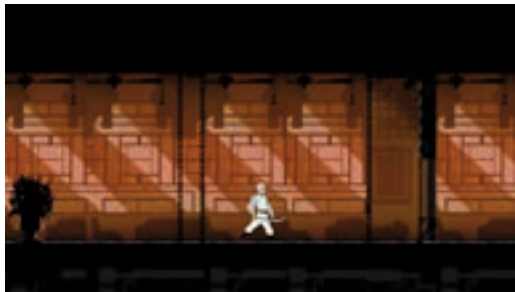
|	
Project Title:	Microbubble generator using Venturi Tube and Rotation Chamber
Name:	Dzmitry Laurynovich
Email:	dzmitry.laurynovich2@mail.dcu.ie
Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Yann Delauré

Project Number: 61

This project's main objective was to create a microbubble generator by means of Venturi Tube (Convergent-Divergent nozzle), and for further possible improvement combine it with a Flow Rotation chamber system. The Venturi Tube type microbubble generator was found to generate microbubbles with mean diameter of 100Œºm and for Rotation Chamber from 10 to 50Œºm. Compressed air was used to drive the system. A number of tasks had to be performed to complete specified objective including fluid flow simulation. Research fields included various microbubble generators, microbubble properties, and a supersonic compressible flow through a convergent-divergent (CD) nozzle. The CD nozzle had to be carefully analysed to determine a zone of lowest pressure values. Fluid flow simulations, using ANSYS Fluent, were performed to show the behaviour of fluid inside the CD nozzle. Fluid flow of the overall system, including rotation chamber, was also simulated to show the effect of nozzle injection angle change on flow behaviour. SolidWorks software was used to create 3-D models of CD nozzle, rotation chamber, and an assembly of a fully combined system. The hole was placed in the zone of lowest pressure, along the nozzle, for water suction which proved to be successful. Nozzle testing results, at 1 and 2bar, showed the generation of some microbubbles due to turbulence of the fluid at the nozzle exit, and if left for some time a cloud of bubbles was observed. Combination of the nozzle and chamber did seem to improve the result as more bubble-dense cloud was seen. An unexpected "fog" like phenomena appeared to form during test stage which was not explained or studied properly. The overall main objective of the project was met, although a very small amount of microbubbles have been generated.

Project Area: Thermodynamics

Project Technology: ANSYS Fluent
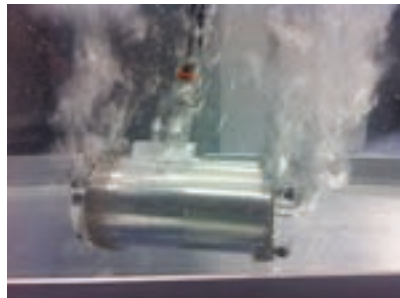
Project Title:	Music of Life
Name:	Feargal Karney
Email:	feargal.karney2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Cathal Gurrin

Project Number: 62

Music of Life takes in sensor data collected by individuals who are wearing or have worn SenseCams (life logging cameras). These cameras capture a still image roughly every 10 seconds. Along with the images, the sensor streams from the cameras include data such as location, user activity (accelerometer readings), colour readings and more. The main aim of the project was to identify repeating patterns in this data, and map it to musical sequences to make music.

The project generates MIDI files ready for playback on a computer using software midi sequencing. The generated MIDI files vary depending on the patterns. There are many elements which make up a MIDI file, such as velocity, tempo, and key. The MIDI files will be different based on how these elements vary. A MIDI file with a slow tempo playing notes from a minor scale would create a completely different mood than one with a festo tempo playing notes from a major scale.

Project Area: Data Mining

Project Technology: Java

Project Platform: OSX

Project Title:	The Design of a Wrist Splint for Manufacture using Rapid Prototyping
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Programme:	Biomedical Engineering
Supervisor:	Dr Garrett McGuinness

Project Number: 63

Problem: The aim of this project was to design a wrist splint to treat the common wrist sprain for manufacture using rapid prototyping techniques. Within the design of this device, the feasibility of using rapid prototyping to create custom wrist splints was assessed. Patient adherence was focused on as it was identified as a major problem with upper extremity splinting.

Method: To achieve this aim, background information on the injury in question, splinting techniques, rapid prototyping and the product design cycle was gathered. Using this information, a conceptual design was conceived. From this design a prototype was produced. Along with functional testing of this prototype in comparison to an over the counter splint, a finite element analysis was performed. Material testing of the PLA produced by the rapid prototype device was also performed, with a focus on how the mechanical properties are affected by fibre orientation.

Results: The functional testing revealed that the new design performs better than the over the counter splint, but not as good as a control of no splint. The material testing resulted in a difference in mechanical properties with differing fibre orientations. The finite element analysis of the splint revealed a minimum factor of safety of 2.83.

Conclusion: The design of a wrist splint and manufacture using rapid prototyping techniques to treat the common wrist sprain is a feasible process, one that with future improvement in technology could lead to astounding developments in the process of splinting.

Project Area: Mechanical Design and Manufacture

Project Technology: Solidworks,3D Modelling

Project Platform: Windows

Project Title:	In Case of Emergency (I.C.E)
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Email:	aine.rafferty3@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Prof Alan F. Smeaton

Project Number: 64

The objective for this project is based on a Proof-of-Concept design for a medical alert device entitled In Case of Emergency (I.C.E.). The idea behind this project was to create a wrist device that incorporates an accelerometer to determine when a person has a fall or accident in the home.

By measuring the amount of static acceleration due to gravity, we can determine the angle the device is tilted at with respect to the earth. The device can also pick up readings of whether someone has stopped moving for a significant length of time due to a sudden fall. From this, the accelerometer can send an alert signal from the wrist piece which then contacts the Response Centre. The response centre team will then contact the customer directly to see if they have had an accident. Failing that, their next of kin contact can be alerted. If neither of those options are successful, the appropriate emergency services are contacted immediately.

Especially in Ireland, there is an increase in the incidence of chronic diseases, an ageing population and challenges to the sustainability of the healthcare system. The plan we hoped to achieve was to help and protect people in the home if an incident was to occur. Many emergency devices already installed in homes include only a panic button mechanism. In other cases, accelerometers are only installed in the likes of a mattress if an elderly person gets up in the middle of the night and doesn't return to bed. Neither of these components are integrated into a system together as of yet.

Project Area: Sensor Technology

Project Technology: SQL

Project Platform: Windows

Project Title:	Electrospun scaffolds for tissue engineered blood vessels: manufacture and mechanical properties
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Programme:	Biomedical Engineering
Supervisor:	Garrett McGuinness

Project Number: 65

Coronary heart disease (CHD) is one of the leading causes of mortality and morbidity worldwide. While CHD can be treated using medications and minimally invasive techniques, the best outcomes are associated with coronary artery bypass graft (CABG) surgery. Many patients present CHD co-morbidly with other diseases which may render a autologous graft procedure impossible. An objective of much recent research has been to create an artificial biocompatible artery graft, seeded with the patient's own cells, which may be used instead of homologous or xenologous grafts in such cases.

Attempts at creating small diameter tissue engineered blood vessels have not been successful to date, with one of the leading problems being a mismatch in mechanical properties between the graft and the host tissue. In this project, a number of polymer (PHBV) scaffolds are created under differing electrospinning conditions, which are then mechanically tested and subjected to scanning electron microscopy. The images obtained are subjected to image analysis, using an image analysis program developed by the author as part of the module EE465, to determine the relationships between the electrospinning parameters and scaffold morphology.

The overall objective is to attempt to create a scaffold with properties similar to that of human coronary artery tissue. However, it is found that in all that cases the mechanical properties of the electrospun scaffolds are far from what is required for coronary artery bypass grafts, being much stronger and more brittle than native coronary arteries. This difference is so pronounced that no variation of parameters is able to bring the scaffolds into line with tissue mechanical properties

Hence it is concluded that this polymer, PHBV, is unsuited to the task of creating a tissue engineered coronary artery graft. However it may be suitable for use as a scaffold material for other body tissues, particularly ligaments, as these have tensile properties closer to that of electrospun PHBV.

Project Area: Tissue Engineering

Project Technology: Matlab

Project Platform: Windows
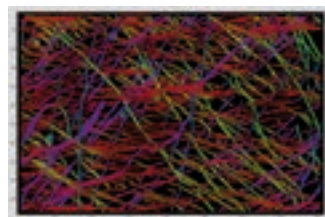
Project Title:	M:NTis – A Mood Monitoring & Analysis Tool
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Programme:	Enterprise Computing
Supervisor:	Dr Cathal Gurrin

Project Number: 66

Cognitive Behavioural Therapy is a type of treatment for the symptoms of mental illness that operates by observing how held beliefs can change a person's perception of events. A critical element used in Cognitive Behavioural Therapy is a pen and paper mood and event diary that is held and updated by the patient which is then reviewed by both patient and therapist. Through the research for this project, it has been found that recording this information only once per day can lead to the data in cases being inaccurate or incomplete.

This project (M:NTis) aims to look at how modern technology can be applied to this area to become a key enabler in the successful treatment of illnesses such as depression, stress and anxiety. M:NTis is made up two key elements:

■   Android Smartphone App

This will be used to manually prompt a user to input their mood at points during the day based on factors such as GPS location, proximity to WiFi networks and time since last recording. By analysing these details along with accelerometer data from the smartphone, we can see how active and social the patient is during their day.

■   Website with HTML5 Interface

The website is used to visualise the data recorded form the smartphone and the responsive HTML5 design will allow this data to be presented on a mobile device for analysis by the therapist and patient.

Project Area: Mobile App, Web Application

Project Technology: HTML5

|	
Project Title:	An online system for developing/debugging Android applications
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Programme:	Digital Media Engineering
Supervisor:	Robert Sadleir

Project Number: 67

Android application development requires a comprehensive set of development tools. The installation, configuration and maintenance of these tools can impede the progress of a newcomer to Android application development. To tackle this issue, a web based Integrated Development Environment (IDE) was created that provides easy access to a set of preconfigured Android development tools thus allowing the user to focus solely on application development. The JavaScript framework Sencha ExtJS was chosen to build the web interface as it provides modern UI widgets and cross platform browser compatibility. The server-side of the IDE which handles the project creation and compilation processes was built using the Java Servlet API which is part of the Enterprise Edition of Java (Java EE). Google Cloud Messaging was integrated with the IDE to notify the user on successful compilation of the Android application. Two Android applications were also created using the Android API in order to allow the web based IDE to communicate with the user's mobile device. The first application enables the user to download and install the developed Android application on notification from the server, while the second application controls the broadcasting of real time logging information from the user's phone to the web application. This web-based IDE enables a newcomer to fully focus on the learning and development process without any need to configure the development environment.

Project Area: Mobile App, Web Application

Project Technology: Eclipse, Java, JavaScript, JSP/Servlets

Project Platform: Multi-platform
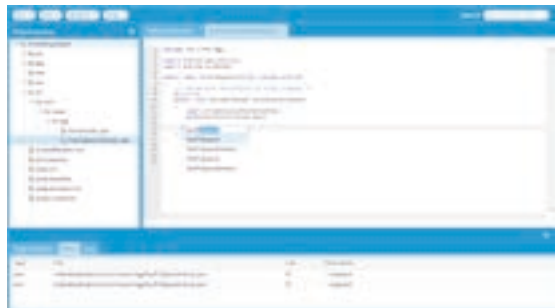
Project Title:	Comissioning of a laminar flow table
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Brian Corcoran

Project Number: 68

A laminar flow table is a piece of educational apparatus, designed to help students visualise what occurs when a laminar flow encounters an obstacle in its path. The purpose of this project was to commission the laminar flow table within DCU, for the potential use in the study of fluid mechanics.

In order to commission the rig, a series of experiments were carried out to calculate important flow parameters for the table such as the mass flow rates, velocity of the flow and most importantly the Reynolds number. Three different methods were used to find these parameters and the most accurate method was selected.

Once the flow properties were found, a range of experiments were carried out. These experiments included; flow around a simple disc, flow around a bluff body and flow around an airfoil with an increasing angle of attack. Flow control through a pipe was also considered with experiments investigating the impact on a venturi and orifice meter. The results obtained from these experiments were compared with the theoretical data previously researched. In addition, some of the experiments were simulated using Computational Fluid Dynamic software.

In conclusion the laminar flow table is a good visual tool to students studying fluid mechanics, but it does have its limitations. The results obtained match the appropriate theoretical data and the results found from running the simulated CFD models, but it was found that the table is very temperamental and consistent results were difficult to obtain.

Project Area: Fluid mechanics

Project Technology: ANSYS
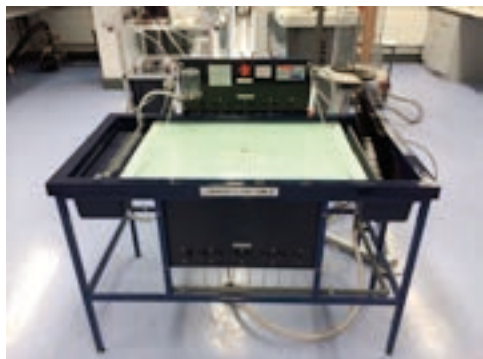
Project Title:	Social Puzzle Alarm
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Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 69

My project is an android application that is to be used as an alarm. The idea behind the app is that user will set an alarm for a specific time and when the alarm triggers, the user will have to solve four puzzles to turn it off. The puzzles are two random maths questions, a colour pattern game, a reaction game, and a match the brick game. The reason the user has to solve puzzles so they can turn off the alarm is to make sure the user is fully awake before the alarm is dismissed.

The social aspect of this alarm is that the user has the ability to request that an alarm be set for another phone that is using the app. This functionality of the app means that the user will have the ability to set group alarms. A scenario where this could be used is if a lecturer had a 9am class he could request that alarms be set for all the students in that particular class. The student would have the ability to reject the alarm if they wanted. I will be using Google Cloud messaging to connect the devices to each other. The user will have a contacts list in the application. From this contacts list, the user will be able to make specific groups e.g. family, sports team, friends etc.

Project Area: Mobile App, Network_Applications, Software Development

Project Technology: Java, Node.js, NoSQL, XML

Project Platform: Android

Project Title:	Paperless Tickets
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Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 70

Paperless Tickets is a web application developed using Node.js along with different modules and Bootstrap. The web app will allow the user to login into the site, browse events (e.g. gigs, cinema times, shows) and purchase tickets to use at a later date.

As the user may buy different tickets for different events, there will be no need to worry about losing the tickets. The tickets will be stored on the user's profile and allow them to access the tickets at anytime from their smart phones or tablets. No standing in queues, or waiting around at the self service machines. It is an easy to use, simple web app that looks great on any device.

Development:

Node.js has many different modules. In the development of 'Paperless Tickets', the modules used were: MongoDB with Mongoose for the database, Express for the web application and Passport to handle the logins and sign up.

The languages used to develop the app were Javascript for the backend of the application and the interaction between database and web app, while Jade along with Bootstrap were employed for the user end of the application.

Paperless Tickets was developed using these new technologies for an emerging market of websites for different devices of all sizes.

Project Area: Web Application

Project Technology: JavaScript, Node.js

Project Platform: Multi-platform
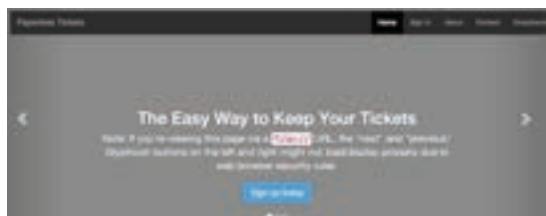
Project Title:	Stop-Motion and Mechanism Animation
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Email:	paul.stanley3@mail.dcu.ie
Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Alan Kennedy

Project Number: 71

Describing the behaviour of the motion of a mechanism can be a difficult task. Simulation and video-based tools can help to overcome this problem. This project was designed to create both types of tools and was broken up into two parts accordingly. The first involved investigating and developing VBA code for moving simple shapes in Excel to create simulations of mechanisms. Current animations are generally produced using Excel charts and are often of poor quality, slow moving or excessively jerky. It was found that Excel offers an easy to use platform for creating mechanism simulations and results in attractive simulations that may help students in their understanding of mechanism behaviour.

The second part of the project involved researching, designing and building a system to allow the easy creation of stop-motion videos of Lego mechanisms. The system built repeatedly moves a 4-bar linkage mechanism by a small amount and triggers a camera so that a photo is taken after each step. MATLAB is then used to turn the series of pictures into a video file. The purpose of this is videos are blur-free when paused. It was found that the system produced good stop-motion videos. These videos may help enhance the understanding of mechanisms and may, in the future, be analysed further for educational purposes with video analysis software.

Project Area: Educational

Project Technology: VBA

Project Platform: Windows

Project Title:	PACBetting – The World's Front Page to Betting
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Name:	Conor Cassin
Email:	conor.cassin3@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Martin Crane

Project Number: 72

PACBetting is a new web portal that allows users to access and browse through a large variety of information that they could find necessary in choosing the right bet. The website will host a torrent of information for users to find the right bet whether it be statistically based, or information based. The web application will include statistics such as form of sides, player statistics (goals, appearances, bookings, etc.), live scores and odds. The website aims to affiliate with bookmakers giving the website users the best bonuses and bets while also providing an income for the website. Users will also be allowed to create their own profile on the site, comment on blog posts, and interact with the site.

The web application was developed within the Joomla 3.0 Framework, with Bootstrap integrated meaning that the site is built with a responsive design which is functional both online, and on mobile technology such as a tablet or a smart phone. Through the Joomla interface modules can be moved, created and edited to create an aesthetically pleasing and functional site for our users. The website will include options for Odds, Tips, Live Scores, News, Opinion Pieces, Fixtures, Streams, Bookmaker Reviews, Injury News and a section dedicated to each team with important information which is required for finding the best bet. The Joomla Framework allows us to work with the backend of the website with ease, with databases editable, as well as website elements and modules. With all of these features and assets, users will be guaranteed a good experience at PACbetting.

Project Area: Web Application

Project Technology: PHP

Project Platform: Multi-platform

Project Title:	Work well management system
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Name:	Kevin McGee
Email:	kevin.mcgee4@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Dr.Cathal Gurrin

Project Number: 73

Work Well management system is a proof of concept project designed to improve the health and wellness of company employees.Work Well makes it easier to incentivise, monitor and encourage employees to participate in workplace wellness initiatives and to provide instant feedback. This system encourages employees to track their progress in terms of exercise, nutrition and tailored Work Well events. The benefit of using Work-Well is that it provides an inexpensive and lighter solution in a manner that employees to use the tools already at their disposal such as smartphones, thus reducing the costs of monitoring to the company. The system will allow employees to automatically track exercise regimes through technology such as GPS and Accelerometers, or manually track progress through the App or desktop interface. Employees also have the opportunity to record their daily eating habits with the Work Well app help any dietary plans they are on. The system provides companies with an events section to encourage and promote company events by encouraging employees to come together and work as a team. Individual goals and group goals are key to participation and motivation. The employees' positive incentives will be rewarded with achievements and points and they can participate in a league table against other work colleagues if they wish. A web page will be available for employers with an overview of the data collected so they can use it to measure and quantify the ROI of their wellness initiatives. Using Work Well, companies can better react to the rising costs of insurance, reduce absenteeism and increase productivity by encouraging a healthier lifestyle for their workforce.

Project Area: Mobile App

Project Technology: JQuery

Project Title:	Energy Analysis of a building; B.I.M. & Solar Energy
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Email:	david.gallagher38@mail.dcu.ie
Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Lorna Fitzsimons

Project Number: 74

The use of non-renewable resources has become a major issue and a rapidly increasing global problem. Non-renewable energy resources such as coal, natural gas and petroleum are being used to generate energy for homes, businesses and transport. Ireland has many opportunities to tap into available renewable energies such as wind and solar. Questions continuously arise, however: why bother switching from traditional energy production to this cleaner method of energy production? What are the benefits? How much will it cost to change? The following report discusses the switch to a domestic solar hot water system, studies the effect of various system parameters, and assesses the financial implications in terms of payback times. The project allows the reader see the challenges, benefits and drawbacks of implementing a solar domestic hot water system. Several solar hot water models were developed using different parameters, thus allowing various comparisons to be carried out. The simulations were carried out using the software package SimSol. The package allowed the user to vary key parameters in order to identify the potential energy savings and CO_2 emission avoidance (reduction in carbon footprint). The results obtained from six case studies identified an optimal and feasible model. This model produced 47.33% of the total energy required for the solar domestic hot water system, and resulted in monetary savings of .Ç¨306.06 per year. These savings, however, resulted in a very long payback time, approximately 20 years. Consequently, the recommendation made is that this particular system should not be implemented in Ireland due to the excessive payback time. It is important to note that financial savings are not the only motivation; other important benefits include the reduction in personal carbon footprint.

