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University of London
Science and Engineering

School of Engineering and Materials Science
10th Industrial Advisory Board 20th November 2019

Professor James Busfield
Director of Industrial Engagement in SEMS

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Division Structure in SEMS

Aerospace Engineering and Fluid Mechanics	Bioengineering	Chemical Engineering and Renewable Energy	Materials Engineering	Mechanical Engineering, Robotics and Design


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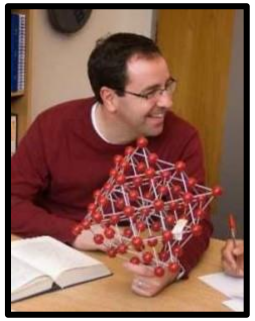


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IAB Partners Present Today

Prof	Markys	Cain	Electrosciences Ltd.	Director
Mr	Tom	Dowden	Sugru	Principal Researcher
Prof	Peter	Ford	Nanoforce / EventMap	Chairman
Dr	Joe	Hallett	Birla Carbon	Technical Service Manager
Dr	Philip	Jackson	Lucideon Ltd	Technical Manager - Healthcare
Dr	Phillip	Kennedy	ex 3M	Former - Head of Innovation
Dr	Amy	Kinbrum	De Puy	Senior Engineer - Bio-mechanical Testing, WW R&D
Prof	Andy	Lewis	Biocompatibles UK Ltd	Technical Director
Dr	Tie	Li	Ford	Supervisor / Technical Specialist, CAE, Chassis Engineering
Dr	Zulshan	Mahmood	Ford	Supervisor – Intake, Combustion & Exhaust CAE
Mr	Dimitrios	Pavlidis	Foster + Partners	Senior Environmental Design Analyst
Dr	Monisha	Phillips	BSI Healthcare	Global Head of Orthopaedic & Dental Devices
Dr	Shiva	Pingle	BP plc	Mechanical Design Specialist
Dr	Nima	Roohpour	RB	External Innovation Lead
Dr	Carolyn	Small	Arconic Manufacturing	Process and Product Development Manager
Mr	Richard	Smith	Winchester Consulting	Engagement Director - Talent Retention Solution
Dr	Nigel	Smith	Biomedical Consultancy Ltd	Director
Dr	Douglas	Watson	Weir Advanced Research	Programme Manager
Mr	David	Williams	NGF Europe	R&D Manager
Mr	Simon	Witts		

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Agenda for the IAB today

A. Curriculum Review and Update
   - Review of the latest skills matrix
   - Review of the year 1 curriculum map

B. Review of opportunities for collaboration

C. Identify potential projects for MSc student (600 hour duration) collaboration – 100 new MSc students projects start in the next month.

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Item 1 – Curriculum Review

Professor Julia Shelton & Dr Joe Briscoe

The need to review the academic programmes

Improve the delivery of knowledge	• Ensure continuity of knowledge between modules • Avoid repetition
Align academic content between modules	• Be transparent about what the students need to know from a module and where will they use it in the future
Include skills	• Ensure that skills are developed as well as technical knowledge • Provide clarity on skills acquired and their value in employment
Improve impact of teaching	• Reduce assessment & ensure all assessments have clear goals, aligned between modules
Student feedback	• Experience repetition of knowledge • Difficulty understanding certain areas • Excess assessment with unclear goals

How it will benefit us

- Reducing our teaching and assessment loads and streamlining activity
- Improved NSS results -> improved student recruitment so we can be more selective in the recruitment of students
- Better prepared students for third year / fourth year projects: more mature learners
- Students better prepared for employment – improving our relationships & interactions with industry
- Improved student engagement; students more motivated to study
- Happier, bolder, more confident students who we enjoy interacting with and teaching

The main goals of our programme review

- To create a clear and transparent technical content learning pathway for students through their degree programme
- To create a clear and transparent skills content learning pathway for students through their degree programme
- To foster an attitude of enthusiasm, professionalism & motivation in all our student cohorts

Curriculum Review Committee – Specific “Roles”