Project Area: Renewable Energy Technology

Project Technology: SimSol

Project Platform: Windows

Project Title:	Gherkin – A web automation system
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Programme:	Computer Applications
Supervisor:	Stephen Blott

Project Number: 75

Gherkin is a cloud-based web automation system to connect different web services such as Facebook, Twitter, Gmail, etc. It is similar to IFTTT (https://ifttt.com), the objective is to build the system with all main functionalities IFTTT has while extend its flexibility and functionality.

Gherkin works as an aggregator for different web services. It will enable users to create simple tasks (called recipes) that can trigger events (called actions) on some services from events happened (called triggers) on others. For instance, if a user wants to automatically upload all his/her Instagram pictures to a certain folder in Dropbox, he/she can set up a recipe on the system to achieve it.

Gherkin is primarily written in Node.js. It was built with Express web framework, Mongodb database, and Jade template Engine. It uses other open source node modules too.

Project Area: Social Networking

Project Technology: HTML5

Project Title:	Installation and Validation of a New Purified Water Generation System
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Brian Corcoran

Project Number: 76

This project investigates the procedures employed when upgrading a Purified Water Generation System in a pharmaceutical facility. The generation system eliminates contaminants within the water, to produce purified water that meets the critical quality attributes and release specifications for the drug product requirements. The management of the upgrade involves a series of phases from designing the system through to the validation of the installation. The aim of the project was to inspect the project process including the reasons for the upgrade, the specifications required, the cooperation between the pharmaceutical company, the contractor and the qualifications involved. The function of the purification equipment and the type of system is explained along with the analysis of the components that make up the final system. The validation of the system is also illustrated, step by step.

Attaining an understanding of purified water and the systems used by pharmaceutical companies to achieve relevant qualities of water was needed before inspecting the management of the project. Learning the various preparations that are pursued by AbbVie to obtain the requirements of the upgrade and the specifications of the product was the beginning stage of researching the project management steps involved. Different documentation used in the design proposal were revised and analysed to acquire the advancement of the new generation system. Once the criteria of the project were understood, the duties of the contractor were investigated. This included the final design of the new system along with the vendor's responsibilities to follow the installation with a validation plan.

Planning the project and complying with specific quality standards are key aspects to completing the installation of the system. Overall, this project demonstrates the impact project management has in a pharmaceutical facility such as budgeting and scheduling with the consideration of the increasing regulatory requirements demanded by the regulatory bodies.

Project Area: Project Management and Validation

Project Technology: Word

Project Title:	Rotate – Workforce Management Software
Name:	Andrew Brennan
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Programme:	Enterprise Computing
Supervisor:	Monica Ward

Project Number: 77

Rotate is a workforce management application in the cloud, aimed at allowing small enterprises to manage their internal staff scheduling more effectively. This is achieved through the implementation of both a mobile application and tradition web browsing experience and as such, can accommodate the diverse range of devices available within smaller organisations.

Rotate is software provided as a service, that allows the management of very small businesses to define upcoming work schedules for employees and have this communicated directly to their staff. Using Rotate, employees can then view up-to-date information regarding their upcoming schedules and as the application is hosted in the cloud, changes are implemented in real-time. This, coupled with a mobile application for accessibility, means employees can have their schedules pushed directly to their smartphone, ensuring they remain up-to-date with their working commitments.

Rotate caters for employees requesting holidays and/or adjustments to their work schedules. This is communicated through the service for review and these changes take effect automatically when approved, ensuring all parties are aware of their current commitments. In addition, Rotate also offers the ability to revisit past staff schedules, providing a level of recourse for management in the event of arising issues. Management then have the capability to export schedules from Rotate to excel, making the output easy to integrate with existing automated payroll systems.

As Rotate is a cloud application, it can be made available to multiple organisations, allowing each to utilise the service independant of one another. This makes Rotate a solution that can be scaled to accommodate a growing user-base and as the client has no infrastructure to manage and maintain, updates can be easily implemented on the server-side. This makes Rotate an ideal solution for organisations who may not have the resources available to implement a similar solution internally.

Project Area: Web Application

Project Technology: PHP

Project Platform: Multi-platform

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Project Title:	Keep Fit
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Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 78

Keep Fit is an Application (App) for Tablet and Computer devices running the operating system Windows 8.1. The aim of the App is to promote a healthy lifestyle to the user. The App helps the user record their progress during exercising. A user can view their progress for each exercise and have their records shown on a graph for comparison. This allows a user to easily see if they are meeting targets and how well they are performing overall. The layout of the App was created using XAML.

The App can also allow a user to record what they eat and keep a record of their diet. The App provides statistics on exercising performance and food eaten, such as calorie intake. Each user creates their own account. User information is stored on a MongoDB database on an external server. Node.js is used for communication between the App and the database.

Another feature of the App is the bar-code scanning function. A user can scan a bar-code on a food product and the App will attempt to identify the item and provide some nutritional values about the product. A user can use this feature to keep track of what they have eaten. By scanning a product, they can specify how much of the food item they have eaten. This information is recorded on the database.

Project Area: Software Development

Project Technology: C#, Node.js, REST, NoSQL, XAML

Project Platform: Windows

Project Title:	Design and build a rig for twisting and stretching elastic bands
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Email:	eoin.mooney8@mail.dcu.ie
Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Jeremiah Murphy

Project Number: 79

Materials that can be exposed to large elastic deformations display dramatic instabilities. This report investigated the instability's experienced by long slender elastic rods when subjected to streching and twisting. The instability's expected were the sudden formation of knots along the length of the elastic rod. The procedure undertaken to design a suitable rig for applying large amounts of shear to incompressible elastic rods and obtaining reliable data on the formation of these instabilities for various cross sections was discussed in detail. Following this the procedure used to investigate the modelling of the formation of such instabilities was discussed using the results obtained from the designed rig and stress strain data for simple tension experiments on each test specimen.

The strain energy of the various test specimens were analysed and modelled using a simple strain energy functions derived from Mooney's and Rivlin's theory on large elastic deformations. A modified strain energy function (buckling model) was used to investigate whether or not, the non-linear instabilities experienced by long slender elastic rods could be modelled and predicted when subjected to large amounts of shear.

The result of this investigation concluded that the Mooney-Rivlin strain energy function is an excellent model for characterising the strain energy of elastic rods. The modified strain energy function used with coefficients derived from this fit was used to model the formation of these non-linear instabilities. A second test was done by working backwards to the strain energy function from the buckling model, with the coefficients used for predicting the stress strain relationship used as parameters in the Mooney-Rivlin strain energy function. This allowed comparisons between the accuracy of the fit of the buckling model and the fit of the original Mooney-Rivlin strain energy function, upon which, the buckling modelled was developed.

Project Area:	Mechanical Design and Manufacture
Project Technology:	Solidworks
Project Platform:	Windows

Project Title:	Lockbox – Quantum proof encrypted cloud storage for Android
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Programme:	Computer Applications
Supervisor:	Dr Geoff Hamilton

Project Number: 80

Much of the encryption technology in use today is based on a variant of the discrete logarithm problem or the integer factorisation problem. Once quantum computing becomes a reality these methods will be much easier to defeat, thanks to clever randomised algorithms proposed by Peter Shor.

Lockbox is a cloud storage application, similar to Dropbox, that uses a form of encryption based on a different mathematical problem – the shortest vector problem. It is not known to be vulnerable to quantum attacks, and the implementation (Ntru) is also much faster than other public/private keypair based schemes.

The user stores files locally on their device, which are then synchronised to their account on the Lockbox server. The encryption aspects of the application are invisible to the user.

In terms of technology used, the server is an Ubunto 12.04 LTS box, the encryption library used is Ntru, and the SSL software is CyaSSL. By default, Android uses OpenSSL, which contains no quantum proof handshake mechanism (unless we disregard perfect forward secrecy). Replacing the SSL stack with CyaSSL was non-trivial and required building a modified Android kernel.

The actual server application was handwritten in Java rather than using an existing web server. It was planned to use Nginex, or failing that, Apache, however integrating CyaSSL with either was not possible. For storing the users files, CouchDB was used, a NoSQL database.

Project Area: Cloud_Computing, Mobile App, Security
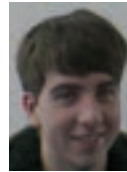
Project Technology: C/C++, Java, NoSQL

Project Title:	Concepts to Improve the Security Features of a Charity Clothes Bank
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Email:	christopher.lawson2@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Dr Brian Corcoran

Project Number: 81

Textile Robbery from Clothing Banks is currently a huge national issue. The increase in this activity has adversely affected many charities. The current solutions of clothing banks on the market at the moment are too easily robbed and interfered with. Saint Vincent DePaul (SVP) wants to lead the way in taking action against this issue and have teamed up with DCU in the hope of putting an end to this problem. This union of these two groups led to the formation of the project.

The aims of the project are to:

■ Evaluate the weaknesses of current textile (clothing) banks.

■ Develop possible concepts to improve the security of the bank.

■ Test and evaluate an optimum solution against the initial requirements of the project.

The project identifies the weaknesses in the current solution of the clothing banks:

■ The large gap that can be accessed by setting the current Inlet mechanism to the midway point, allows for easy removal of the bank's contents.

■ On the Outlet it was found that 'Jimmying' the door and breaking visible locks were the main factors in the contents being stolen.

From this weakness analysis, concepts are developed in order to overcome the problem. The project presents three viable concepts and then uses a weighted matrix to determine the best concept.

The optimum concept determined is a sliding drawer based mechanism with a trap door. The concept eliminates the security hazards mentioned above, while also keeping the design simple, safe and easy to use. The design also incorporates reinforcements on the Outlet and motorised locks. The concept can be easily fitted to the current solution.

The solution is modelled on SolidWorks and is finally tested under various stresses and strains. Results proved the solution to be a viable and sound concept to take onto the next phase. This decision however lies with SVP upon the final presentation of the finished project to them.

Project Area: Mechanical Design and Manufacture

Project Technology: Solidworks

Project Platform: Windows

Project Title: Design and development of an incubation and
detection system using image analysis for
enumeration of faecal indicator bacteria i

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Programme: Mechatronic Engineering

Supervisor: Dr Dermot Brabazon

Project Number: 82

Water plays many important roles and studies have shown that water can be easily contaminated which can be bad for the environment, people and animals that depend on that source of water.

The aim of this project was to develop a detection system using image analysis for enumeration of faecal indicator bacteria in environmental waters. Samples were taken from different locations and mixed with different chemical solutions acting as food for bacteria, which was later sampled using the Most Probable Number (MPN) method.

In this project a system was developed for use of a fluorescence method to detect the presence of the bacteria in solutions, by exposing them to a UV light source with a wavelength of less than 400 nanometres. The device developed consisted of three different sub-systems (incubator, vision and control). Thermal energy was supplied by the incubator to heat up the sampled solutions so that the growth of bacteria increased while images of the sample fluorescence were captured with a web-camera (vision system). Image processing and analysis algorithm was programmed in Matlab for capturing and counting the coliforms from the fluorescence within each image. The vision system and heating were both monitored and controlled via a microprocessor connected to a PC. A Wixel was used as the microprocessor and the programming language used was C.

This report presents the reader a good understanding of how coliform bacteria were used as indicators for water quality. How the developed device was designed and controlled via Matlab are also presented. The report is sectioned into chapters which document each step that was used for the completion of the project.

Project Area: Image Video Processing

Project Technology: Matlab

Project Platform: Windows
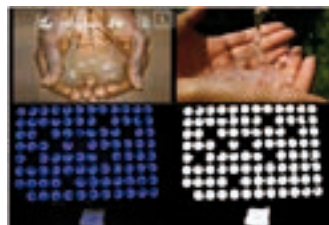
Project Title:	PID control – Ball and Beam
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Email:	yuan.qu3@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Harry Esmonde

Project Number: 83

This project is entitled "PID control – ball and beam system". A PID controller is a control loop feedback mechanism regularly used in industrial control systems to optimise speed of response, steady state error and stability. This project is a real time application of a ball and beam control system based on LabView software interfaced to an arduino platform. The benefit of using Labview is that it allows users to see the performance of the system and how the system is controlled.

The ball and beam is a common feedback control system application. It is easy to build and it is a good example of a dynamic system that is used for demonstration purposes. The system consists of a ball, a beam, an ultrasonic sensor, a potentiometer and a DC motor which connects directly to a gear box. The ultrasonic sensor is used to detect the position of the ball and the potentiometer is used to detect the angle of the beam, the signals are used as feedback information when controlling ball position. Torque generated by the motor through the gearbox will cause the beam to tilt thereby moving the ball to the desired position.

The system was simulated using Matlab Simulink in order to test the controllability and stability of the system. The mathematical model for the open-loop dynamic system is a fourth order system with two real negative poles and two poles at the origin.

Project Area: Control Systems

Project Technology: LabVIEW

Project Platform: Arduino
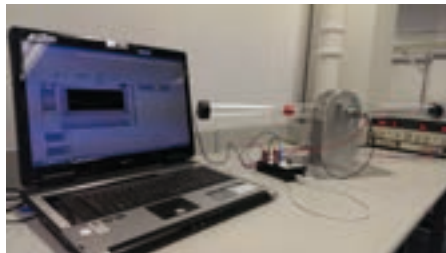
Project Title: Optimisation of Chassis for Electric Vehicle

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Programme: Mechatronic Engineering

Supervisor: Dr Paul Young

Project Number: 84

The aim of the project was to optimise the chassis of an electric vehicle. The chassis of the vehicle is designed and manufactured from plain carbon steel sheets with the thickness of 6mm, 8mm and 10mm. Parts are laser cut and bent into shape before welding. Manufacturing the chassis with varieties of material thickness presents a high cost of material and higher scrap rate during production. As this is a low price vehicle, reducing the cost of production and scrap quantity is essential, and one approach is to manufacture all the chassis components from a single sheet thickness (e.g. 6mm sheet of Plain Carbon Steel).

In order to decide on the most suitable material thickness to be used in producing the chassis parts, a replica chassis model for each of the material thicknesses was developed in the Solidworks solid modelling package. The performance of each model was simulated in a virtual environment using finite element analysis (FEA). The chassis models were simulated to determine the internal stresses due to the weight of the batteries and different skip loads. The boundary conditions were the reactions from the ground at each wheel and were common to all models. The results were analysed with regards to the yield stress of the steel [210Mpa].

The simulation results for the initial designs show that the maximum stress experienced by each model is higher than the specified limit. To improve the performance of the models, the parts experiencing the highest stress were redesigned. With the new design concepts implemented, the models were updated and analyses, the new solutions revealed a much improved performance lowering the maximum stresses to acceptable levels. Optimisation decisions were made by comparing the performances of the 3 replica models and show that the use of 8mm for all components would be suitable.

Project Area: Mechanical Design and Manufacture,3-D Modelling

Project Technology: Solidworks

Project Platform: Windows

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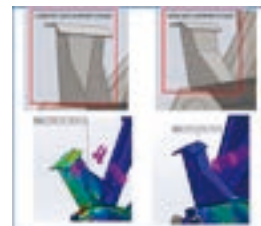
Project Title:	Now Watch These – Sentiment Analysis Application
Name:	Fergal Brady
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Name:	Shane Sunderland
Email:	shane.sunderland2@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Stephen Blott

Project Number: 85

Now Watch These – Sentiment Analysis App

Sentiment analysis is a hot topic across the technology market today. More and more users are going to twitter to find reviews and opinions relating to a chosen topic.

This app deals with the sentiment that can be gained from Twitter data to provide users with a useful tool to help them choose a particular TV Show to watch. The development of this app will see it provide users with a simple, yet effective, user-interface that allows them to search for new TV shows that may be of interest to them and view the opinions of thousands of Twitter users. This application will provide users with a valuable tool to gauge interest on a particular program. It will consist of an effective and efficient user-interface which will allow users to choose some popular programs from a list supplied.

The opinion of others is highly valued today as it can easily be found on various social media sites. This app will collectively gather the data from Twitter and analyse the positive and negative data to provide valuable results to its users. Many organisations use social media sites to gauge interest on a particular topic. It is clear that we value the opinion of others in relation to a potential interest. This app will automatically extract comments, experiences, emotions and opinions contributed by people on Twitter. Users will be provided with results in the form of clear and precise positive and negative tabs on the results page. These results will give users a clear indication of the sentiment portrayed relating to that TV show.

With the introduction of several on-demand services into many households this app will provide a useful tool where people can get opinions of others relating to a TV show.

Project Area: Data Mining

Project Technology: Proof Of Concept

Project Title:	Archer Zone
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Programme:	Computer Applications
Supervisor:	Alistair Sutherland

Project Number: 86

Archery is a sport where a person shoots arrows at a paper target [or target face]. At the end of each round, s/he removes his/her arrows, leaving a tear or hole in the target face.

In a competition or training session, an archer can gain the most points by clustering or grouping his/her arrows in a high scoring part of the target face. Once arrows are removed a cluster can be displayed by all the tears and holes.

Archer Zone is a mobile application that is designed to detect the centre of an archer's cluster on a target face. The App does this by having the archer take a picture on his/her mobile device. This is then analysed and processed in App to determine the centre of each grouping. Subsequent to this, Archer Zone displays to the user the exact location of the cluster in relation to the definitive centre of the target. This information facilitates the archer to reset his/her sights to increase the opportunity of shooting directly at the definitive centre. Not only is Archer Zone an advantageous App that assists the user at an actual shoot; it is also a very interactive training tool.

The App is designed for iOS devices using the OpenCV framework to support image processing. It is very user friendly and comes with detailed information of how the user interacts with the system.

Project Area: Image Video Processing, Mobile App

Project Technology: C/C++, Objective-C, OpenCV

Project Platform: iOS
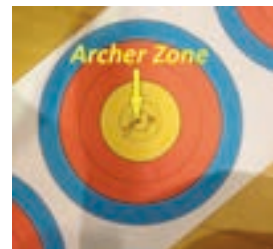
Project Title:	Zero Gravity
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Email:	desmond.oflaherty6@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Mark Humphrys

Project Number: 87

Zero Gravity is a realistic simulation of a 3D zero gravity environment and built for Windows using the Unity game engine. As an astronaut performing extra vehicular activities, the user can experience some of the unique challenges such an environment produces when trying to perform simple tasks such as basic navigation or interacting with other objects.

The player directly controls an astronaut (strapped into a thruster harness to allow for multiple axes of movement) floating in an Earth orbit environment along with a collection of objects and items such as tools, boxes, debris and various other bits of clutter an astronaut might find himself around while performing extra vehicular activities. The player can jet around and turn using short, vectored thrusts but must be sure to take care, as his momentum and inertia will not decrease on its own in the vacuum of space. Collisions with other objects can cause unpredictable results as the force of the impact could cause both astronaut and object to spin off in different directions. The player can also grab on to objects, carrying them with him, manipulating them in his grip and even pushing or throwing them away.

The point of this project is to demonstrate just how difficult some of these basic interactions can be in no gravity in a fun and creative way.

Project Area: Gaming

Project Technology: C#

Project Platform: Windows

Project Title:	Lotto Ticket Scanner
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Email:	james.redmond9@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Dr Darragh O'Brien

Project Number: 88

The Lotto Ticket Scanner Android application is designed to give Android users an application to check their ticket against the latest results of the Irish National Lottery. This application will allow users to use the camera on their phone to read the numbers from a Quick Pick lotto ticket and check to see if that ticket is a winner. This application uses the OpenCV Android Standard Development Kit to access to a wide array of computer vision algorithms. Digit identification in an image is implemented with a cascade classifier. An image classifier for each digit from 0-9 was built and is used by the application to recognise each individual number in the ticket image. These numbers are then combined to form the lottery line and compared with the latest results from the national lottery website. In order for users to use this application, they must download and install the OpenCV manager from the Google Play store.

Project Area: Optical Character Recognition

Project Technology: Java

Project Platform: Android

Project Title:	CampusNav
Name:	Ross Barnett
Email:	ross.barnett2@mail.dcu.ie
Name:	Rory Assandey
Email:	rory.assandey2@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Mr Brian Stone

Project Number: 89

This project is a real-time, location-based android mobile application that will serve all students, staff and guests of a particular university. For the purpose of this prototype we have used Dublin City University (DCU) as our client; however the intention is to provide this as a customisable solution to university, business and other commercial campuses both nationally and internationally.

The application delivers the following services; Indoor and outdoor navigation, location-based push notifications in relation to a user's proximity, analytics for promoters who will also have access to an online web application allowing them to update notifications to a database, an easy to use application interface for mobile users to navigate, browse locations and event listing and customise their notification preferences.

The working prototype of the application which we have developed resembles a fully functional version. We have included the main aspects of the project, several complete program paths and dummy user accounts for trial purposes.

Project Area: Mobile App

Project Technology: C/C++, Java

Project Platform: Android

Project Title:	Virtual Wardrobe For Your Android Device – Androbe
Name:	Niamh Morgan
Email:	niamh.morgan4@mail.dcu.ie
Name:	Eoin McDonnell
Email:	eoin.mcdonnell29@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Monica Ward

Project Number: 90

Androbe is a an android mobile application. This application combines the ever growing fashion industry with mobile technology. Users can build a replica of their wardrobe on their android device. The user can customise how they view their wardrobe and can have unique filters to make their clothing more accessible. Now you can have your wardrobe at your finger tips.

- Users can take a picture of their items from within the application
- These pictures will be uploaded to a cloud database
- Users can catagorise their items for filtering
- Users can build outfits from within their wardrobe

Not only can you view your own wardrobe but you can also view your friends wardrobes once you are connected on this application. The application will allow users to add friends; this will allow a user to view the wardrobe contents of any friends, and look at the description each item of clothing that can be provided by the user. Images of clothing items will be taken by the user and then stored on a server, this will then allow for any friends to view the clothing on your wardrobe.

- Users can search for other users by name to add to their friend list
- Once two users are connected they can view each others wardrobes

Androbe will give clothing companies the opportunity to advertise on this application so users can keep adding to their Androbe wardrobe.

Project Area: Mobile App

Project Technology: Eclipse, HTML5, Java, PHP, SQL, XML

Project Platform: Android

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Project Title:	AI Sports Game
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Programme:	Computer Applications
Supervisor:	Alistair Sutherland

Project Number: 91

This project attempts to create a simple and user friendly sports management game for both Windows and Android OS. The game allows users to train and customise AI-controlled players and teams. The AI controls the players as they take part in a handball-like competition. They utilise data gathered from previous matches stored in a database to make their decisions. The game attempts to keep the management experience simple and satisfying with displays of scores, statistics and standings. The purpose of the project was to gain an understanding of artificial intelligence in game design, how engines can aid the development of games and how development patterns ensure a system is maintainable.

The system is implemented using Java and an SQLite database. LibGDX serves as the game engine for this application. The engine provides tools for interface design, textures, physics and input processing. The technology allows for multi-platform implementation and has a large active community.

The system uses a layered architecture to transfer data from the database to the user. Interface design follows the Model-View-Controller pattern.

Project Area: Artificial Intelligence, Gaming

Project Technology: Java

Project Platform: Multi-platform

Project Title:	Driver Sleep Detection
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Email:	alan.blake5@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Tamas Szecsi

Project Number: 92

The aim of this project was to develop a computer based system, capable of detecting if the driver of a vehicle is falling asleep.

Falling asleep while driving is a large contributor to vehicle collisions; however it is an area lacking in safety improvements, due to its untraceable nature and variation between drivers. The concept of this project is for a camera to be installed in a vehicle, which can provide continuous monitoring of the driver's facial characteristics. The pre-programmed algorithm can then emit a warning signal should it detect signs of a sleeping driver. The developed system can potentially provide an increase in road safety, by being implemented in a moving vehicle.

The system operates using Image Processing techniques, achieved through the use of the 'OpenCV' libraries. OpenCV is an open source computer vision package, with which it is possible to utilise pre-trained commands for tasks such as face or eye detection. The system was developed through 'C' language programming on a laptop. A webcam is used as the chosen monitoring device, and the characteristic used to identify sleep is the length of time the driver's eyes are closed. The developed system successfully detects when the subject's eyes are closed and emits both a visual and audible warning output should they not re-open within two seconds.

Project Area: Image Video Processing

Project Technology: OpenCV

Project Platform: Windows

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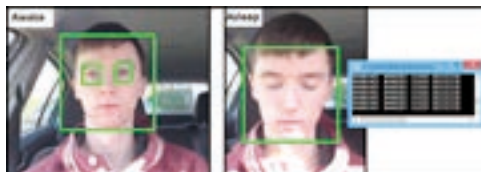
Project Title:	Design and manufacture a stand to position two video cameras for stereo vision
Name:	Conor Kavanagh
Email:	conor.kavanagh39@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Tamas Szecsi

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Project Number: 93

The aim of the project was to design and manufacture a fully functional automated camera stand that supports stereo vision with a variable baseline. Stereo vision is a technique of comparing two images of a scene from different viewpoints and extracting 3D information from the scene. Most stereo vision systems have a fixed baseline. This is the distance between the two cameras. Increasing the baseline between the two cameras also increases the accuracy of depth/height information extracted using stereo vision. However in systems with large baselines objects in the close vicinity leave the cameras view and are not processed by the cameras. Due to this, depth information cannot be extracted from these. Automatically changing this baseline can solve this problem and greatly aid in the techniques used in stereo vision. This invokes the need for a high accuracy camera stand with a controlled variable baseline. The positions of the two cameras had to be controlled accurately for the process of stereo vision. The length of the baseline is essential knowledge for the stereo algorithms. A motor controlled stand with cameras mounted to lead screws and software was developed and tested to find the stands capabilities. The method for controlling the position of the cameras is using a lead screw setup to ensure high accuracy. Results aided in the conclusion that the camera stand would support stereo vision techniques due to the accuracy of the known baseline dimension that is used in the stereo vision algorithms.

Project Area: Mechanical Design and Manufacture

Project Technology: C/C++

Project Platform: Windows

Project Title:	Design and Development of a Testbed for Sensor Fusion
Name:	Marc Denmead
Email:	marc.denmead2@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Ms Jennifer Bruton

Project Number: 94

The emergence of sensor networks combined with the increasing availability of MEMS (Micro Electromechanical Systems) devices has created a demand for robust and reliable sensors. The aim of this project is to design and assemble a low cost solution for testing MEMS (Micro Electro Mechanical Systems) devices and to evaluate the performance of the resultant test bed using a microchip with on board sensor fusion capabilities. This project details the progression of the development from a design concept to the manufacture of the physical rig, and an evaluation of the actual performance of the device compared to the designed performance. A 3D model of the rig was produced utilising the CAD package SolidWorks and working drawings were drafted from the model for the manufacturing technician. An Arduino UNO microprocessor is used as the controller for the rig as it is a low cost low power device with a wide range of functionality. A gyroscope and accelerometer will be used for evaluating the rig. The device contains three accelerometers and three gyroscopes that can achieve 9 degrees of freedom when combined with combinatorial sensor fusion. The code was developed on the Arduino Integrated Development Environment (IDE). The device uses three stepper motors for open loop control of each axis.

The completed test bed comprises of three motors arranged in orthogonal directions to each other and is capable of rotating in three dimensions. The results of the testing show that the rig is a viable method of extrapolating data from a sensor in a controlled environment. Thus, the test bed is capable of providing an environment for sensor fusion development if combined with an appropriate control algorithm and independent sensors.

Project Area:	Embedded Systems, Sensor Technology, Mechanical Design and Manufacture,3-D Modelling, Mechatronic Systems
Project Technology:	C/C++
Project Platform:	Arduino

Project Title:	Experimentation on POV displays
Name:	Keith Moffatt
Email:	keith.moffatt2@mail.dcu.ie
Programme:	Electronic Engineering
Supervisor:	Dr Robert Sadleir

Project Number: 95

Persistence of vision (POV) refers to the notion that images remain present to the eye after they cease to exist. Displays created using the POV effect can offer low cost, low power, high quality solutions for presenting images and video when compared with other methods.

The aim of this project is to use the POV effect to create a device, capable of displaying two-dimensional static and animated images. This dissertation documents the different stages in the development of a POV display. The principles of operation are explained throughout and these principles are ultimately employed to create a two-dimensional display.

Experiments are used to explore minimum pixel size, animation frame rates and the accuracy of shading levels which can be applied to images. Areas where improvements can be made to the display have been identified. Methods of increasing image resolution through the use of smaller LEDs and increasing the accuracy of shading levels are applied as a means to demonstrate how the operational limitations of the system can be improved.

Project Area: Software Development, Embedded Systems

Project Technology: C/C++, Java

Project Platform: Arduino

Project Title: Design of an Experimental Rig to Investigate
Bubble Flow for the Purpose of Gas Sparging
Filtration Units

Name: James Power

Email: james.power26@mail.dcu.ie

Programme: Manufacturing with Business Studies

Supervisor: Dr Yann Delauré

Project Number: 96

The initial aim of this project was to design an experimental rig in order to investigate the effects of gas sparging on the fouling of a filtration unit. Filters play an important role in modern industries such as water treatment, bioprocessing and food and beverage manufacturing. Over a period of continuous use, filters can become fouled as particles deposit on the filter surface. The fouling reduces the permeate flux and can eventually lead to critical conditions with no flow through the filter. By gas sparging filters, the rate of permeate flux can be increased over time, resulting in a more efficient filter and reducing the need to clean or replace filters. From previous studies bubble flow and in particular slug flow have been shown to delay the filter clogging. Experiments were done as part of this project in order to investigate bubble flow by visually inspecting the bubble formations. A computational analysis of the bubble flow was carried out using the Fluent CFD software in order to complement the experimental analysis. Another aim of the project was to investigate the pore size of the provided filter for which there was no information. The results showed that contrary to previous studies churn flow provides the highest shear stress which results in a more efficient permeate flux. The average pore size of the filter was found to be 0.0304 microns. It can be concluded that the results found were inaccurate due to the setup of the computational model. An explanation for the inaccuracy was down to the lack of elements in the mesh. Another reason was the mesh geometry was too short to allow the bubble to form fully.

Project Area: Fluid Dynamics

Project Technology: Ansys

Project Platform: Windows
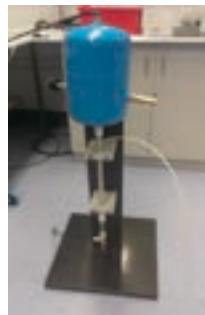
Project Title:	Development of Computer-Based Learning Tools For Mathematics
Name:	Eimear Sutcliffe
Email:	eimear.sutcliffe2@mail.dcu.ie
Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Alan Kennedy

Project Number: 97

The motivation behind this project is to help students that are rushed through maths topics in order to keep up with the pace that teachers set. When studying maths, working through examples is the key to understanding a concept. Because teachers and lecturers do not always have the time to help students when they are confused, the student must turn to alternatives. The aim of this project was to design a tool to assist these students in understanding differentiation rules, by allowing students to work through multiple examples at their own pace.

A differential solver was designed using Visual Basic (VBA) in Excel. The user can choose a differential rule they wish to work with, open the relevant worksheet, and see how equations are differentiated using that rule. The user can also modify these equations by changing the function name, independent variable and constants to whatever they wish.

The solver is split over five separate worksheets. The 'Basic 1' worksheet was the first worksheet to be created and was then used as a template for the other worksheets. A rough design of the interface was made and then code was added in order for the scroll bar, input cells and output cells to function properly. After this worksheet was built, it was rigorously tested for errors that could be potentially copied over to the next worksheet. After all errors were corrected, the next worksheet was designed, built and tested. Each worksheet was made in this way until all were completed. When they were all complete, the worksheets were beta tested in order to get opinions on how effective the worksheets were. Feedback from the beta testing was used to improve the worksheets, where possible.

Project Area:	Educational
Project Technology:	VBA
Project Platform:	Windows

| **Project Title:**	Numerical methods for computing solitons
Name:	James Conlon
Email:	james.conlon5@mail.dcu.ie
Programme:	Electronic Engineering
Supervisor:	Dr Marissa Condon

Project Number: 98

Solitons are self-reinforcing waves that maintain their shape and velocity during propagation. They arise in many areas of science and engineering and are the solution to several completely integrable systems. Researchers are keenly interested in utilising solitons in fibre optic communications. Because of their unique properties, solitons would allow transmission through fibre optic media over long distances with very little signal degradation.

The Nonlinear Schrodinger Equation is a partial differential equation that describes the propagation of light through a nonlinear medium such as a fibre optic cable. It is important that one has fast and accurate algorithms for solving it numerically to enable accurate design work in practical timescales.

The purpose of this project is to investigate methods for numerically computing solitons and to compare them in terms of accuracy and efficiency. It explores the effect of frequency dependent potentials. The mathematical basis for the simulation algorithms is given in order to implement them in Matlab. Results indicate the success of the simulations and the effect of frequency dependent potentials.

Project Area: Computational Mathematics/Optics

Project Technology: Matlab
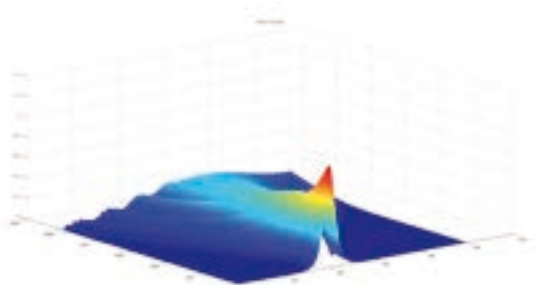
Project Title:	Mechanical Ventilation Heat Recovery System
Name:	Eoin Butterly
Email:	eoin.butterly2@mail.dcu.ie
Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Brian Corcoran

Project Number: 99

The current awareness of global warming and the ability to stop it happening has led to increased pressure on builders and designers to build houses that are more energy efficient than before. One of the main methods of increasing energy efficiency of a house is to increase its air tightness and stop warm air escaping from the house.

However, improving the air tightness of a house brings its own problems. The build-up of stale air within the house can have serious negative health implications for the occupants of the house. The build-up of stale air can also damage the building fabric itself by causing the accumulation of condensation on cold surfaces such as walls, ceilings and windows.

The purpose of this project was to investigate the use of a Mechanical Vent Heat Recovery (MVHR) system and see how efficient the system would be if installed. The investigation consisted of testing at various temperatures to and from the MVHR unit.

The results for testing at controlled temperatures supplied to the MVHR unit produced high efficiency values. The MVHR system is highly efficient in these cases where the temperature to and from the system is controlled. On the other hand, for testing in real world situations where the air temperatures fluctuated due to local weather conditions the efficiency calculations were inconclusive.

Project Area: Thermodynamics

Project Technology: Pico Technology Data Logger

Project Platform: Windows

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Project Title:	Solar air heater for SODIS water disinfection
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Yann Delauré

Project Number: 100

SODIS is a simple method that uses solar irradiation to disinfect water. This technique involves transparent containers with contaminated water which are exposed to solar irradiation for water disinfection. To improve the efficiency of this method the solar air heaters (heat exchangers) are used to increase the bacteria inactivation rate. Therefore the main aim of this project was to design and develop a heat exchanger whose purpose was to achieve air temperature at outlet above 50°C. Thus, it can be concluded, from the obtained experimental data, that 3D CFD simulations would not be able to replace the physical experiment to acquire accurate results.

Project Area: Thermodynamics

Project Technology: 3D Modelling

Project Platform: OSX
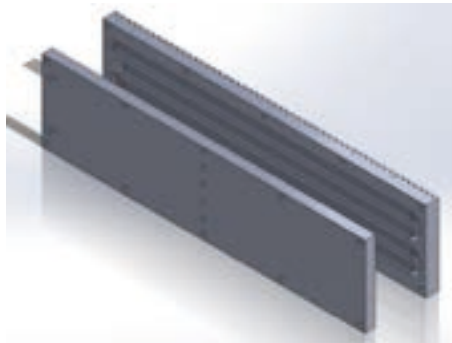
Project Title:	Finite Element Analysis of a Total Hip Arthroplasty
Name:	Ivana Hayes
Email:	ivana.hayes3@mail.dcu.ie
Programme:	Biomedical Engineering
Supervisor:	Bryan Mac Donald

Project Number: 101

Total hip arthroplasty (THA) is a very successful surgery with the earliest recorded procedure taking place in 1891. The biomedical field is constantly growing and improving and with 123 years of hip replacements there are still new designs and procedures being developed. The finite element method is commonly used to examine structural analysis problems but is a very useful tool in the biomedical field for analysis of orthopaedic implants where it is not possible to directly measure structural responses following implantation.

The aim of this project is to build a validated 2D finite element model of a total hip arthroplasty. A validated finite element model of the THA allows predictions of the THA behaviour in cases of extreme loading. The use of 2D finite element models instead of 3D models in stress analysis will greatly reduce computational costs and processing time.

An experimental rig of a THA was restored to working order. The rig consisted of a synthetic femur, Charnley prosthesis, strain gauges and pneumatic cylinders. Strain measurements were obtained from the experimental rig and a 2D finite element model representative of the experimental rig was built. Finite element analysis (FEA) results were obtained for different mesh types and different loading scenarios.

FEA results obtained in this project were directly compared with 3D results of the same problem available in literature. Although the FEA results could not be accurately validated against the experimental results, the trends in both data sets were similar. The bone was modelled in 2D and as such significant assumptions were made regarding its structure. The cross-section selected was assumed to accurately represent the rest of the bone however it is clear that, in reality, a 2D cross-section cannot successfully represent complex 3D bone geometry.

Project Area: Finite Element Analysis

Project Technology: ANSYS

Project Title:	Electronic Table Football Video Game using a Nintendo Wii Controller
Name:	Eoin Ffrench
Email:	eoin.ffrench2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	David Sinclair

Project Number: 102

The nintendo Wii was the biggest selling home console of all time. It was greatly popularised because of its controller which could track hand movements accurately without the need of a camera. But very little immersive games were developed due to the ideology that a hand movement was equivalent to a button press. This meant that developers just changed their programs from a button press to a hand gesture. Speed and accuracy was rarely accounted for.

With this in mind a game was developed where the speed and accuracy of hand movements were necessary to win. A computerised version of table football (also known as "Foosball") was developed with an interface for the user to use a nintendo wii remote. Hand position and movement are traced on screen in real time and players need to react to the motion of the ball within a limited time span. The user can select from several different difficulty levels which makes the computer opponent better skilled depending on the interest of the main users.

This program deals with interfaces to connect the nintendo wii remote to the computer as well as a GUI. It was mainly developed in java with a lot of the ball physics being developed to mimic real world physics. Overall this program is great fun to try and caters for anyone who would like to be entertained for a while.

Project Area: Gaming

Project Technology: Java

Project Platform: Windows

Project Title:	Commissioning of a Sectioned Car Engine for Display Applications
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Joseph Stokes

Project Number: 103

The task for this project was to commission a sectioned car engine for engineering display applications. The diesel engine is displayed on a purpose made display unit and is to be used as a display in the foyer of the Dublin City University engineering building on open days. The project is to be used as an attraction to effectively communicate mechanical engineering to students considering studying engineering in the University. The display will be used for demonstration and marketing purposes to attract attention and to essentially educate the observer about the combustion engine. The project is a continuation from a previous final year project which a diesel engine was acquired, sectioned and attached to a purpose made display unit. The project carried on by the author implements sourcing of components and marketing and manufacturing of the display. The diesel engine was automated by attaching a motor to the crankshaft through a pulley system. As part of the marketability of the display unit a video that contains a CAD drawing that was done by the author and is animated into an educational video describing the four strokes of the diesel engine as a visual aid to help understand the engines workings.