Chair	Hazel Screen
Taught Programmes (PS)	Alison Hartshorn
Student Voice	Bijoy Das
Industrial Voice	Phil Kennedy
Programme Amendments	Jens Mueller
Aerospace Engineering	Fariborz Motallebi
Biomedical engineering	Julia Shelton
Mechanical engineering	Adrian Briggs
Sustainable energy engineering	Joe Briscoe
Chemical engineering	Edo Boek
Robotic engineering	Kaspar Althoefer
Design, innovation & creative engineering	James Busfield
Materials science and engineering	James Busfield
Materials and design	Haixue Yan
Dental materials	Karin King
Biomaterials for biomedical sciences	Karin Hing
Intercalated Biomedical engineering	Tina Chowdhury

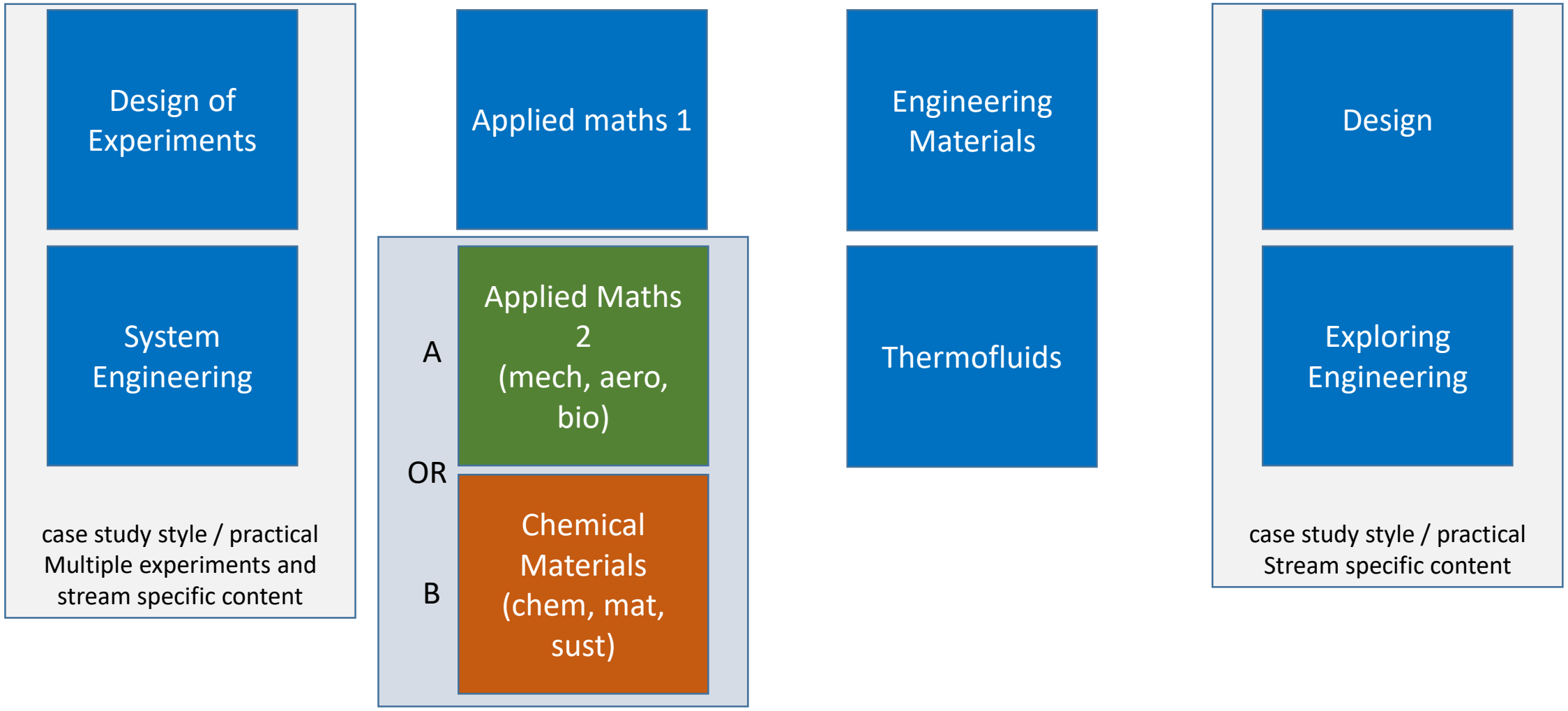
Approach

- To create a clear and transparent technical content learning pathway for students through their degree programme
- To create a clear and transparent skills content learning pathway for students through their degree programme

1. Identify Technical Content
2. Identify Skills Content
   - Technical Skills
   - Transferable Skills
   - Graduate Attributes