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Project Area:	Educational Display
Project Technology:	Solidworks
Project Platform:	Multi-platform

Project Title: Real Time Emulation of an LTE Network

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Programme: Information and Communications Engineering

Supervisor: Dr Gabriel-Miro Muntean

Project Number: 104

In recent years, LTE (Long Term Evolution) technology has emerged as a new standard in mobile communications. Due to barriers such as high initial costs and the need to maintain existing networks which are still widely used and profitable for Telcos, LTE network rollouts have been slow in some areas of the world. Although rollout has been slow in some areas, LTE coverage is continuing to grow and is set to become the first truly global mobile network standard. Furthermore, the amount of data being sent across mobile networks is increasing. According to the Cisco VNI Mobile Data Traffic Forecast for 2013-2018, it is predicted that the global mobile data traffic usage per month will surpass 15 Exabytes, indicating a growth of 1000% in just 5 years.

With a huge growth in mobile data usage predicted the following question is raised: in areas without LTE coverage how can R&D teams prototype and test applications and protocols to run over LTE networks? The purpose of this project is to provide a low cost and effective test methodology, namely a real time test bed which can interact with real IP based network traffic. This project extends the NS3 (Network Simulator 3) LENA module to interact with real-time IP based traffic. The environment created allows two computers to communicate with each other over a simulated LTE network in real-time.

It was found that for small network configurations, the scenarios tested in real-time emulation performed just as well as scenarios tested in discrete-time simulation. It can be concluded that the novel solution produced has many useful applications for R&D purposes.

Project Area: LTE Networks & Emulation

Project Technology: C++; LTE; NS-3;

Project Platform: Unix/Linux

Project Title:	A computer game for teaching GAA skills
Name:	Cillian Charles Lyons
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Programme:	Digital Media Engineering
Supervisor:	Prof Noel O'Connor

Project Number: 105

Sports have been a part of human culture from the very beginning of mankind. It has been a part of our lives throughout evolution and because of this, it is our duty to protect and preserve sport and games. Traditional sports and games are an important part of understanding our culture, who we are and where we come from. These sports and games seem to be on the decline across Europe and that is the reason this particular project was prompted.

The aim of this project is to develop a programme in the form of an interactive video game, which allows the player to work with and see a sport in motion. The sport of hurling was chosen because it is a popular, traditional sport in Europe, especially Ireland. The scope of this project was just to have the swing of the free puck. A free puck is a standard swing within the game of hurling, similar to that of golf or baseball.

The hardware of this project was chosen as it is easily affordable and would suit less funded and less popular sports and games. The Microsoft Kinect was chosen as the most suitable product to record the movements of the player. The outcome of this project is a working 'game', in which you the participant swing their arms with the motion of a hurling free puck. The angle and velocity are extrapolated from the Kinect sensor and the result of the swing is mapped visually on the screen as well as readout of the results, such as max distance, speed and angle.

Project Area: Gaming, Graphics

Project Technology: Eclipse, Java

Project Platform: Windows

Project Title:	Crypto Clear
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Supervisor:	Brian Stone

Project Number: 106

CryptoClear's primary goal is to facilitate businesses and organisations in accepting cryptocurrencies. The rapidly growing cryptocurrency market is expanding all over the world and we want to lead the charge in facilitating Irish businesses to adopt and begin using it. We provide services to encourage, educate and facilitate the businesses in any way they may require.

We have developed a versatile point of sale (POS) application using Android. The app can be tailored for each business to give it a unique and personalised feel with their own colour scheme, logos and layout. The app also allows businesses to take the risk out of accepting cryptocurrencies by facilitating immediate conversion to euro for the value of the transaction. It displays public keys of the businesses wallet as QR codes and lets customers scan them and sends cryptocurrency directly from their smartphone.

We use online APIs to get the current price of the each crypto currency and calculate the amount owed in the selected currency. Then the user will send cryptocurrencies directly from their device to the POS application. The application will verify the transaction via a continuously updating online log known as the blockchain.

We have created an informative website where people can go to learn about cryptocurrencies and begin using them themselves. It was hosted under the name www.cryptoclearservices.com and provides useful information to both businesses and individuals. It will contains lists of all businesses that we work with and supply with our customised app.

There are multiple cryptocurrencies available with new ones rising and falling constantly. Our services are not tied to any one currency and we can adapt to include any new currency that may arise in the future and allow business to keep up to date.

Project Area:	E-Commerce
Project Technology:	Java
Project Platform:	Android

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Project Title:	Development of an automatic Ink dispensing system
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Programme:	Mechatronic Engineering
Supervisor:	Dr Harold Esmonde

Project Number: 107

The aim of the project was to develop a control system that would automate the process of dispensing ink for Prism Inks and Coatings LTD. The requirement was to take some redundant manual dispensing equipment (Pneumatic Pumps and valves) and upgrade it to a fully functioning system.

With the ever increasing consumer demand for big brands, printing is now big business in Ireland. With that comes a demand for printing inks. Prism inks are one of only a few manufacturers of ink in Ireland and with their expanding customer base they are always looking to increase productivity and most importantly quality. Automating the ink dispensing process will achieve both of these objectives. The automated system will ensure the correct formulation and large volume production.

A prototype experimental rig was built to test the design using a series of solenoid controlled valves and pumps. The system was programmed using Labview software interfaced to the test rig via RS232 communications to communicate with a weigh station and digital communications to control the hardware.

Project Area: Mechatronic Systems

Project Technology: LabVIEW

Project Platform: Windows
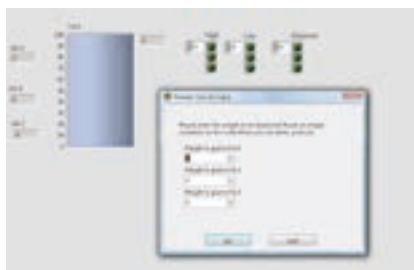
Project Title:	GP Talk
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Programme:	Computer Applications
Supervisor:	Dr Markus Helfert

Project Number: 108

There is currently a large gap in the Irish medical sector that contains a potential opportunity to thrive convenience and immediacy. GP Talk is an Android application that fully automates the menial tasks associated with booking and managing patient appointments. The engagement between a General Practitioner and a patient is increased through real-time, self-service booking and update notifications.

The fundamental aim of GP Talk is to provide a comprehensive booking service to all registered users wishing to make appointments with their desired General Practitioner. Users are exposed to all assistant features such as a personalised scheduler which keeps track of all currently requested, confirmed and rejected bookings and a calendar interface that is automatically updated with confirmed scheduled bookings. Patients are additionally provided with detailed information of all available GPs, including a marked view of the GP's location via Google Maps. The maintainability of a user's personal account is accessible within the application.

Communication between the user and the GP's Android devices comes in the form of a Google Cloud Messaging service. All consultation details are securely stored within a remote MySQL database, in which data is sent to the application on the device of the intended receiver, and is used to automatically update features of the application.

A corresponding website entitled GPTalk.ie was developed and provides additional content based on the application, such as downloadable files, documentation and video tutorials. The website is an alternative source of registration and login to an account for maintainability purposes.

The application has been constructed using the Android SDK, Java, PHP and XML.

Project Area: Mobile App

Project Technology: Java

Project Platform: Android

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Project Title:	PlayerTracker
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Programme:	Enterprise Computing
Supervisor:	Prof Alan smeaton

Project Number: 109

An area of amateur and semi-professional sports science that is not being catered for presently is real time player and team formation analysis regarding a team's on-pitch formation as well as individual player performance. Coaches are reliant on absorbing the positioning and movement of a group of players and analysing in real time how they are acting as a unit. Furthermore they are reliant on memory to determine how individuals did within a game scenario.

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PlayerTracker builds-on present day technologies and enhances their use through the development of a player and team tracking system. Using GPS technology, real time data streaming and cloud in-memory processing, PlayerTracker can provide

- Live positioning and team formation illustrations and performance on a tablet or other digital device.
- Individual player match analyses including distance covered, average speed and a heat-map representation of positions adopted during the game.
- Match data archived for later analyses.
- Player development comparison against archived information.

This will offer coaches an overview of team performance and dynamics including individual player metrics. Each player is tracked in relation to other players and the representation can be replayed and examined to identify strengths and weakness in a strategy or formation at any time in a game.

The SAP-HANA in-memory process will be employed for data processing. It operate as the analytical processing engine for our proposed system and provides the perfect environment for analysing a constant stream of player information data and providing real-time reporting and playback functionality on digital devices.

This application will provide to the mass market the technologies currently only available to sports scientists attached to elite organisations such as premiership football clubs or international sporting bodies.

Project Area: Sensor Technology

Project Technology: HTML5, Java, JavaScript, SQL, XML, HDBSQL

Project Platform: Android

Project Title:	Investigation of the suitability of variable frequency drives in Irish wastewater treatment plants
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Lorna Fitzsimons

Project Number: 110

There is a strong urgency for the world to increase its energy efficiency. Pumps currently consume approximately 10% of global energy [1]. This figure alone provided the required motivation for the completion of the project.

Wastewater treatment facilities pump large volumes of fluids daily. Potentially, there is a big opportunity in this sector for energy savings. The focus of this report is the use of Variable Frequency Drives (VFDs) in wastewater treatment systems. The main aims of the project are to assess the potential of VFDs to reduce pump energy consumption and to ascertain the challenges involved.

Achieving the overall aims of the project required the completion of a number of steps. An extensive literature survey was carried out to develop an in-depth understanding of the pumping process characteristics; this involved researching how VFDs actually work within a wastewater treatment system to reduce energy consumption. From this, an analysis was carried out on an energy consumption calculator available online. The analysis provides details of how the tool calculates energy costs, while also recognising its limitations. Finally, the dead-leg rig in the thermofluids laboratory was upgraded with a new pump and VFD. A series of tests was carried out to assess the energy savings and benefits of using VFDs.

The overall results of the experiment supported the data found when carrying out the literature review. The use of a VFD in the system to control flow significantly reduced power consumption and produced cost savings of 35% over the period of the test. It was found that, in relation to wastewater treatment facilities, it is important to calculate the benefits of a VFD on a case by case basis. This is due to system variables changing between different facilities. The results obtained in the project serve as an indication of the potential savings achievable through the installation of VFDs in wastewater treatment applications.

Project Area: Pump energy consumption

Project Technology: Fluke Power log 4.2

Project Platform: Windows

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Project Title:	M&M Water Management System
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Programme:	Enterprise Computing
Supervisor:	Dr Markus Helfert

Project Number: 111

The M&M Water Management System provides an innovative technological service to the water metering industry. The system is a software tool that will manage and conserve water usage in large non-domestic water users. The overall goal of the system is to reduce costs by lowering the gross water usage of an organisation by implementing a personalised automated system. This is done by managing and analysing all data received by water meters with emphasis placed on leak detection. We offer our customers a unique service by personalising the water management system to each organisation by means of consolidation. The system's main user interface will be a mapped view of the organisations water schema in which each water meter will be highlighted and clickable.

Our prototype is based on Dublin Airport Authority's (DAA) water scheme. Currently the DAA does not have an automated system in place and water readings are taken manually every month. M&M Water Management System will take daily water readings sending the data automatically to the database. This will reduce manual labour as there will be no need to physically take readings. Taking meter readings daily as opposed to monthly will provide more accurate data for analysis, this will also be used to accurately bill commercial water users within the DAA. Most importantly daily readings will detect leaks far faster and in turn reduce the overall water usage, this means the worst case scenario a leak will go 24 hours unnoticed. Currently a leak could potentially go a month unnoticed until the next water reading.

Project Area: Content Management System

Project Technology: PHP

Project Platform: Windows

Project Title:	UPnPi
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Programme:	Computer Applications
Supervisor:	Stephen Blott

Project Number: 112

UPnPi is a project that aims to unify the vast amount of multimedia available on devices such as laptops, smartphones and tablets. It provides a means for end users to share their media and/or contribute to a playlist. This is achieved using UPnP protocols which facilitate media to be streamed wirelessly over a LAN.

There are 3 types of UPnP devices, Media Servers, Media Renderers and Control Points. The Raspberry Pi implements both a Media Renderer and a Control Point. The user interacts with the Control Point via a web interface, control commands are then passed onto the Control Point which can return information of available Media Servers on the LAN and files available within those Media Servers. The user can also issue for a media file to be sent to the media renderer to play, such as song or a film.

The project is primarily written in C++ with the use of the Platinum UPnP SDK. This SDK has been used by many companies and organisations such as XBMC, Plex and Toshiba and provides a means to build UPnP and DLNA Compliant Devices. It is open source software licensed under the GNU General Licence.

Project Area: Multimedia, Wireless Technology

Project Technology: C/C++

Project Platform: Raspberry Pi

Project Title:	Artificial Life Simulation Game
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Programme:	Computer Applications
Supervisor:	Alistair Sutherland

Project Number: 113

This project is a life simulation game for windows which involves the player controlling a creature through various stages of evolution. The game will allow the user to control the creature by ensuring it grows and survives by eating, drinking and interacting with others. The aim of the game is to control this creature and aid it through it's development, competing against computer-controlled creatures. They will start off as simple creatures who only have to survive and every time they take an action, which will help ensure their survival, they will gain a small bit of intelligence. As they become more intelligent they will learn new things like how to make tools, create farms and establish simple societies. The game therefore involves the creation of AI players and a player for the user to control.

The game will be developed using C# and the XNA framework and will run on the windows OS.

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Project Area:	Gaming
Project Technology:	C#
Project Platform:	Windows

Project Title: Design Aspects of The Hoka One One Running
Shoe Concept

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Programme: Biomedical Engineering

Supervisor: Garrett McGuinness

Project Number: 114

Aim: This project aims to examine the new trend in the running shoe market, maximalist running shoes, and in particular, the Hoka One One running shoe concept and compare it to a control shoe.

Method: The Hoka shoe was compared to suitable control. Running trials & drop jump trials were carried out using force plates and in shoe pressure sensors. These data sets were then synchronised and examined. Compression testing was also carried out on the shoe midsoles. This compression data was examined and also used to calculate parameters of the Ogden Compressible Foam model in Ansys.

Results: Average vertical loading rate, response time & maximum active peak force were all found to have statistically significant differences. Drop test trials were discounted due to high inter-trial variability. Centre of pressure trajectories for both shoes showed some evidence of biomechanical changes of the foot and ankle. Compression data showed that the Hoka shoe was generally a stiffer shoe then the control.

Conclusion: Evidence was found for kinetic changes and possible kinematic changes between the shoes. Results must be interpreted with caution however due to a small sample size. Further research with large sample is suggested.

Project Area: Mechanical Design and Manufacture, Motion Analysis

Project Technology: Matlab

Project Platform: Windows

Project Title:	FRProject – Penalty Points Database
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Programme:	Enterprise Computing
Supervisor:	Jennifer Foster

Project Number: 115

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This project involves the development of a web-based application and an Android application. The main aim of the project is to create an online database to store and access penalty points accrued by drivers and other road users. The benefit to motorists is that their data can be easily accessed at any time through a single online or App-based portal. For example, motorists might access their account to view a summary of all of the penalty points that they have received, along with information such as the offence for which the points were awarded, the date the points were received, confirmation of payment of any fine and the date on which the points will expire. This could be helpful, for example, when applying for or renewing motor insurance.

The initial target customer base is motorists in the Republic of Ireland, but there is potential to expand the application into other countries that employ some form of Penalty Points system.

The web application also includes video tutorials which show how to use different aspects of the system to assist users in using and making the most of the capabilities of the system.

The web application has been developed using Bootstrap framework, which ensures that the application can be viewed on smartphone devices.

The motivation behind developing the application comes from frustrations encountered when using the current system for checking penalty points in Ireland. This cannot be done on a smartphone, nor is it available on the web, with the only way to access the information being by a voice phone call using a chargeable number. This new application will give everyone with access to a smartphone or web terminal the ability to check their penalty points at any time.

Project Area: Databases, Web Application

Project Technology: HTML5, PHP, SQL

Project Platform: Windows

Project Title:	SHout – System Notifications
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Programme:	Computer Applications
Supervisor:	Dr Stephen Blott

Project Number: 116

SHout is an online hosted service that aims to instantly deliver responses from shell run tasks, in the form of a notification, to the user's Android smartphone. The user, upon receiving the notification, is able to view the output of the task, various meta-data about the executing system's state and, where possible, easily connect to the executing system via SSH. The service will support multiple users and multiple devices per user.

This project is comprised of a hosted web service, a Linux shell application and an Android application.

The hosted web service is developed using Node.js and is split into two separate parts. The first part consists of a web interface allowing the user to register, login and configure their account and devices. The second part provides a RESTful API, with OAuth2 authentication, used by both the Android application and the Linux shell application to send and receive notifications and relevant meta-data. The web service also communicates with Google Cloud Messaging (GCM) in order to deliver the notification to the Android devices.

The Linux shell application is written in Python. Once configured by the user it monitors set tasks or commands and relays the outcome of that task, along with system meta-data, to the web service.

The third and final piece to SHout is the Android application. This application receives notifications of completed tasks from the web applications via GCM and delivers this to the user in a form of an Android system notification. Once the user interacts with the notification they can instantly view the system's state and meta-data of the completed task.

Project Area: Cloud Computing, Mobile App, Web Application

Project Technology: HTML5, Java, JavaScript, Node.js, Python, REST

Project Platform: Multi-platform

|	
Project Title:	Modelling and Improvement of Assembly Line Operation
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Programme:	Manufacturing Engineering with Business
Supervisor:	Paul Young

Project Number: 117

Model-based improvement is a key advance in the application of lean/six sigma approaches. This project aimed to produce a discrete event simulation (DES) model to analyse and improve the current performance of a flexible manufacturing system (FMS), through reducing lead, transport and activity times within the system. Discrete event simulation is a step-wise refinement process used to analyse how real world activity will perform under different conditions. It allows testing of a system without the cost, monetarily and in terms of time, of actually physically adapting the system. Problems can be quickly approximated and solutions tested to improve knowledge of the system, as well as evaluate the potential impact any changes could make to the system. The simulation of the system for this project was developed using version 8 of ExtendSim's modelling software. The current queue and activity times of the system were measured and inputted into the model, and the results analysed to discover any operational inefficiency and identify potential means of improving the system's functionality.

Project Area: Modelling Of Production Systems

Project Technology: ExtendSIM

Project Platform: Windows

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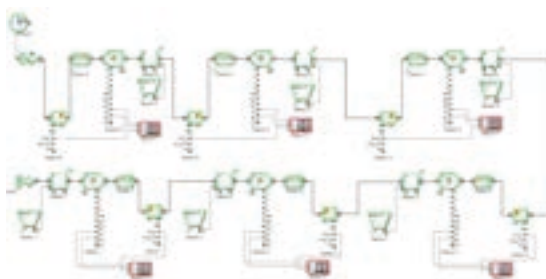
Project Title:	Ultrasonic Surgical Cutting of Soft Tissues
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Programme:	Biomedical Engineering
Supervisor:	Garrett McGuinness

Project Number: 118

TThe brief for this project was to design a probe and investigate the interaction between the device and soft tissues.

A review of powered surgical instruments was carried out. It was found that the use of ultrasonic power is commonly adopted by surgeons for cutting and ablation of tissues. The desired function is linked to the type of end effector. Electrosurgery (use of electrical energy) has also been applied in the medical field and there seem to be parallels between this method and the use of ultrasonic power. The application of these technologies in medicine motivates research for the refinement of these technologies. This focuses on reducing their disadvantages, which are essentially the effect of temperature and damage to areas surrounding the incision.

High-energy, low frequency ultrasound was chosen for this project. The primary area was the design of a sonotrode for use with the Branson digital sonifier 450d. Finite element analysis was used to establish the working geometry of the probe. A probe consisting of a 40 degree tip angle was manufactured from grade 2 titanium. It was tested and results compared against a probe 70 degree tip angle. A porcine heart was used in testing. Rubber samples were tested as a control measure. Testing would examine the effect of tip angle on the cutting rate for tissue, with the different densities of tissues accounted for. These tests were conducted first with ultrasound and also without ultrasound.

Results showed an increased cutting rate for a sharp probe when the tip was vibrating ultrasonically compared to unassisted cutting, for tissues of higher yield strength. A device with a sharp probe tip may be sufficient for cutting softer tissues requiring little or no ultrasonic power, unless ablation is the intended action.

Thermal damage was observed for all ultrasound assisted experiments due to the elevation of probe temperature. The control of force in ultrasound assisted devices is attributed to surgical expertise, playing a role in the physical post-surgical results and healing process.

Project Area: Mechanical Design and Manufacture

Project Technology: Solidworks, 3D Modelling, Ansys

Project Title:	SportsHub
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Programme:	Enterprise Computing
Supervisor:	Dr Mark Roantree

Project Number: 119

Our vision for 'SportsHub' is to revolutionise the way in which leagues are governed and to better the technology used when managing it. Its primary function is to focus on the aspects that are needed to manage (at an amateur level) players, teams and the league officials.

The main features of the application are:

- Ability to view latest/upcoming fixtures.
- Use of discussion boards between managers and their players.
- Send and receive message alerts.
- Find location of football grounds.
- View league tables.

It also looks at the administration of the league through bettering communication between league officials and the teams. Each user has a profile page where he/she can update their contact information also and referees have the ability to submit cards through the application by associating a card with a player and entering in scores of matches which in turn will automatically update the league table.

The application is split into two user interfaces. The first GUI is web based, where a user can log in on a browser to use the application. The second option which a user can use is a mobile application which will be available on iPhone/Android devices. The mobile application will also be used to send and receive league alerts for fixtures and other team related issues and also for referees to update the league table by submitting scores at the end of the game.

'SportsHub' user interface design is kept as simple as possible for the user. We are focusing primarily on soccer leagues nationwide with expectations to expand our market in the near future. The application can be adapted to other sports which leaves the application open to new markets easily.

Project Area: Web Application

Project Technology: PHP, MySQL, Amazon Web Services, HTML, CSS

Project Platform: Multi-platform

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Project Title: Comparison of Fabrication Methods of
Immunoassay Well Plates Via Injection Moulding
and Laser Processing

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Programme: Biomedical Engineering

Supervisor: Dr Dermot Brabazon

Project Number: 120

The purpose of this project is to optimise the manufacturing of immunoassay well plates via laser processing. The immunoassay well plates currently being used contain well sizes down in the lower μm which is the benchmark to aim for.

The CO_2 laser without optimisation would produce well sizes too large and not of a high enough quality to be considered adequate for use as immunoassay plates. In order to optimise the CO_2 laser for the manufacturing of these plates a Design of Experiments approach was taken

After a screening experiment alumina ceramic was found to produce less burring, staining and a cleaner smaller well than other tested materials.

To determine the quality of the well/hole produced, quality was defined as a combination of hole diameter, circularity, HAZ (Heat Affected Zone) and hole taper, and importantly the reliability and confidence interval associated with each experimental run.

Design of Experiments approach overcame the problem of accurately determining the optimum set of parameters, shown by means of numerical and graphical results. The smallest produced hole was 159.1 μm and was found on the entrance side of the slide. However the optimal run was determined using a power setting of 20W, focal point position of -4000 μm below the surface and an assist gas pressure of 1Bar.The smallest hole produced was 176.2 μm in this combination of parameters. Importantly this set of parameters had by far the best confidence interval with a 95% CI of 1.46 μm rendering it optimal. Circularity was 0.93, and had a HAZ thickness of 8.59 μm. The taper was 1.34°. The biggest influence on hole diameter, and taper was power. Focal point position influenced circularity and hole diameter significantly. No factor significantly influenced HAZ.

Project Area: Mechanical Design and Manufacture

Project Technology: Design Expert 8

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Project Title:	Exerciser
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Programme:	Computer Applications
Supervisor:	Donal Fitzpatrick

Project Number: 121

Exerciser is a web application to help users keep fit by guiding them through a series of exercises and tracking their progress. It reflects a growing interest in personal analytics that is now larger than ever. Many people are trying to get fit without spending a lot of money on a glorified gym membership. This application aims to bridge that gap by helping users exercise how they want and whenever they want. The web application can be used on virtually any internet browser which means that it can be used on any internet device such as, Smartphones, Laptops, Smart TVs etc.

Users can select goals for themselves to complete or choose from a list. This information is then tracked on a database to create the users profile. Each user's data is then displayed using visual charts/graphs. Exerciser is hosted online and is developed using the latest emerging technologies including: Node.js, Express, D3.js, MongoDB and Twitter Bootstrap.

Project Area:　　　Web Application

Project Technology:　HTML5, JavaScript, Node.js

Project Platform:　　Multi-platform

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Project Title:	CollegeHub
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Programme:	Enterprise Computing
Supervisor:	Alistair Sutherland

Project Number: 122

CollegeHub is a mobile application of which the primary goal is to promote student involvement and lifestyle within campuses. The main end users of the application are intended to be the student population who will be encouraged to download the application during orientation.

Students will have access to various information all in the one place via the application. Students will have access to a map to navigate around specific campuses. They will have access to weekly newsletters from clubs and societies to view events. They will have access to student union events and awareness campaigns and also they will receive promotional offers from on-campus shops.

Other users of the application will be students unions, clubs and societies and campus shops. They will each have access to a web portal where they can upload their information on a weekly basis. This information will be received by students via push notifications. These push notifications can then be customised by students based on their preferences.

The secondary goal of the application is to increase exposure and thus revenue of clubs and societies, students unions and on-campus shops.

Project Area: Mobile App

Project Technology: Java

Project Platform: Android

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Project Title:	Final Commissioning of Thermal Spray Facilities with Health & Safety Implementations and Audit
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Programme:	Manufacturing Engineering with Business
Supervisor:	Dr Joseph Stokes

Project Number: 123

This project involved conducting work in two thermal spraying facilities in DCU. A plasma spray facility which was of operational status but required the implementation of equipment and issues to be resolved with current equipment in order to improve the process. A high velocity oxy-fuelled (HVOF) spray facility which is in a state of decommission and required work to prepare the facility for operation once again, while also improving the health and safety standard. The tasks completed in both facilities focused on four areas; health and safety, process improvement, problem solving and issue resolution, and facility commissioning.

The scope and objective of this project differed from that of a traditional final year project; accounting for this fact it was approach in a different way more like a project would be typically in industry, employing the ethos of a project engineer and adopting project management tools. The project was dissected into four stages: initiating, planning, performing, and closing. The performing stage accounted for the highest effort and time. The work was identified as tasks and similar tasks were grouped into work packages. There were 8 work packages accounting for 29 individual tasks in total.

The plasma spray facility was successfully fitted with the traverse unit and all corresponding hardware was integrated. A test substrate mounting system was designed, manufactured, and implemented also. The substrate clamp incorporated an element of adjustment for standoff (distance from gun to substrate) which had previously not been available.

Significant progression was made in the recommissioning of the HVOF facility. The traverse unit was successfully mounted with a new gun mounting system. The new mounting system was required to house both HVOF guns simultaneously and was designed and manufactured as an element of this project. Assortments of health and safety improvements were successfully implemented on equipment and hardware in the facility.

Project Area: Advanced Material Engineering

Project Technology: Solidworks

Project Platform: Windows

Project Title:	Fabrication of Disposable Microfluidic Chips with Integrated Chemical Reagents for Microfluidic Analytical Applications
Name:	Gillian Carty
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Brian Corcoran

Project Number: 124

Fresh water is an essential finite resource, as described by the World Health Organisation (WHO) and the United Nations (UN)[1]. Without fresh water of adequate quality and quantity, sustainable development would not be possible[1]. Microfluidic chip and support technologies offer countless opportunities to those that utilise them[2] providing an excellent platform for water quality monitoring. This project required the development of a disposable microfluidic chip (MC) with an integrated chemical reagent that would be used for analytical applications of water quality monitoring in water bodies such as swimming pools, rivers, lakes and water treatment facilities.

The project commenced with an initial study of microfluidics and microfluidic chips. This was followed by the design and manufacture of a set of novel chips. Subsequent to this, testing involving the HACH power pillow chemical reagents for nitrite NO^ took place. Initially the reagents were tested using a UV spectrometer to determine the type of photodiode required in conjunction with a light emitting diode (LED) for testing on the chip and the reagents ability to be used at small volumes. A sensor holder was designed and manufactured. Finally, experimentation took place on a clamped chip with the powder reagent inside, focusing on phosphate testing with a brief look at nitrite. It was found that while the photodiode detector was not capable to distinguish between concentrations in a consistent manner. To conclude, further work and research is required on the use of HACH power pillow chemical reagents for phosphate and nitrite testing before they can be used as viable integrated reagents on Microfluidic Chips.

[1] Bartram, J., and Helmer, R,. (1996), Chapter 1, in Bartram, J., and Balance, R., Water Quality Monitoring – A Practical Guide to the Design and Implementation of Fresh water Quality Studies and Monitoring Programmes, United Nations Environment Programme and the World Health Organisation, [online], http://www.who.int/water_sanitation_health/resourcesquality/wqmchap1.pdf, (Accessed 5th April 2014)

[2] Whitesides, G. M., (2006)," The Origins and the Future of Microfluidics", Nature, Vol. 422 (7101), pp. 368-373, [online], http://dx.doi.org/10.1038/nature05058 (Accessed 3rd December 2013)

Project Area:	Microfluidics
Project Technology:	Solidworks, Catalyst, Hyper Terminal and M.Wave
Project Platform:	Windows

145
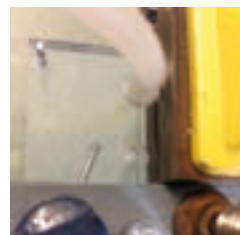
Project Title:	ComputeTY store
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Email:	karl.treacy5@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Jennifer Foster & Robert Hanrahan

Project Number: 125

This final year project is a 'ComputeTY Store', in the spirit of the Android Play Store, for the ComputeTY programme – a computer course run by DCU's School of Computing for Transition Year secondary school students which runs in January of every year. The ComputeTY Store allows students on the programme to store their best work, whether it be an Android app, a Java program or a link to a website they have designed. Students can search for and download each other's work, and their parents and teachers can also use the store. In the Apps section of the store, students can upload an image of their app, a description of their app and the app itself for download. In the Java section of the store, the students can upload an image of their program, a description of it and the code itself. In the Web Design section of the store, the students can upload a link to their website together with a brief description. Within the store, users can search by titles of apps, programs or websites.

Project Area: Web Application

Project Technology: Eclipse, JSP/Servlets, SQL

Project Platform: Windows

Project Title:	Implementation of 2D elements in a FEA smartphone app
Name:	Andrew McGrane
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Bryan MacDonald

Project Number: 126

Finite Element Analysis (FEA) is a technique used to model engineering systems. Typically, desktop software packages used to perform these analyses are very cumbersome and expensive. A lighter, portable version for mobile devices would be very useful to the modern engineer.

The goal of this project was to build upon an existing program so that in addition to the 2D truss elements already available, 2D constant strain triangle elements could be used to model engineering systems.

There is a distinct lack of effective, easy to use 2D Finite Element Analysis (FEA) apps for mobile devices. There are currently Smartphone apps which use truss and beam elements in their models, however these are unable to model complex solids. The addition of constant strain triangle elements facilitates the user to model two dimensional stress and strain problems such as a plate with a hole in it.

An investigation into the formulation of constant strain triangle finite elements was undertaken and its fundamental equations were adapted and used to create an FEA Smartphone app. The app was extensively tested to ensure its consistent and reliable operation.

The app performed just as well as a desktop FEA package when tested and the results obtained correlated with results found in literature. Upon examination of the fundamental equations of the constant strain triangle element it was found that as the shape of the element deviated from an equilateral triangle, it became increasingly unreliable at accurately predicting stress/strain behaviour. It followed that in order to maintain an acceptable level of accuracy a significant number of elements needed to be employed in the model.

Project Area: Mobile App

Project Technology: Java

Project Platform: Android

| **Project Title:**	Development of an aircraft traffic awareness system based on software-defined radio
Name:	Allan Healy
Email:	allan.healy35@mail.dcu.ie
Programme:	Information and Communications Engineering
Supervisor:	Dr Noel Murphy

Project Number: 127

In this project an investigation was carried out into the possibilities of localising air traffic within a pilot's vicinity by decoding relative aircraft transponder and secondary surveillance radar transmissions at 1.03/1.09 GHz via a Terrestrial Digital TV (DVB-T) dongle. An application has been designed through the use of Java and Bash scripts on a Linux environment to decode these transmissions as a result of that investigation. The application display resembles that of radar display used in air traffic control towers. Within a set range, the 'radar' displays airplane positions relative to the device for aircraft that are transmitting. Test cases have been performed and the results have been examined to check the soundness of the application. Issues related to the installation of this application in a light aircraft are explored with regard to safety and economics. Problems and solutions are identified within the scope of this project and recommendations for further projects are proposed. A conclusion is finally given on the whole project and what objectives have been met.

Project Area: Network Applications
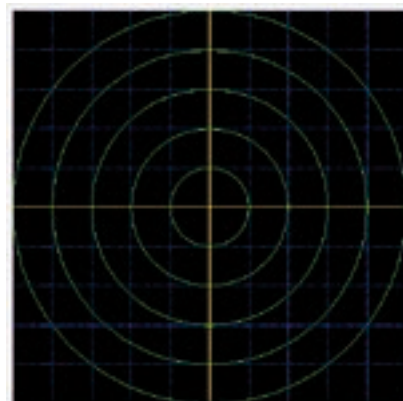
Project Technology: Java

Project Platform: Unix/Linux

Project Title: Design and Development of a Low Temperature Deposition Gun for Coating Applications

Name: Philip Marlborough

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Programme: Mechanical and Manufacturing Engineering

Supervisor: Dr Joseph Stokes

Project Number: 128

Cold spraying is a thermal spray process that applies a protective coating on the surface of materials. The material which the coating is applied to is known as a substrate. The coating material is accelerated to supersonic velocities onto the surface of the substrate in particle form using a converging-diverging nozzle. The kinetic energy of the coating powder is converted to plastic deformation energy upon impact with the substrate, forming a bond between the coating powder and the surface. Cold spraying operates at relatively low temperatures (650°C and below) compared to other thermal spray techniques. The coating material is in a solid state when adhesion occurs with the substrate. The cold spray process produces a coating that is dense, less porous, stronger adhesion, reduced oxidation, and reduced residual stress.

The aim of this project was to design and develop a low temperature deposition nozzle that could be attached to a heat gun to perform the cold spay process. This results in a cold spray process that's low-cost, practical, and portable. The nozzle was designed using fluid dynamic principles and through the research and analysis of previous experiments. It was developed further using Computational Fluid Dynamic software and through physical data gathered from experimentation.

When the final design was decided upon the nozzle was manufactured in the DCU workshop. It was then tested in the DCU thermal spraying room. A successful coating was not applied due to the high pressure in the converging side of the nozzle preventing the coating material from entering the nozzle. Further analysis of the process resulted in a number of possible solutions. One of the solutions include injecting the particles into the diverging side of the nozzle which is an area of low pressure. There was no opportunity to implement these solutions for this particular project but this is something which could be developed further in the future.

Project Area: Material Coating Technology

Project Technology: Solidworks

Project Platform: ANSYS

Project Title:	Robust Deconvolution and its Applications
Name:	Jonathan Maxwell
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Programme:	Electronic Engineering
Supervisor:	Dr Anthony Holohan

Project Number: 129

This project discusses robust deconvolution techniques and their many applications in signal processing. These techniques are widely used in image processing where they have applications in medical and scientific imaging. They are also used in seismology, most notably for oil exploration where system identification is required. The project contains a literature review of a selection of real life applications of these algorithms.

The application of these methods is generally an ill-posed problem because all the information we need is unlikely to be known. There will also usually be some unknown noise component related to the signal. Therefore the focus should be less on finding exact solutions and more on finding estimation algorithms capable of producing acceptable solutions for these problems. In many cases little or none of the required information will be known. In these situations, human judgement is needed to make certain assumptions of the signal or system in question.

The discussion will focus on Weiner filtering, the least squares deconvolution algorithm and Kalman filtering and a mathematical overview given. The aforementioned methods of deconvolution will also be implemented in Matlab for 1-D and 2-D problems. A degraded audio signal is chosen as a 1-D example and a blurred image is used to implement a 2-D example. The robustness of these techniques is tested under different conditions and a comparison on their speed, robustness to noise, efficiency and effectiveness is made.

Project Area: DSP

Project Technology: Matlab

Project Platform: Windows

Project Title:	StreetFixr
Name:	Niall Lennon
Email:	niall.lennon2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 130

StreetFixr is a hazard reporting service developed for use in conjunction with county councils across the country. It consists of two client-side services; an Android application and a web application for use by the general public and county councils, respectively.

The purpose of this service is to allow the general public to report any hazards and potential faults in their area in a simple and hassle-free way. The Android application is designed so users can quickly tag a hazard such as a pothole, faulty street lighting, illegal dumping of waste and graffiti, with minimal information. Once in the application, users will only have to select their hazard type and report it.

The administrator's side is a web application built using NodeJS, Express and MongoDB as the server-side technologies and Twitter's Bootstrap 3 and Google Maps API on the client-side. The web application provides users with a graphical interface to help them visualise the data that has been provided to them by the general public. Smart and simple filters allow the user to dictate what data is displayed and what isn't. The application can be accessed across all types of devices including all desktop browsers and selected iOS and Android browsers.

This service will benefit both communities and the councils that represent them. Any member of the public can track a hazard through its lifecycle from it being reported to its completion. Each council will get a constantly updating database of problems in their jurisdiction and a clean interface to manage and organise the crowd sourced data.

Project Area: Mobile App, Web Application

Project Technology: Java, Node.js

Project Platform: Multi-platform
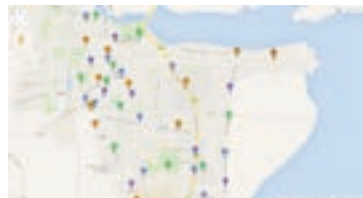
| **Project Title:**	Automated High Security Steel Door Assembly
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Email:	kevin.conway3@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Tamas Szecsi

Project Number: 131

Technology plays a large role in modern manufacturing. Through the introduction of automation and robotics into production lines massive savings can be achieved in efficiency increases and cost reductions. By increasing a company's manufacturing efficiency allows for growth and expansion through its ability to be competitive in what can be very volatile market places.

This project describes the development and design of an automated solution to increase efficiency on the high security steel door assembly line within Iron Images Ltd. The aims were to analyse current production processes and identify if there were any outdated production methods that through the use of new technologies could allow Iron Images to become more cost efficient and competitive as they further expand to European markets. This project was also intended to educate Iron Images as to how investment in production technologies can greatly benefit them in all of their future ventures by increasing their volumetric output and reducing manufacture costs.

The project presents finalised designs and costing of an automated linear welder for implementation with the steel door assembly line. Designed as a low cost solution with minimalistic initial capital for an introduction to autonomous manufacture within Iron Images, the welder after implementation will reduce the manufacture costs by 2%.

Project Area: Mechanical Design and Manufacture

Project Technology: Solidworks
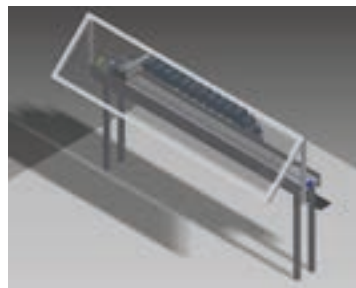
Project Title:	Mechanical Control of a Horizontal Axis Wind Turbine
Name:	Michael McCabe
Email:	michael.mccabe22@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Dr Yann Delauré

Project Number: 132

There are many hobbyists who have a great interest in renewable energy and the harvesting of natural resources on their own property. From this there has been a growing community of experts and DIY enthusiasts who share their methods in building a homebuilt wind turbine. Often amongst these designs, the Hugh Piggott fixed blade approach is adopted.

Even though the Hugh Piggott design may be used by many owners of a homebuilt wind turbine, it is not clear if this is the most economical or efficient approach when harvesting the wind.

In this project, the common industrial approach of using a variable pitch hub to allow the change in the pitching angle of the blade will be looked at. A detailed design solution will be presented, and the theoretical analyse of the performance of the new concept will be completed, using a free available software package, Qblade. The blades from the Hugh Piggott design will be integrated into the final design of the hub and a comparison between the variable pitch design and the original Hugh Piggott was made.