3. Develop pathways for both, providing:
   - Cohesion within a year
   - Cohesion & development across a programme
   - Cohesion between programmes

Module ‘framework’



Skills Content Review

- “Curriculum review group” focus on technical and transferable skills (graduate attributes ; employability attributes) required throughout a programme of study, and develop a map for developing each of these throughout the programme
- Skills need to determine the shape of the programmes. An essential graduate skill is to develop an appreciation of the importance of life-long learning, self-development and self-sustainability for personal and professional reasons

By the end of their degree (BEng) our graduates will be able to, or will have skills within seven broad areas:

- Resilience
- Creativity
- Working collaboratively
- Effective communication
- Project management
- Professional practice
- Technical

By the end of their degree (BEng) our graduates will be able to, or will have:

Resilience	1	develop a growth mind-set approach through self-reflection, self-management, personal growth and personal effectiveness.
	2	confidence built through active engagement in activities that take the student out of their comfort zone.
	3	an appreciation of the criticality of their personal wellbeing, work and lifestyle habits.
	4	an appreciation of the importance of life-long learning, self-development and self-sustainability for personal and professional reasons.

By the end of their degree (BEng) our graduates will be able to, or will have:

Creativity	5	a range of critical thinking and problem solving techniques to develop, assess, and prioritise multiple creative solutions to problems.
	6	an understanding of the development of product requirements.
	7	been exposed to creative thinking approaches and entrepreneurial cultures.
	8	had the opportunity to assess and take creative risks in projects.
	9	think and analyse strategically in order to manage large amounts of information /data sets

By the end of their degree (BEng) our graduates will be able to, or will have:

Working collaboratively	10	worked with different communities in order to develop a global pespective.
	11	worked in a team and developed an appreciation of team roles and characteristics.
	12	demonstrate skills to work collaboratively.
	13	taken a leadership role.
	14	provided and received constructive feedback.

By the end of their degree (BEng) our graduates will be able to, or will have:

Effective communication	15	communicate and disseminate using a variety of digital resources to persuade and connect with different audiences.
	16	share their ideas and work with confidence using a variety of digital resources.
	17	convey technical and other information in a written form appropriate for the audience and media use.
	18	undertake critical assessment of information
	19	understand and implement careful communication, incuding IP and securtiy.

By the end of their degree (BEng) our graduates will be able to, or will have:

Project management	20	develop process steps for a project, including develop key milestones and deliverables for stages of a project.
	21	evaluate required resource, time, risks and strategy for a project.
	22	apply an integrated or systems approach to the solution of complex problems
	23	appreciate value of time, people, risk, innovation and information management.
	24	an awareness of common project management tools, methodologies and processes used in industry and research

By the end of their degree (BEng) our graduates will be able to, or will have:

Professional practice	25	an awareness of the importance of health and safety, from both a personal and corporate responsibility standpoint.
	26	commercial awareness and technology foresighting, including company finances.
	27	familiarity with research governance, H&S and responsible work practices.
	28	understanding of code of ethics.
	29	appreciation of Quality Assurance processes, GLP, regulatory frameworks.
	30	appreciation of IP laws and patents, spin out companies, data protection, confidentiality, attribution and data privacy.

By the end of their degree (BEng) our graduates will be able to, or will have:

Technical	31	Sketching and drawing - hand and computer generated, Auto CAD
	32	Practical use of hand tools, soldering, metal work
	33	Practical use of manufacturing machine tools, CNC etc.
	34	Code
	35	Ability to rapid prototype designs
	36	Relevant practical and laboratory skills
	37	Appreciation of and ability to work with technical uncertainty
	38	Understand and apply basic statistical concepts
	39	Apply the techniques associated with the design of experiments
	40	Computational modelling skills, FEA & CFD
	41	Simulation & numerical modelling skills
	42	Critically evaluate inputs and outputs (sense check)
	43	Run appropriate performance tests
	44	Perform quantitative, semi-quantitative and qualitative analysis
	45	Proficiently use commercial software

Are the seven areas appropriate?

Have we capture the skills for our graduates your industry requires?

Which skills are critical?