The software package used in this project produced crucial parameters to allow the performance of both designs to be assessed and a comparison to be made between the new variable pitch design and the original Hugh Piggott solution.

From this, the results that were produced show how certain aspects of both designs have there benefits, but for small wind turbine owners, the variable pitch hub design that was looked at in this project was not justified.

Project Area: Renewable Energy Technology

Project Technology: Solidworks
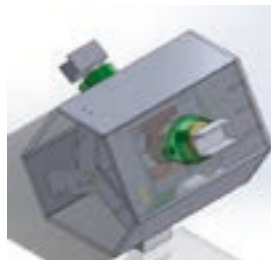
Project Title: Reducing process variation in a multi-product manufacturing site, through the visualisation of data and process improvement

Name: Jake Jackson

Email: jake.jackson3@mail.dcu.ie

Programme: Manufacturing Engineering with Business

Supervisor: Dr John Geraghty

Project Number: 133

The purpose of this project was to reduce the process variation in a multi-product manufacturing site through the visualisation of data and process improvement. The project would use performance metrics as a visual measure of performance, which in conjunction with lean tools and methodologies would be used to identify and eliminate waste within the system while measuring the level of improvement achieved.

This project began by researching different Lean Six-Sigma tools and methodologies which could be used. The Six-Sigma DMAIC project methodology was chosen as it was identified as having the quality's necessary to satisfy the project requirements. OEE was chosen as the performance metric to be used due to its ability to visually indicate the level of improvement made through improvement efforts as well as allowing the company to benchmark its manufacturing performance against other sites worldwide. In conjunction with the OEE data, Lean tools such as Root Cause Analysis, Pareto analysis and control charts were used to systematically identify and remove the main critical faults within the process. Once the limiting constraints were removed the process was run and new performance measures taken to test whether or not the improvement efforts had been successful. When verification was received confirming some level of improvement, control procedures were put in place to ensure improvements were not forgotten and reverted back to old methods.

In conclusion the efforts of this project successfully achieved the deliverables and resulted in a reduction of machine downtime while reducing the inherent levels of variation present within the process. This reduction in machine downtime results in a better utilisation of equipment by reducing machining time required to manufacture a batch of product and, therefore, reducing the total cost of production. Through the efforts of this project OEE experienced a total increase of 7%, reducing operating costs by approximately $50k per annum. The reduction in process variability allows the company to create more accurate production schedules, reduce the amount of over time required to process batches that overrun the scheduled duration and ensure customer deadlines are consistently achieved.

Project Area: Overall Equipment Effectivness (OEE)

Project Technology: Rockwell OEE

Project Title:	Finite Element Analysis of a Mechanism for an Electric Vehicle
Name:	Céin Sheridan
Email:	cein.sheridan38@mail.dcu.ie
Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Paul Young

Project Number: 134

This project deals with the design and optimisation of the E1000 Eco-Volve battery powered electric work vehicle. It is versatile indoor and outdoor high tip dumper, capable of carrying a payload of up to one tonne. Using the SolidWorks Simulation software program an analysis of the existing lifting mechanism design was undertaken. The Simulation Solver is a finite element method solver, used by engineers to predict and test the capabilities of a product without the need for a prototype.

After an initial FEA study was completed the configuration of the design and the material dimensions were optimised to ensure the safe working conditions of the vehicle and the user. Optimising the design required modifications to the original concept improving the areas which the Simulation study indicated as weak points, or where failure occurred.

After the optimal design was developed a final FEA study was carried out for all working positions of the mechanism through the lift cycle. The outcome of this final analysis proved the design modifications improved the strength, resisted deformation and improved the overall safety of the mechanism.

The knowledge built up over the course of the project, was finally used to create an instruction manual on how to use the SolidWorks Simulation program. It provided a step by step guide to the setup, processing and the post processing of the software program; which could be used for future work or where no previous knowledge of Simulation was had.

Project Area: 3-D Modelling

Project Technology: Solidworks

Project Platform: Windows

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Project Title:	TechDesk
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Email:	conor.burke2@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Brian Stone

Project Number: 135

TechDesk is an interactive tech support application based on Android OS. TechDesk allows users to both seek and provide IT support over a range of problem areas and platforms.

TechDesk is based around an Android application to ensure users can request support on the go, parallel to this will be a functional website developed for both marketing purposes and indeed interactive support functionality itself. This allows users a choice of device to use TechDesk ensuring the effected device can be addressed.

Users requesting support labeled, as Seekers will input their problem area and description, this will be queried against engineer's inputted skillsets and bio. Users will retrieve a list of suitable engineers, and based upon reviews, feedback, pricing and availability they will choose and begin communication with that engineer, to bring the issue to resolution.

TechDesk will launch initially to the Ireland and United Kingdom markets, and will market itself through different and unique channels depending on the registration point of the user, whether seeker or engineer.

To gain revenue TechDesk will use a commission based mechanism, their will be an initial 15% commission on each completed support issue, engineers will be able to work their commission down over time and usage, the model for this is detailed in the documentation.

Project Area: Mobile App

Project Technology: HTML5

Project Platform: Proof of Concept – (Android)

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Project Title:	Location Based History App for Android
Name:	Baris Batiege
Email:	baris.mckenna7@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Monica Ward

Project Number: 136

This project is an Android app which takes GPS coordinates from an Android phone, uses the coordinates to find culturally or historically relevant sites near the phones location and then displays information regarding those sites to the user. The idea behind the application is to have a simple way to find out interesting information about your current locale.

A use case could be a tourist hiking in Connemara who uses the app and is given a list of historical information about it, two examples of which would be the Ó Cadhla clan who ruled the lands up to the 13th century or the megalithic tombs scattered around the land.

The application was developed mainly in Java, makes use of Google Location API for gathering location data and gathers the information to be displayed to the user through a web scraping system. Both English and Japanese languages are supported by the app.

Due to how information gathering is handled by the app, there is no set area where the app could be used, theoretically it should function correctly anywhere in the world. However, in practice, language barriers and lack of data may limit its usage.

Project Area: GPS GIS, Mobile App

Project Technology: Java

Project Platform: Android

Project Title:	Age of Empires for iPad and iPhone
Name:	Dan Malone
Email:	daniel.malone9@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 137

AOE for iPad and iPhone

This project is a 'port' of Age of Empires II for iDevices, and Android through Apportable.

This game mimics the features and graphics of the original Age of Empires game, implemented through Objective-C with no original code re-use. The interface has been optimised to allow fluid interaction on mobile.

I believe most games created for mobile platforms are still quite lighthearted and lightweight, intended for 10-15 gameplay at a time; when mobile games are compared to their equivalent console based games, a fairly obvious divide is clear.

I believe the reason for this is primarily to do with interface. Touch screen interfaces are not suitable to most popular game types such as First Person Shooters, which require flexibility and fine detailed control.

However the current generation of phones contain processors and memory far exceeding their current usage. I feel that other popular game types have a home on mobile. These game types include Real Time Strategy games.

I intend to justify the mobile platform as a home for high end games; I believe interface is the big barrier and my port of AOE displays that a strong interface can make previously inaccessible markets accessible.

This project is written primarily through Objective-C, with a Rails back-end for saving state.

I am using the Spritekit Framework provided by Apple. Spritekit is an Apple implementation of the popular open source Cocos2d framework for 2D Game Development.

Graphical assets are used under the Microsoft 'Game Content Usage Rules'.

Project Area: Gaming, Graphics, Mobile App

Project Technology: Objective-C, Ruby, REST

Project Platform: iOS

Project Title:	The Investigation of Lean Replenishment Optimisation Strategies
Name:	Ronan O'Byrne
Email:	ronan.obyrne4@mail.dcu.ie
Programme:	Manufacturing with Business Studies
Supervisor:	Dr John Geraghty

Project Number: 138

This report presents a combinatorial optimisation algorithm that has the purpose of minimising the number of Mizusumashi that continuously replenish production lines in a manufacturing facility. The implementation of this algorithm will enable the management of workers or even a fleet of vehicles to determine if too many are currently being used to carry out the task. Employers are consistently looking for new ways to save money and reduce their costs. A frequently encountered problem in the workplace is excess staff working on a particular task. The algorithm presented in this study promises to decrease the costs for organisations in which it is implemented as it selects the optimum route which should be taken thus reducing the overall time.

Previous studies offer descriptive accounts of vehicle content and route optimisation problems individually; however studies with the two combined were practically non-existent. The literature review addresses the algorithms which were examined and implemented. Initially these algorithms were looked at individually, however through advancements in the coding the two types of optimisation could be combined. Throughout the development of the algorithm constraints had to be considered. In relation to content optimisation, dimensional constraints of the products were in place to determine the number of items that could fit within the logistics cart, providing its capacity was not exceeded. For the route optimisation aspect of the algorithm a constraint was implemented to ensure that the replenishment is carried out within the two hour time frame of the milk-run. The efficiency of the algorithm was tested on a number of theoretical layouts presented in the report; interlocking doors and clean rooms were added to increase the problem's complexity.

Overall this Final Year Project presents the results which are the first stepping stone towards the proper development and implementation of this program in an industrial related field. A descriptive model and breakdown on how the results were obtained enables further research and development to be carried out. The project concludes with some recommendations for future development.

Project Area: Operating Systems Development

Project Technology: Matlab

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Project Title:	SimpleLife – Third Level Student Discount Service
Name:	Declan Clarke
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Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 139

'Do the simple things and do them well...' – Con Clarke

SimpleLife is a cooperative web and mobile application designed to enhance the third level student discount process. The idea is to be able to offer a better range of discounts to students through participating partner stores and businesses while streamlining the overall process into a more modern, technological fashion.

The web application, developed on the Play! framework with HTML5/Twitter Bootstrap 3, serves as the power house behind the whole project. The user creates an account online to use the service and to gain access to the app. Only verified students can register and this is ensured by requiring a sign-in through your college portal. Once registered, the user can log into the mobile app and begin availing of discounts in participating stores. Discounts are claimed using a digit code/QR-scan feature.

The project itself is a proof of concept currently and has plenty of room for additional features. In an ideal world, this project would benefit from the use of RFID/NFC technology to allow 'quick swipe' discounting.

Please drop by on the day to see the project demo in action. If you have any questions, I'll be happy to answer them for you.

Project Area: Mobile App, Web Application

Project Technology: HTML5, Java

Project Platform: Multi-platform

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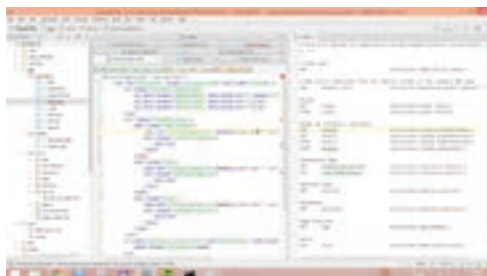
Project Title: High Saturation Power Semiconductor Optical
Amplifier

Name: Joseph Byrne

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Programme: Electronic Engineering

Supervisor: Pascal Landais

Project Number: 140

Optical communications is the main area where advances in communications technology have been seen in the recent past. One of the main areas we can see the use of optical communications is in the the roll out in the last decade of high speed fibre broadband. The high speeds associated with broadband systems are made possible by the use of optical fibre communication channels. One of the aspects of using optical fibre signals that must be considered is the attenuation of the signal in the fibre. Signal amplifiers are used to boost the signal in the fibre at intervals along the network. Most signal amplifiers convert the signal to an electrical signal before boosting the signal. One of the advantages of the SOA is that it boosts the optical signal without the need for conversion. The main disadvantage of the SOA is that the output power saturation point, the point below which is inappropriate for signal amplification, is quite low in comparison to other signal amplifiers. This project is an investigation into certain parameters to produce an optimum high saturation output power. The main concept relies on control of the carrier density within a multi-contact SOA and predicting the best solution using a number of methods including using the genetic algorithm to help produce the best results.

Project Area: DSP

Project Technology: Matlab

Project Platform: Windows
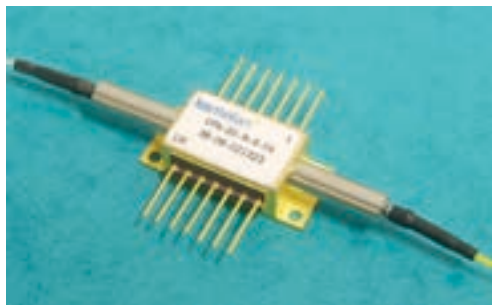
Project Title:	Event Mapping & Tracking
Name:	Declan Thomas Sweeney
Email:	declan.sweeney2@mail.dcu.ie
Name:	Aaron Doherty
Email:	aaron.doherty26@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Alistair Sutherland

Project Number: 141

Often when an event is being held in a large area, be it for entertainment, social, sporting, political or business reasons, many people visit locations for the first time and don't know how to get there or find their way around the event. They have very little knowledge of the surroundings, nearby facilities, and most importantly in the case of festivals and business conferences, where all the important places of interest are located. This can often leave people late, frustrated, and racing around asking for directions. With modern technology this is completely avoidable.

Our application, is a location aware smart phone event app that will utilise Google Maps technology, and provide the user with a dedicated map of a specified event location. The app will display an array of entities that the user can then select to view details about, and furthermore the user can map a route from their current location to the chosen entity.

The app also provides different functionality, which will aid the user at a given event. The 'Take Me Back' feature allows the user to save their current locations and return to them at a later time by tracking the saved location via GPS. This will save the user both time and effort and will allow them to quickly retrace their steps. An example is finding your tent at a festival like Electric Picnic, or finding your car after the festival has ended. This handy app will undoubtedly improve your event experience and provide you with the simple tools necessary to find your way around with ease, get information about the surrounding area, and retrace your steps in one service.

The most impressive functionality of our app is the capability of users to create a group of friends who also have the app. Users can then locate each other via the app which accurately pinpoints friends locations on a map. This feature is likely to be very popular, especially at very crowded events such as concerts and festivals where people tend to get separated from each other for large periods of time. It can also be looked at as a security feature.

Project Area:	Information Retrieval
Project Technology:	Java
Project Platform:	Android

| **Project Title:** | Injection moulding of composite materials for biomedical applications. |
Name:	Fiachra Cleere
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Programme:	Biomedical Engineering
Supervisor:	Dr Garrett McGuinness

Project Number: 142

The aim of this project was to manufacture a composite biomaterial, through injection moulding, suitable for interfacing with human bone. Polymer/ceramic composites have great potential as bone interface materials for low loading applications. The introduction of ceramic into a polymer matrix has been found to increase the Young's Modulus to within the lower ranges of cortical bone. A widely used ceramic for this application is hydroxyapatite (HA), which bears a close resemblance to the calcium phosphate phase of bone and as a result has excellent bioactivity and biocompatibility properties.

A suitable simplified manufacturing route had to be deployed to produce composites of suitable quality. The composite itself consisted of polypropylene (PP) and HA at a ratio of 80% and 20% respectively. This process involved dry mixing the two materials before feeding them into an injection moulder. The effects of changing the manufacturing route and process parameters were investigated. Initial attempts produced a composite of inconsistent quality, exhibiting an unusual and unfavourable response to loading. Recycling of initial mouldings was found to produce composites with a significantly and consistently increased value for Young's Modulus, to the order achieved in reviewed works. Varying the processing temperature was found to have mixed results. Composites manufactured at a temperature of 200°C were found to have little or no increase in Young's Modulus. This report contains detailed analysis of the stress/strain behaviour, fracture surfaces, and compositional makeup of the tested composites and also recommendations for future development of this work.

Project Area: Advanced Material Engineering

Project Technology: Injection moulding and Zwick Tensile Testing

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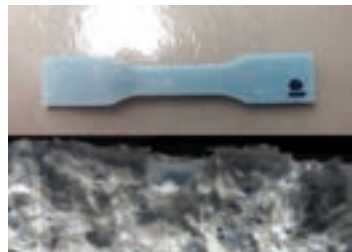
Project Title:	Vinyl Record Scratch Detection and Classification
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Email:	daniel.irwin2@mail.dcu.ie
Programme:	Electronic Engineering
Supervisor:	Prof Paul Whelan

Project Number: 143

Although vinyl records are no longer a popular medium in which we listen to music today, with the rise of online auction websites, such as eBay and Amazon, there has risen a very large collectors market, for old vinyl records. These records can be very valuable depending on the rarity of the record and more importantly, the condition of the record. One of the factors that can determine the value of a record, is how badly scratched the record is.

The aim of this project is to use image processing and analysis techniques to develop a system, which automatically detects scratches present on the record and classifies the degree of scratching on the surface of a vinyl record. This information could be very important to collector who can't physically view the condition of the record. A person selling a second hand vinyl record could potentially use this information, when advertising the record on an online auction site or in a shop.

Project Area: Image Video Processing

Project Technology: Matlab

Project Platform: Windows

Project Title: Complete Farm Management

Name: John McDonnell

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Name: Robert Fullam

Email: robert.fullam2@mail.dcu.ie

Programme: Enterprise Computing

Supervisor: Jennifer Foster

Project Number: 144

Complete Farm Management is a Web Based Application targeted at the Irish Agricultural Industry with a view to expand to the Global Agricultural Industry. This Application will allow users to make their business more profitable and more efficient as global demand for food continues to increase. Our application will allow users to gain a competitive advantage over their competitors.

In the Irish Agricultural Industry today, the majority of information is stored on spreadsheets and paper based systems. These record keeping systems can be hard to manage and can be difficult to leverage in order to gain competitive advantage within the market. Our application aims to bring all of this information into one centralised location to be readily accessed by the user at anytime from anywhere.

The main reason we chose this project is that we believe that all farms should be brought into the modern technological age. Machinery has become more technological and has improved efficiency greatly. However the same strides have not been made in farm management.

We believe that there is a huge gap in the market for our product as farmers wish to increase profitability and efficiency in an age where the cost of running farms is increasing.

The agriculture industry accounts for over 36% of the global workforce but there is a lack of useful software tailored towards farmers. Complete Farm Management aims to introduce this software to farmers. It will allow farmers to map out their own farm on interactive maps. It will allow them to record and manage significant information about their fields including crops, nitrates, fertiliser, spraying dates, under sow and yield. The tool shall also allow management of other important aspects of farm life such as livestock and machinery.

Project Area: Web Application

Project Technology: PHP

Project Platform: Multi-platform

Project Title:	SmartCast
Name:	Ervin Slavotic
Email:	ervin.slavotic2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Dr Stephen Blott
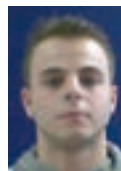
Project Number: 145

SmartCast is an easy to use podcast player which plays podcasts sequentially in the order they are streamed in and also a podcast player which is less complicated to use. Another important feature which is intended for SmartCast is its method of organising users' podcasts, it eliminates the categorisation feature which is present in most podcasts rather it just plays podcasts as they are streamed into their corresponding time stamped folders. This enables users to have an ongoing playlist of variety in their

SmartCast gives users variety to what they are listening to. The media player uses a very simple data structure which the user can manipulate in that the user can just simply listen to podcasts the sequence they are downloaded in or they can move their favoured topic up and down the play queue.

Project Area: Mobile App, Multimedia, Software Development

Project Technology: Java, XML

Project Platform: Android

Project Title:	Automation of a Dust Sampler
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Programme:	Mechatronic Engineering
Supervisor:	Dr Lorna Fitzsimons

Project Number: 146

The focus of this project is environmental monitoring, and in particular, air and soil monitoring. The key driver for this research was a 2004 Environmental Protection Agency (EPA) report concerning heavy metal pollution in the Silvermines region of County Tipperary. The EPA report recommended an automated approach to pollution testing to replace conventional methods which had a number of disadvantages, for example, the length of time required to process results and the potential exposure of the tester to harmful heavy metals and other toxic substances.

This project builds on previous work undertaken in CLARITY. The aim of this project was to further develop an existing rig for autonomous, in-situ testing for airborne heavy metals. The rig incorporates an X-ray Fluorescent (XRF) analyser that detects substances at the elemental level. Interested stakeholders potentially include environmental monitoring agencies. The project involved a number of important mechanical and electronic engineering developments. An Arduino Microcontroller was introduced to control the system, thus making it easier for people to use and adapt. The system includes two stepper motors and the circuitry was adapted for easier power management. The project also involved the design and fabrication of a container for holding the tested samples, thus improving traceability. Initial testing was undertaken to determine the feasibility of pumping the particulate onto the filter paper for testing. In order to do this, separate testing was required to determine the optimal thickness of the sampled airborne particles. The report presents the system developments to date and the results of the preliminary XRF testing.

Project Area: Mechanical Design and Manufacture, Microcontroller

Project Technology: C/C++, Solidworks
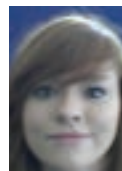
Project Platform: Arduino

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|	
Project Title:	Develop a New Method of Determining the Setting Time and Adhesive Properties of a Novel Hydrogel Composition
Name:	Sarah Brady
Email:	sarah.brady33@mail.dcu.ie
Programme:	Biomedical Engineering
Supervisor:	Garrett McGuinness

Project Number: 147

Approximately one to six percent of the population have an unruptured cerebral aneurysm. A ruptured aneurysm can lead to stroke, disability or death. Due to the severity of a ruptured aneurysm, research is taking place to determine the best treatment to prevent an aneurysm from rupturing. One treatment method that is showing positive results is using a hydrogel, a biocompatible polymer, as a filling material to stabilise the aneurysm.

The aims of this project were to manufacture and determine the mechanical properties, setting time, adhesive strength and injectability of a novel hydrogel. This novel hydrogel, called EnduraGel, was developed in DCU.

Compression testing and tensile testing were carried out to determine the novel hydrogels mechanical properties. As the novel hydrogel will be injected into the cerebral aneurysm through a catheter the setting time and injectability had to be determined. A component and experiment were designed to find the time the novel hydrogel sets at room temperature and at 37°C, which is body temperature. The injectabilty was determined by injecting the novel hydrogel through a catheter and the bond strength of the novel hydrogel was tested by completing a peel test.

Project Area: Advanced Material Engineering

Project Technology: Solidworks
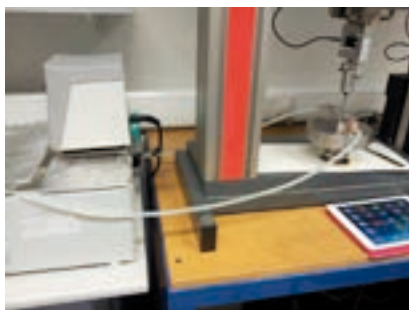
Project Title:	Educational Platform Development for Control Theory
Name:	Ian Carey
Email:	ian.carey3@mail.dcu.ie
Programme:	Electronic Engineering
Supervisor:	Ms.Jennifer Bruton

Project Number: 148

The area of control theory and systems analysis has become highly important in recent years. With the advent of small and relatively cheap microcontrollers more and more physical systems are no longer neither purely mechanical nor electrical/electronic. As such control theory and systems theory seeks to combine the analysis of these fields under one umbrella.

This project details the development of an educational platform for use in teaching control theory and systems analysis. The centrepiece of this design is a physical apparatus which is controlled by a micro-controller and is capable of interfacing with MATLAB. This project illustrates the early conceptual phases of the design of the physical apparatus all the way through to the final implementation of the finished system.

For the final implementation of the apparatus a stepper motor was used as the main actuator. Optical position sensors were also used to form a system feedback loop. The Arduino prototyping embedded systems platform was used to provide I/O capabilities for these actuators and sensors.

In this project, a phase lead compensation approach was adopted to implement the position control of the ball on the physical beam. Simulation studies give encouraging results regarding the applicability of the developed controller design whilst the documented experimental results highlight the constraints and limitations of the approach with respect to the actual physical rig.

Project Technology: C/C++, Matlab, Simulink

Project Platform: Arduino

Project Title:	GrandJob.ie
Name:	Daniel Grimes
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Programme:	Computer Applications
Supervisor:	Mark Humphrys

Project Number: 149

GrandJob.ie is a complete hiring and bidding web based solution aimed towards the freelance market of Ireland. The idea is to enable both those who are looking to hire and the freelance workers themselves whilst maintaining a competitive marketplace that see's both parties receiving the deal they want. The site itself will greatly benefit small businesses and individual traders that might indeed have the required skill set but would otherwise become overlooked and drowned out by big businesses and their powerful advertising campaigns.

Those who are actually looking to have work done can easily submit a job, describe exactly what they want, define a budget and timeframe and then wait for the bids to come in. A reputation system ensures trust between bidder and employer, weeding out the good from the bad and once the employer is satisfied they can accept their desired bid and upon doing so contact is then established between the two.

The term 'nixer' is a common one in Ireland and well GrandJob.ie will be a site for just that. Enabling the self-employed and those looking for extra work to have a the opportunity to bypass your standard means of operation and find work directly from the source.

Project Area: Web Application

Project Technology: HTML5, JavaScript, JQuery, PHP, SQL

Project Platform: Multi-platform

🚀 GrandJob.ie

Project Title:	Gym Buddy – Phone application that uses NFC tags
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Email:	joseph.finnerty4@mail.dcu.ie
Name:	Alan Lawton
Email:	alan.lawton3@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Mark Humphries

Project Number: 150

The vision for this project is to create the concept of a product that will enhance and improve a gym users experience while also benefitting the gyms. The product will provide gym users with clear information and tutorials on how to use each piece of equipment in a gym to its full potential by leveraging NFC tags. It will also offer the usual services that you can expect from a gym related phone application such as dietary information and workout plans, making this application the complete gym companion.

On the user end, the product consists of a phone application and an NFC tag. The phone application enables the user to enter their profile details and goals, the phone will also read the NFC tag. The NFC tag will be placed on each piece of gym equipment in a gym. The nfc tag will tell the phone application which machine is about to be used. The application will then cross reference this information with the users information to provide the tutorial suited to that person. The application will then stream the related video to the users phone. These videos will be stored on our database ready to be streamed. The gym will have the option to create these tutorials themselves if they wish, if not we will have our own tutorials available.

Additional features include:

- A workout planner, that works with the tags to cross completed sets off the list.
- Analysis capabilities for the gym to use.
- Gyms can include any news/updates/adds.
- App will have links to social media.

Project Area: Mobile App

Project Technology: Java

Project Platform: Android

Project Title:	G.A.A. Match Stats
Name:	Conor Smith
Email:	conor.smith42@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Mark Roantree

Project Number: 151

The G.A.A. Stats app is a mobile based application which allows users to record scores and game events during a Gaelic match. The recorded data is then used to display notifications & various real-time statistics to the user during the match.

The mobile app allows the user to create two teams and configure game rules such as game length & number of players. The application can optionally allow for location and weather data to be recorded, but this is not critical to the project functionality.

During a Gaelic game, the system allows game score and game time recording for basic game statistics. Players can be created and edited to match real-world data (E.g. player name & position) and players can be substituted when required. The user can optionally record various in game events and the consequence of that event (E.g. booking, score, wide). Each event is assigned to a specific player to allow for fine grained statistics and player accountability. The above functionality can be recorded for both home and away teams so detailed data can be gathered. The data recording is achieved through a "game-view" user interface. A sample of possible game events are as follows:

- Fouls: Free/Penalty
- Shot: Free/Penalty/45/Side-line/Play
- Kick-outs
- Turnovers

Statistics can be generated from recorded game data. These statistics can be in displayed in both textual and graphical formats and allow the user to compare specific events against the opposing team. A time log of events is also be available to the user. The statistics are presented in a simplistic and intuitive manner to clearly show strengths, weaknesses and/or correlations throughout the match. This allows a consumer to deduce informed decisions to aid and/or remedy any areas of concern highlighted by the statistics.

The statistics are generated in real-time to allow the user to switch from a recording data view to live statistics view with ease. The system compares recorded values against pre-defined business rules and supply the user with live notifications if required.

Project Area: Mobile App

Project Technology: Java

Project Platform: Android

Project Title:	Gomoku
Name:	David Hand
Email:	david.hand6@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Dr David Sinclair

Project Number: 152

Gomoku is an abstract strategy board game, it is traditionally played with black and white stones on a go board. Although this japanese board game is over 2000 years old it is extremely popular today. The object of the game is to be the first player to get an unbroken row of five stones, this can be done in a vertical, horizontal or diagonal direction. This project is an android adaptation of Gomoku where the user can play online or against an AI. The problem with Gomoku is that it produces a large search tree and exhaustive searching would be impractical. The app uses alpha beta pruning, an advanced AI algorithm to minimise the search tree and create an efficient AI. The app is written in java with XML used to create a touch and drag interface to allow the user to move stones into place and make their moves. The multiplayer option allows the player to find an opponent online or play against a friend via a server.

Project Area: Mobile App

Project Technology: Java

Project Platform: Android

Project Title:	Deals Companion App
Name:	Adam Goodison
Email:	adam.goodison3@mail.dcu.ie
Name:	Gary Delahunty
Email:	gary.delahunty2@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Jane Kernan

Project Number: 153

The Deals Companion application is a web and mobile based application that would allow customers to find deals offered by local businesses within a specific radius of their current location. The Deals Companion application will have a cloud database system that will communicate with the businesses database system where offers will be updated and synchronised to the cloud database and then with the application.

The Deals Companion application will automatically find a user's location using GPS or alternatively the user can manually enter in their location. Based on the user's location, the Deals Companion application will suggest deals that are currently on offer by many local businesses within a specified radius of the user. Once the user selects a deal to purchase, they have a number of options available to them, they can select 'Pay in-store' and the item will be reserved in-store for a specified time, they can also pay for the item directly through the Deals Companion application and collect the item from the retailer or opt for 'Pay & Post' the availability of this option is dependent on the retailers providing this service.

The Deals Companion application was developed in response to the need for users to be able to view local deals on the go and collect that day. The main online sales application companies only offer postage which means users can be waiting up to ten working days for their item. Our application allows user to collect the item in-store or have it reserved in-store for a specified time as well as posted.

The Deals Companion application is currently a proof of concept project. Based on our market research we feel this project has the potential to excel, and we would like to see it developed in the future.

Project Area: Web Application, Cloud Computing

Project Technology: SQL, HTML

Project Platform: Multi-platform

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Project Title:	Sensor subsystem for an aircraft attitude/ heading reference system (AHRS) demonstrated on a self-leveling/orienting platform
Name:	Eoin O'Hobain
Email:	eoin.ohobain2@mail.dcu.ie
Programme:	Mechatronic Engineering
Supervisor:	Dr Noel Murphy

Project Number: 154

Accurate and reliable attitude and heading information is essential to the safe operation of an aircraft. Solid-state sensors are gradually replacing less-reliable mechanical ones, and allowing connection with on-board computer systems for efficient information displays as well as inputs to autopilot systems – even for small aircraft.

In this project the author explains the application and the importance of autopilot systems. The author explains the operation of the sensors used for information displays and autopilots, how they work and their limitations.

The software implementation used to read the sensors as well as the processes to convert the data into a robust and reliable form, are explained and derived by the author. This includes the use of digital filters to improve the quality of the data derived from the sensors.

The equipment used to implement a self-leveling/self-orienting platform are described. The role of each piece of equipment is explained and a comparsion against other available equipment is given.

The author gives a detailed account of testing the software system implemented in the project. The testing demostrates the sofware ability to read, filter and fuse the sensor's data to give a reliable and robust output.

Project Area: Embedded Systems

Project Technology: C/C++

Project Platform: Arduino

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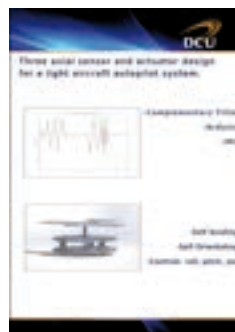
Project Title:	Design and Fabrication of an Arduino-Based Solar Tracker
Name:	Shaahad Shaamile
Email:	shaahad.shaamile2@mail.dcu.ie
Programme:	Electronic Engineering
Supervisor:	Prof Patrick McNally

Project Number: 155

Global warming, climate change, the unsuitability of fossil fuels and their massive pollutive impact on mother earth has increased human attention towards renewable energies such as solar energy. Solar energy is one of the most important renewable energies that can lead to a clean environment, less money spent on utilities and a healthier world.

Solar cells which convert the sun's energy into electricity are costly and inefficient. Different mechanisms have been applied to increase the efficiency of those cells to maximise the output energy. A solar tracker system is the most appropriate technology to enhance the efficiency of solar cells by tracking the sunlight throughout the day, thereby ensuring the greatest possible incidence angle of the sunlight onto the cells.

This project presents the design and fabrication of a low cost microcontroller-based solar tracker. Light dependent resistors are used as the sensors for the solar tracker and the designed tracker will provide two degrees of freedom for movement.

Project Area: Control Systems

Project Technology: C/C++

Project Platform: Windows

Project Title:	Development of a Simple CAD Smartphone app
Name:	Conor Traynor
Email:	conor.traynor4@mail.dcu.ie
Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Bryan MacDonald

Project Number: 156

The objective of this project was to develop a simple CAD (Computer Aided Design) smartphone app for the creation and modification of engineering drawings in the field. Due to the time limitations on the project a two specific objectives were identified: the app should allow the user to draw basic geometric entities (line, circle, rectangle) and the app should be capable of importing drawings from other CAD software using the DXF graphics exchange format.

Initial work consisted on learning to program using Java and, subsequently, learning the specifics of programming the Android System. As this project will be further developed by final year students in coming years, it was important that the code was developed in such a way that it is easily understandable and easily adapted.

The Android user interface (UI) was designed to initially show two options: create a drawing or import a drawing. Touching either of these options on the Android device brings the user to an appropriate screen. The create screen provides methods for entering the coordinates of the three primitive types (line, circles, rectangles) and provides a canvas on which the resultant drawing is automatically displayed. The import screen opens a file picker which allows the user to point a DXF file containing a CAD model. The import facility currently finds the first line in the CAD model, determines its start and end coordinates, transitions to the create UI and displays the line on the canvas.

In conclusion, a simple demonstration CAD smartphone app has been developed. Although the functionality of the app is currently quite limited the code is capable of being readily expanded to introduce additional functionality by subsequent final year project students.

Project Area: Mobile App

Project Technology: Java

Project Platform: Android

Project Title:	Quantifying Exergy Losses in the thermo-fluids lab
Name:	Edward Condon
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Lorna Fitzsimons

Project Number: 157

The objective of this project was to complete an exergy and energy balance of thermodynamic equipment in the thermofluids lab. The equipment that have been analysed include a double pipe heat exchanger, an air and water heat pump, a refrigeration unit and an air conditioning unit. The aim of the project was to compare the energy and exergy balance approaches and to determine whether an exergy analysis was necessary for thermal systems.

Due to the effects of global warming becoming more apparent, the need for efficient use of natural energies is clear. The combined use of energy and exergy analysis is a key thermodynamic theory which can determine the complete performance of a process. An exergy balance defines the level of energy degradation in a system as well as its ability to do work.

On completion of the analyses it was found that the use of both an exergy and energy balance can help determine a system's ideal operating conditions. The advantage of an exergy balance becomes clear when each component in a system is analysed. An exergy analysis locates areas that account for high a percentage of the exergy destruction and inefficiencies in a system. By determining the coefficient of performance and the exergy destruction in each system the ideal operating conditions can be determined. For the heat pump, refrigeration unit and air conditioner it was found that the condenser accounts for a significant amount the of the exergy destruction in each system, while other critical components such as the evaporator, compressor and expansion valve have less of on an overall effect on the total performance. However, an improvement in their efficiencies will still have a positive effect on the overall performance.

Project Area: Thermodynamics

Project Technology: LabVIEW

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Project Title:	Electrical Contractor Management System
Name:	Conor Murphy
Email:	conor.murphy246@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Monica Ward

Project Number: 158

This web application is aimed to increase productivity and consolidate data within J.Vaughan Electrical. The idea is to take existing systems within the company, and provide access to a single application containing all of the company's data. It will save time and effort for the company through the use of the simplified user interface.

It will grant members of staff different levels of access through the application, while storing all the data in an easily accessible database. Users can effortlessly add new information about the company sites, their employees and tools upon their sites. This will ensure that all the information stored is up-to-date and correct. This will help with stock taking, employees working hours, as well as loss prevention.

This web-application was built using the Java Spring MVC framework. It was developed and deployed using an array of OpenSource technologies, some of these include PostgreSQL, Tomcat, Maven, Hibernate and Bootstrap. The application has been extensively tested using JUnit for unit and integration tests, Selenium for User-Acceptance Tests, as well as dummy-tested by the company to ensure correct functionality and accessibility.

Project Area: Web Application

Project Technology: Eclipse, HTML5, Java, JSP/Servlets, XPath, Selenium, JUnit, Java Spring, Tomcat,

Project Platform: Unix/Linux

Project Title:	MouseFree
Name:	Donal Anglin
Email:	donal.anglin2@mail.dcu.ie
Programme:	Computer Applications
Supervisor:	Alistair Sutherland

Project Number: 159

MouseFree is an application for the Leap Motion Controller. The Leap Motion Controller is a small device that is placed on the desk in front of the user and uses two monochromatic cameras and three infrared LED's to track the space above it and recognise objects like the user's hands and fingers as well as tools such as pencils and pointers. This application allows users to interact with their computer by waving their hands and fingers above the device. Users are able to point at the screen and the mouse pointer will move to where they are pointing and through a number of customisable gestures, the users can open and close applications and even map gestures to certain key combinations. The application is written for Windows and made to take advantage of the new touch friendly interface in Windows 8 by allowing users to attach gestures to things like the charms and start menus or in app shortcuts such as swipe from the top.

Project Area: Sensor Technology

Project Technology: C#

Project Platform: Windows

Project Title:	The development of Cross Industry Fraud and Non-Compliance management information reports aimed at C-suite clients
Name:	Eimear O'Grady
Email:	eimear.ogrady8@mail.dcu.ie
Programme:	Manufacturing Engineering with Business
Supervisor:	Dr John Geraghty

Project Number: 160

The aim of this project was to work in conjunction with the Accenture Analytics Innovation Centre to develop a cross industry fraud and non-compliance reporting suite that could be used to demonstrate the abilities of using predictive analytics to c-suite clients (e.g. CEO, CFO). This is highly important as fraud is a multi-billion dollar problem affecting organisations in every industry across the globe.

The development of the project followed a four step process: i) Tool selection, ii) Key Performance Indicator (KPI) selection, iii) Building the initial and final design, and iv) Testing within Accenture. These processes involved working closely with Accenture personnel to gain an understanding of the organisation's needs and methods.

- The tool selection aspect involved rigorous assessment of current reporting/Business Intelligence tools on the market in order to develop the report on the most appropriate platform
- The selection of KPI's proved to be the cornerstone of the project. This involved using various techniques to select and assess metrics as well as taking the company's policies and requirements into account
- The building of the report was completed in Excel as this proved the most suitable. A high level of functionality and design were achieved through utilising Excel's built in pivot tools and adopting Accenture design styles
- The testing was conducted within Accenture as industry experts with years of fraud experience were included in this phase. Feedback was very positive

The completion of this project resulted in a highly visual, intuitive, and integrated fraud and non-compliance reporting suite. Future work will continue within Accenture to deploy the report across various analytics projects/client workshops allowing Accenture to quickly implement a means to demonstrate fraud analytics capabilities to c-suite clients.

Project Area: Data Analytics

Project Technology: Microsoft Excel

Project Platform: Windows

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Project Title:	An ARM Controlled Internet Camera Dolly
Name:	Tom Byrne
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Programme:	Mechatronic Engineering
Supervisor:	Derek Molloy

Project Number: 161

A camera dolly can be any frame which facilitates smooth and precise movements of a camera to create dynamic video footage. This can be seen in almost all of today's films, whereby the camera may follow a subject as they walk, rotate around them to emphasise their presence or zoom in on an object to reveal its detail. In many cases in the film industry, these are manually operated as a very fine degree of accuracy is not needed but this project creates a motorised camera dolly that cannot only complete tracking shots but take still frames for Image Processing and Analysis. Therefore its movements must be accurate and quantifiable.