Comments on our approach to the curriculum review

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Item 1 – Modes of Interaction

Professor Julia Shelton & Dr Joe Briscoe

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Routes of Engagement – Student Projects

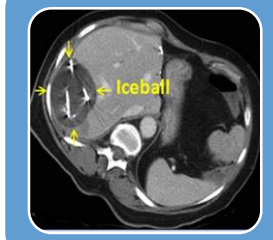
Benefits to the company

- Cost-effective way of getting a project done or an idea tested
- Ability to trial potential employees
- A creative, highly skilled and fresh approach
- Involvement and access to high quality cutting edge researchers

Costs – Students should have consumables provided and expenses paid for company visits

IP - Standard agreements regarding any IP developed while involved in an industry project

NDA – Standard NDAs can be arranged. All projects need to be examinable (and be seen by the examiners)



In Module Case Studies

3rd Year Individual Projects

4th Year Group Projects

MSc Projects

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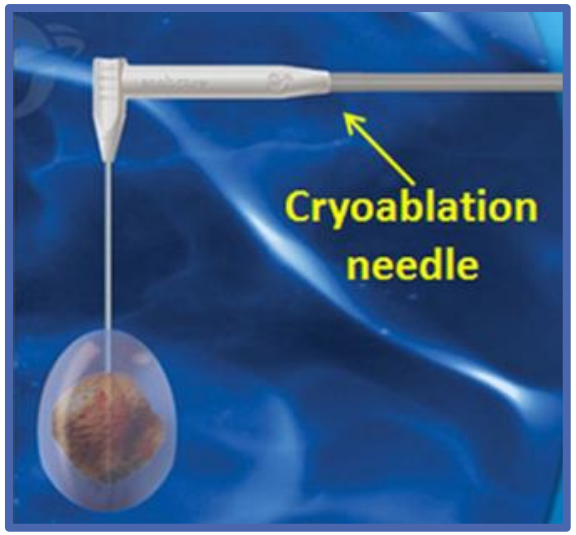
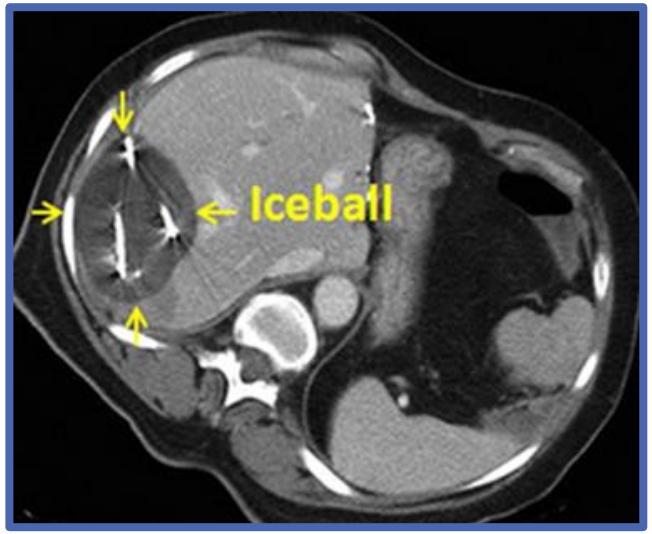
In Module Case Studies

Embedded into our Modules

- Commercial case studies are offered in many modules. Recent examples include:
  - Andy Lewis, Boston Scientific – Minimally invasive cryoablation of tumours
  - Sarah Chapman, 3M - Reducing sound pollution at drive through fast food outlets
  - Nick Read, Bosch - Design brake systems to reduce non-exhaust particulate emissions from vehicles
  - Carolyn Small, Arconic – Lightweight and repairable materials for use in naval marine applications
  - Ana Gallego, Blatchford Group - Breathable prosthetic limb implant liner





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Third Year Individual Projects

- 2000+ large undergraduate projects undertaken every year across the S&E Faculty
- Many are projects suggested by companies (Including companies on our Industrial Advisory Boards)
- Micheal Stratton - worked on a graphene coating for a glass fibre cord embedded into a timing belt that made it into a smart sensor (NGFE)
- Mechanical and Electrical properties of PEDOT: PSS-Paper composites
- Interaction between bone graft granules and serum containing protein culture
- Magnetically driven drug release from micro-chambers

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4th Year Group Projects

Masters Level Group Activities

- An award winning group of 4th year SEMS students: Arya Li, Bijoy Das, Lydia Denton & Yue Meng
- Designed a totally novel road bike
- Incorporating state-of-the-art technologies including a carbon fibre frame and magnetic ferro-fluid bearings
- The multidisciplinary team of engineers and materials scientists was sponsored by three companies