The dolly designed and fabricated in this project can pan a DSLR camera across the 1 metre fixed track while simultaneously rotating it with a high degree of accuracy. To achieve this accuracy, stepper motors are used to operate both the pan and rotate functions. It also means the movements can be quantified without feedback by the steps of the motor. The entire system is controlled by the Beagle Bone which is powered by an ARM microprocessor. This is a very powerful embedded system that has a large number of input/output pins which means there is room for future projects to add extra functionality if so required.

Connection to the Beagle Bone is via secure shell (ssh) and this is how the device is controlled over the internet. The device runs Linux Ubuntu and the project is coded in C/C++. A virtual machine was set up to run Linux and the Eclipse integrated development environment (IDE) was used to create the code. Eclipse IDE needs special add-ons including C/C++ development tools, remote system environment and ARM compilers.

Project Area: Mechatronic Systems

Project Technology: C/C++

Project Platform: Beagle Bone

Project Title:	Investigation of Potential Methane yield from Irish Biomass Resources
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Joseph Stokes

Project Number: 162

This project sets out to investigate the potential and actual methane yield from waste products manufactured by an international industrial bread bakery. Following in the footsteps of previous investigations into biofuels and biomass resources, this project goes one step further and investigates a substrate not tested before using waste water sludge as an inoculum in anaerobic conditions.

Due to the ever increasing demand for the use of renewable sources of energy to reduce the world's reliance on fossil fuels coupled with current EU directives on renewable energy targets this project deals with reducing greenhouse gas emissions along with providing a cheap alternative to existing energy sources.

Using the top waste trending products produced at the bakery facility a mechanical pre-treatment is used to prepare samples for elemental analysis and experimental analysis using a Costech element analyser and a series of anaerobic reactors respectively to examine biogas yield.

Due to inhibition of methane production from acidic conditions within the reactor, the results from this experiment are not fully conclusive yet do show signs of biofuel production. With methane yields of 0.0550 - 0.3966 L/g[VS] from an expected 0.5413 - 0.5813 L/g[VS] and an ethanol concentration of 0.82 - 1.32% it is quite clear that biofuels are being produced, albeit not in volumes great enough to provide a viable source of energy.

Project Area: Renewable Energy Technology

Project Technology: Biofuels
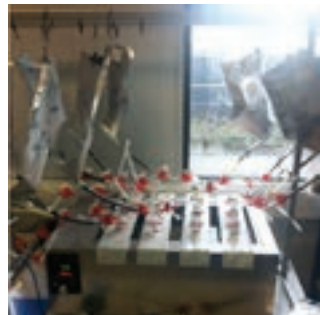
Project Title:	Anodising of Aluminium for Anti-Corrosion Applications
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Joseph Stokes

Project Number: 163

Anodising of aluminium is a method of enhancing aluminium's properties especially corrosion resistance through the synthesis of an anodic oxide layer in an appropriate controlled anodising tank. This project aims to improve the existing anodising equipment and process and to tackle the corrosion resistance of anodised aluminium suggesting solutions and widening its application areas. During the course of this project, equipment was designed and manufactured for the anodising tank in order to obtain a stable process producing the required coating on all samples. Experiments were conducted in order to find the best anodising process with least changing variables using the new experimental equipment. Following to this set of experiments, the best processes were chosen to be repeated in order to its reproducibility. After an evaluation of the obtained samples, a decision has been made about the specific parameters of the anodising tank resulting in the best and most reproducible anodic oxide layer quality. In an attempt to improve corrosion resistance of anodised aluminium, some alterations have been made for the sealing phase involved in the anodising process. The resultant samples have been tested against corrosion inside a dishwasher. Using the hydrothermal sealing method, a sealing time of 45 minutes has been found having best corrosion resistance. Using the new introduced sealing method, a solution of 5% stearic acid in isopropanol used as a sealant for an application time of 20 minutes has resulted in better corrosion resistance than hydrothermal sealing.

Project Area: Advanced Material Engineering

Project Technology: Solidworks

Project Title:	Cloud-FUSE – A Distributed Filesystem
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Programme:	Computer Applications
Supervisor:	Dr Stephen Blott

Project Number: 164

This project aims to provide a network filesystem with cloud storage capabilities. CloudFUSE uses the FUSE library in order to create a fully functional filesystem that gets synchronised with a remote storage provider like Dropbox. FUSE module provides a "bridge" to the actual kernel interfaces. It acts as an abstraction layer between non-privileged user code and the kernel itself which allows the filesystem to reside in user space.

Dropbox gives us initially 2 GB of storage space. A cool idea would be to access that space just like a local hard drive partition. This is the core idea behind CloudFUSE. It is used to replicate cloud storage data and keep files in sync. Dropbox space can be mounted as a local file system even on hardware that isn't supported by the storage provider's sync agent/desktop app.

CloudFUSE has been developed with programmers in mind. Often desktop/mobile storage apps synchronise everything in a particular folder, however this is often unnecessary for a programmer as binary files, for instance, are easily generated by compiling the source code again. This project makes it simple to ignore such "restricted" files.

CloudFUSE supports file permissions for synchronised and locally stored files. After the filesystem is mounted it reflects the current access rights for each file. For efficiency the system keeps in memory the most recent snapshot of the listed files' metadata and updates it after a specified interval of time.

Project Area: Filesystems

Project Technology: FUSE, Python

Project Platform: Unix/Linux

Project Title:	Bio-fouling Mitigation using Surface micro topographies
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Programme:	Mechatronic Engineering
Supervisor:	Lorna Fitzsimons

Project Number: 165

Marine biofouling is the unwanted accumulation of micro-organisms, bacteria and algae on surfaces that have been exposed to the marine environment. It is a major problem for shipping, as biofouling on a ship's hull can reduce its speed and increase its fuel consumption. Toxic coatings and biocides have been used to prevent fouling, but these coatings can have hugely negative impacts on the marine environment.

This project aims to develop an environmentally friendly alternative to biocides using surface topographies. The topographies designed in this study consist of randomly placed micro-pillars across a 2D plane, 1 centimetre square in size. The density of the pillars in each centimetre square varies from 1000 to 10000 pillars.

The initial design concepts were created in SolidWorks. From here the design files were adapted for use with a Heidelberg maskless lithographer in order to create a photomask. This mask was subsequently used to create a silicon master using the process of photolithography. This master is used as the final mould on which the PDMS test surfaces were cast.

In order to determine the anti-fouling effectiveness of the surfaces, each sample was exposed to the diatom, Amphora Coffeaeformis. The test topographies were then imaged using a Scanning Electron Microscope (SEM) in order to establish what, if any, anti-fouling properties the test surface may have. The initial findings were inconclusive; diatom settlement was observed; both in close proximity to the pillars and on the flat control surfaces on the PDMS casting.

Although the initial results didn't suggest that the pillars affected the settlement of the diatoms, further work testing much larger pillar densities may prove a more viable deterrent. A second design concept is also outlined in the report that focuses around the patterning of pits with varying shapes instead of pillars. This surface design may prove more fruitful in identifying anti-fouling properties for surface micro-topographies.

Project Area:	3-D Modelling
Project Technology:	Solidworks
Project Platform:	Windows
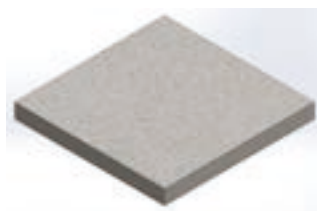
Project Title: Development of Game-Based Learning Tools
for Mechanics

Name: Emmet Higgins

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Programme: Manufacturing Engineering with Business

Supervisor: Alan Kennedy

Project Number: 166

The aim of this project was to develop a game-based learning tool to aid in the teaching of mechanics to students. Evidence suggests that techniques used in computer games which give feedback to the user and encourages long term engagement can be used in computer-based learning tools. A simple game-based learning tool has been developed using Excel and VBA. The tool is designed to aid the study of mechanics and gives immediate feedback to the user as to whether or not they are correct. Testing was carried out on the tool in order to see how relevant the game could be towards a student's study and whether or not it promoted long-term engagement with the user. Positive feedback was received from this testing.

Project Area: Educational

Project Technology: Excel VBA

Project Platform: Windows

Project Title:	BuildingBlocks
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Programme:	Computer Applications
Supervisor:	Dr Kevin Casey

Project Number: 167

BuildingBlocks is a cloud-based content creation tool built using the Node.js platform. It is designed to provide a simple alternative to creating and hosting web content, specifically tutorial-based content. BuildingBlocks removes the need for any HTML/CSS or web development knowledge, which is usually required to publish content on the web. Instead, every piece of content can be crafted using a drag-and-drop block system and edited/styled using on-screen controls. The fluidity of the block system offers endless design possibilities in terms of layout and content, which can all be controlled by the user.

When searching for tutorials or help for a particular problem, a lot of time can be wasted crawling through forum threads or being directed blog posts, each offering a tiny piece of the overall solution to a particular problem. BuildingBlocks also offers a platform where users can browse and search for content directly on the system. An 'up-down' voting system can be used to provide feedback and measure the quality of a particular user's content, with each user having a public credibility score.

This application was developed using a wide-variety of technologies and libraries, including: Express.js, MongoDB, Backbone.js, Passport.js, Bootstrap 3 and more.

Project Area: Cloud Computing, Content Management System, Model View Controller, Web Application

Project Technology: HTML5, JavaScript, JQuery, Node.js, NoSQL

Project Platform: Multi-platform

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Project Title: Finite Element Analysis of Fracture Fixation

Name: Robert Gaul

Email: robert.gaul2@mail.dcu.ie

Programme: Biomedical Engineering

Supervisor: Dr Bryan MacDonald
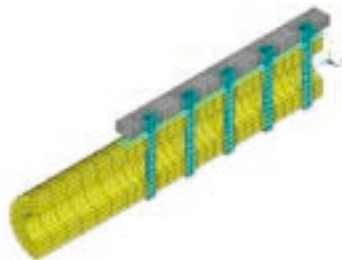
Project Number: 168

Metal fracture fixation plates and screws are regularly employed to assist bone fracture healing in orthopaedic surgery. Non-union is a common issue which affects up to 25% of patients treated with fracture fixation plates. This issue often arises as a result of too much or too little movement occurring at the fracture site. It is now known that the level of relative displacement, known as interfragmentary strain (IFS), is the most important factor in determining if fracture healing will be successful.

This project aims to reduce the risk of non-union by determining the effect of adjusting a number of fixation parameters on the resulting interfragmentary strain. Results were obtained using finite element software to analyse a model created of the human femur. The model was first validated using results obtained experimentally in existing literature. Rigorous testing was then carried out using different screw configurations, plate thicknesses, fracture gap sizes and bone-plate distances in order to determine what parameters have the greatest effect on strain.

Results found that the choice of screw configuration had the greatest effect on the levels of strain experienced at the fracture site. Interesting trends were also noted about which screw combinations had the greatest and least influence on strain levels. The effect of raising the plate above the surface was also shown to have a noticeable effect on results obtained. It is hoped that the conclusions drawn from this study could aid surgeons in choosing appropriate fixation devices and techniques in each patient specific case.

Project Area: Finite Element Analysis

Project Technology: Orthopaedics

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Project Title:	WizardVR
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Programme:	Computer Applications
Supervisor:	Donal Fitzpatrick

Project Number: 169

WizardVR is a virtual reality proof of concept demonstrator, made in the Unity game engine. It utilises new hardware, the Oculus Rift & Razer Hydras, to create a responsive and immersive game world in which you can live out your fantasy of being a wizard. The demonstrator boasts multiple spells, each with its own unique feature, such as shooting light to illuminate a dark passageway, or using levitation to pick up objects. The world is made more immersive by using the second Razer Hydra to track your body's position, allowing you to peak around corners and crouch behind walls.

This project's goal is to investigate the re-emerging technology that is virtual reality, and how to further the sense of immersion in a virtual world. Virtual Reality has made headlines in the past year due to the Oculus Rift, which has received high praise from the greatest minds in the industry, and has caused a number of competitors to start work on their own virtual reality devices, most notably, Sony. Virtual Reality has been around for a long time, but with the rapid development in the technology available, it will finally become a more fully realised aspect of the modern entertainment experience.

Project Technology: C#

Project Platform: Windows

Project Title:	"Go Out" Event Application for Android
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Email:	renatas.gorodeckas2@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Stephen Blott

Project Number: 170

"Go Out" is an event application for Android. It is a digital marketing tool for all type of events and events that would normally never get advertised online such as boot sales and local community events. Users can post and browse events and choose to attend them. The application is integrated with Facebook, Google + and Twitter. Users can sign in using their Facebook or Google + accounts. Once signed in, their likes, +1's, interests etc. are retrieved and from this we make recommendations on events that match the user's interests. Our recommendation system works on attribute values to determine user's interests in types of events and activities. We then match users attribute values to event attribute values. Users can see events that their social network friends are attending and can invite their friends to events that they themselves are attending. Event posters will be able to promote their events further by paying a small fee. This will give the event priority status. Event posters can choose to allow users to pay for the attendance through the application.

Project Area: E-Commerce

Project Technology: Java, PHP, SQL

Project Platform: Android

Project Title:	Thermographic Image Analysis of Building Fabric Heat Loss
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Lorna Fitzsimons

Project Number: 171

Heat loss through the envelope of a building via the building fabric is a major source of heat energy waste. This energy waste has a negative impact on both the environment and occupants of the building. If there are large amounts of heat loss from a house it will make the living conditions very uncomfortable and this will require the heating to remain on for excessive periods. There are ways of reducing the amount of heat that is lost from a building, and in this report a house which has recently undergone a comprehensive insulation programme is studied. The aims of this project are to ensure that the insulation has been installed to the appropriate standard, determine the heat loss from the newly insulated building enveloped, calculate the payback period for the programme and assess thermography as a potential inspection method.

The heat transfer was calculated using two approaches, the first was the Incidence Factor method, and the second was the Dwelling Energy Assessment Procedure used in the Building Energy Rating methodology. The results for the corrected U-Value of the building envelope were 151.7394 W/K and 150.7394 W/K for the Incidence Factor method and the DEAP method respectively. The payback period was calculated to be 38.4 years, but this result is not entirely accurate as it does not account for the effects of air infiltration and exfiltration. It was also found that there were some areas in the building where the insulation had not been installed correctly.

To conclude there is a gap in the market for the use of thermography in the inspection of buildings. Further work is required, in order to standardise the inspection procedure with thermography and the methodology used to calculate the heat transfer through a surface before it can be integrated into the Building Energy Rating approach.
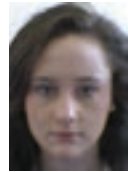
Project Area: Thermography

Project Technology: SmartView

Project Platform: Windows

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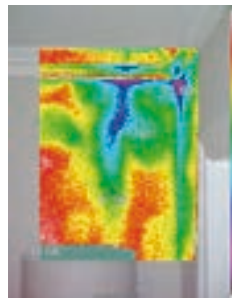
|	
Project Title:	CFD Investigation into Artificial Heart Valves
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Programme:	Manufacturing with Business Studies
Supervisor:	Dr Yann Delauré

Project Number: 172

Heart disease is becoming an increasingly prevalent cause of death worldwide with as many as 10,000 people dying each year in Ireland alone because of heart failure. Many of these cases are the result of failure of the heart valves due to both acquired and congenital valvular heart disease. In cases where valve function has been severely impaired, the replacement of the valve(s) in question is the only viable solution. There is currently a vast choice of prosthesis available on the market with both biological and mechanical prosthetics being regularly implanted.

The objective of the project is to compare the fluid dynamic performance of mechanical heart valves using computational fluid dynamics (CFD). The project outlines the advantages of choosing mechanical heart valves over bio-prosthesis and details the hemodynamic characteristics of three types of valves; ball and cage, tilting disk and bi-leaflet. The valves were studied with 2D, steady state, turbulent models using Ansys Workbench CFD software. The bi-leaflet valve demonstrates the most promise for acceptable hemodynamics.

Major complications caused by mechanical heart valve fluid flows include formation of clots, tissue overgrowth and damage to red blood cells. These side effects are the result of increased turbulent shear stress caused by large velocity gradients, regions of low velocity (stagnation) and recirculation and the formation of vortices. These were all examined in Ansys with the end result of altering the design of the valve to decrease the likelihood of these complications arising. Design changes identified included changing the shape of the leading edge of the valve leaflets to reduce flow separation and placing the leaflets directly parallel to the fluid flow (at zero angle of attack) thus reducing the disturbance to the flow downstream of the valve. This project demonstrates the significant contribution which CFD software can make to prosthetic heart valve design.

Project Area:	Fluid Dynamics
Project Technology:	Ansys Workbench
Project Platform:	Windows
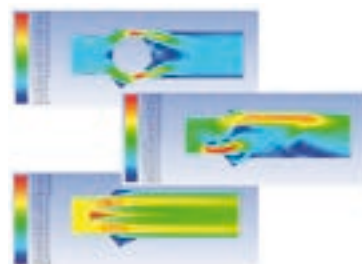
Project Title:	RewardMe
Name:	Cian O'Brien
Email:	cian.obrien59@mail.dcu.ie
Name:	Ciaran Patrick O'Grady
Email:	ciaran.ogrady3@mail.dcu.ie
Programme:	Enterprise Computing
Supervisor:	Dr Markus Helfert

Project Number: 173

The purpose of this project is to design a proof of concept for a mobile application that allows retailers to collect data about their customers while they are shopping in-store. The use of Big Data is becoming a crucial way for leading companies to outperform their peers. In most industries, established competitors and new entrants alike will leverage data-driven strategies to innovate, compete, and capture value.

Retailers are monitoring their customers path through the shops and their purchases - information which, in the aggregate, will be used to configure store layouts, decide what products to stock, and assist in making staffing decisions.

This system, named RewardMe, will work by having the customer register their information when they download the app. They activate the app as they are beginning their shop. There are bluetooth sensors at the top and bottom of each aisle in the store, these sensors register when the customer has entered the aisle and when they exit it. As the customer is paying for their shopping the goods that they have bought are also registered, as is currently done with store loyalty cards.

Using this system it is possible for a store to collect data on what the consumer bought in-store, what route the customer took around the store, and how much time they spend on each aisle.

There are numerous incentives for customers to use this app including; discounted items for app users, entry into store competitions, and the customer will be rewarded loyalty points for not only the goods they purchase - as is currently done with loyalty cards - but also for walking through aisles. In addition to this, the app offers a shopping list feature which, if used by the customer, will allow stores to compare what a customer intended to buy with what they actually bought.

Project Area: Mobile App

Project Technology: Gimbal
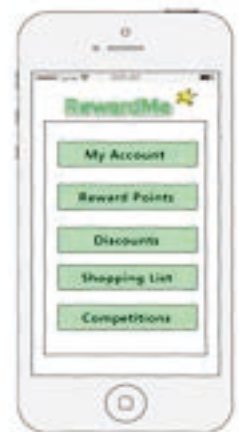
Project Title:	Microbubble Generation for Aeration (Project III)
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Programme:	Mechanical and Manufacturing Engineering
Supervisor:	Dr Yann Delauré

Project Number: 174

The volume of research into microbubbles has exploded over the past two decades, with the benefits of microbubbles being applied to many fields such as water treatment, aquaculture and targeted drug delivery as well as in imaging.

The purpose of this project was to design and build a generator for the purpose of creating microbubbles. This generator, modelled on the theory of a converging-diverging nozzle, is designed to generate microbubbles through the sudden pressure change that is present within an expansion chamber.

This design will produce microbubbles through pressurised water being pumped through the nozzle inducing a suction effect within the throat, this will effect will draw air in from the surrounding environment and causing the air and water to mix just past the throat. It is this mixture that will be broken up by means of a shockwave present within the outflow chamber of the nozzle caused by the differential pressure between the throat and the exit, thus creating microbubbles.

Project Area: Mechanical Design and Manufacture

Project Technology: 3D Modelling

Project Platform: Windows

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Project 175 – Special CPSSD Project

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- Our first intake was in 2013.
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More about CPSSD

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- offering INTRA placements and/or summer internships;
- offering ideas for, or feedback on, the programme;
- presenting seminars/workshops on new technologies;
- offering students access to hardware, software and services.

If interested, leave your name, specifically mentioning CPSSD, and any or all of the ways you would like to get involved.

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Openet

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For more information see: www.openet.com

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Web: www.dcu.ie/computing

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