NANOforce

Gates

SON NABENDYNAMO

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Masters Project Student

Shri Ravi at Yumpingo

Worked on a project to “Detect Fraud in Restaurant Customer Reviews using Machine Learning”

His employer commented that:

- **I was very impressed with Shri’s ability to adapt to working in a start-up environment**
- It was **clear from the outset that Shri appreciated and saw the value of Yumpingo, something which meant a lot to us**
- He **regularly generated fresh ideas relevant to his work, and occasionally outside, to the delight of his colleagues**

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Work Placements & Year in Industry Opportunities

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Undergraduate Placements

Placements of 7 - 14 months

- Supported by Industrial Experience Managers
- More than 100 students at any time are on a work placement
- Our partners include:
  - Service Now (27 placements since 2011)
  - Rolls Royce (24)
  - Airbus
  - Rail Delivery Group
  - Arconic
  - GlaxoSmithKline
  - Siemens
  - IBM
  - Fidelity
  - UBS

Karan Mehta (3) Crawford Blagden Osman Goreish (4)

SEMS IE Manager

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Undergraduate Placements

Service Now

- QMUL has partnered Service Now since 2011
- 27 students have been on placement
- They are a cloud based IT Service Management company
- Students have worked in a number of roles including:
  - Application Developers
  - Site Reliability Engineers
  - Customer Support Analysts
- The students agree that "**the experience has given us a much better understanding of the tech world and built our confidence and communication skills**"

Claire Revell

EECS IP Manager

service now

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Undergraduate Placements

Vijay Gill at GSK

- Winner of the Best Placement Student award in 2019 at the National Undergraduate Employability Awards
- Vijay was a Perimeter Network Analyst, which involved maintaining, monitoring and reconfiguring critical network devices
- He developed scripts that automated service metrics which increased efficiencies by 78%
- He also worked on a special network recertification project in which he improved the status of over 100 virtual private networks across GSK

gsk GlaxoSmithKline

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PhD Student Funding and Work Placements

- Industrial collaborators frequently fund research studentships
- The current entry price for IAB partners for a funded PhD is a 3 year studentship at £85K + consumables
- There are opportunities to cofund other scholarships as well and to support CASE awards
- Research sponsors often take PhD research students on placement (and often hire them as well after graduation)

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Degree Apprenticeships & London City Institute of Technology

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Degree Apprenticeships

First Launched in 2015

- QMUL was the first Russell Group university to offer Degree Apprenticeships and we remain at the forefront of this type of delivery
- Existing Partnerships with: Goldman Sachs, GSK, BBC, Broadridge Financial, Experian, John Lewis, Xantura, Goji Investments, Sapphire Systems, Global and IBM
- Current Degree Offerings Include:
  - MSc Digital and Technology Solutions Specialist - 2 years
  - BSc Digital and Technology Solutions (Software Engineer) – 4 years
  - BSc Business Management (Social Change) – 4 years

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London City Institute of Technology

- 12 Institutes of Technology (IOTs) have been announced
  - £170M Department for Education scheme for technical education at higher levels to provide the skills needed by the economy
- QMUL won a £18M proposal with partners:
  - Newham College
  - Port of London Authority
  - London & Regional Properties
- QMUL also won £10M from the GLA from its Skills for Londoners Initiative
- Other partners include: Boroughs of Newham and Tower Hamlets, SERCO Group, Livetts and Bennett's Barges, City Cruises, AECOM, Network Rail, CVU, WYG, TfL & Siemens

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London City Institute of Technology

- The IOT will focus on delivery of:
  - T levels
  - Higher and Degree Apprenticeships
  - Industry-linked PhDs and research
- It will be located in an innovation hub, as part of a regeneration scheme in London's only enterprise zone
- Over 1,800 places at full capacity in 2027:
  - 20% at Level 3
  - 50% at Levels 4 and 5
  - 30% at Level 6 & 6+
- Degree Apprenticeships are to be industry led but already planned for 2022 start are courses in:
  - BEng Data Scientist (3 years)
  - BEng Aerospace Engineering (4 years)
  - MSc Systems Engineering (3 years)
  - …….?

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Item 3 – Collaborative MSc Project Development

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