

# *School of Engineering University of Bolton UK*

*Professor Danny Morton*

*Head of School*

School of  
Engineering



# About Me

- *Over 40 years experience in HE*
  - *20 years University of Huddersfield*
  - *24 years University of Bolton - Various posts, Dean, Director of Enterprise & Research - Currently Head of School of Engineering.*
- *Significant industrial experience through collaborative research projects, teaching Company Schemes and Knowledge Transfer Partnerships (KTP's)*
- *PhD 1978.*
- *Chartered Engineer, FIET.*
- *QAA Auditor/Reviewer.*
- *Reviewer for National Council for Academic Accreditation in Saudi Arabia (NCAAA).*
- *Developed University of Bolton's first distance learning programme in Advanced Microelectronics in 1996- Funded by EPSRC.*
- *Numerous research grants and contracts.*
- *Supervised over 35 PhD's to successful completion.*
- *Developed collaborative link with University of South-Westphalia in 1996.*
- *Led University of Bolton off-campus research centres in Germany, Malawi, Zambia, Ras Al Khaimah, and Greece.*
- *Worked as consultant to Arden University (Private distance learning University in UK) - Successfully led their bid for Degree awarding powers.*

# *Bolton - Greater Manchester*

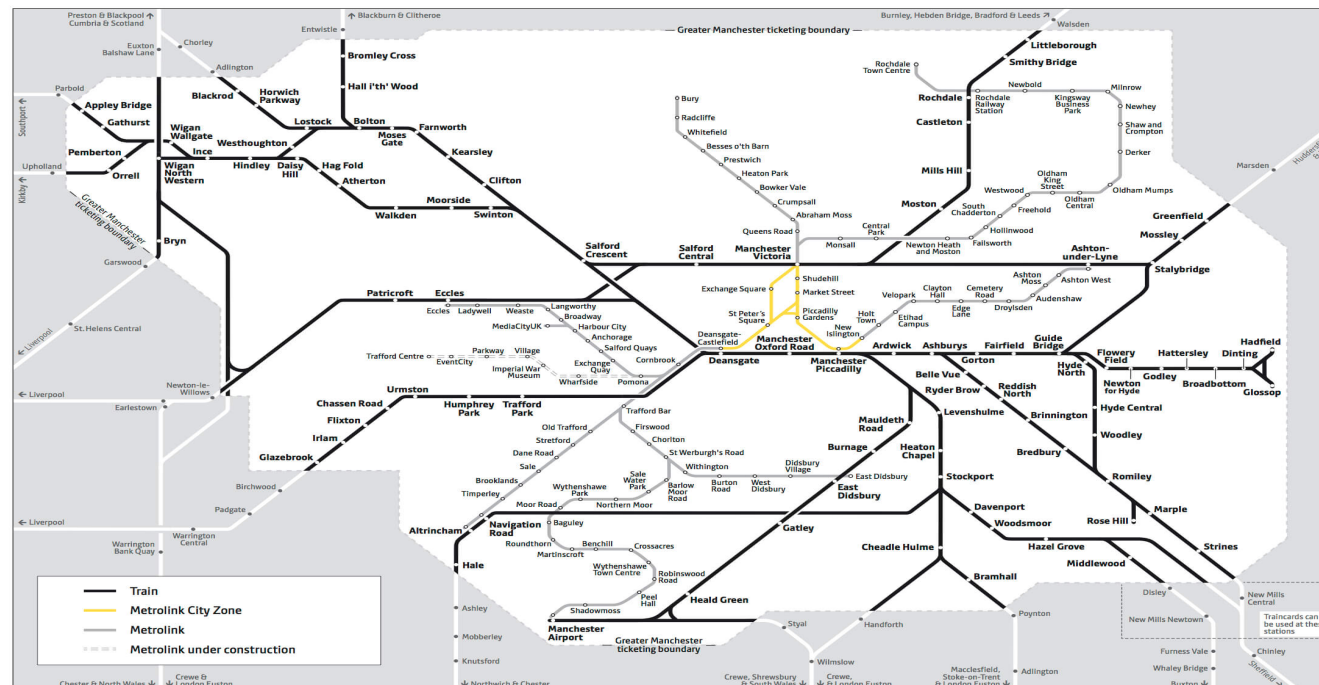


# *Bolton Surrounding Area*





# Transport



# *Travelling from Bolton*

- *Manchester-22km, 30 mins by train, cost c£3.00 return*
- *Manchester Airport-35km, 40 mins by train, cost c£4.00 return*
- *Liverpool - 60km, 1hr by train, cost c£8.00 return*
- *London - 350km, 2.5 hr by train. Cost c£50.00 return*
- *Lake District & Dales - 60km*

# *The University of Bolton*



# *The University of Bolton*





# *University - Institute of Management*



# *University Halls*





# *Bolton ONE - Health Centre & Sports*



# *University of Bolton - New Headquarters*



# *£40m Student Village Development*





# *Bolton Countryside*



# *The University of Bolton Football Stadium - Bolton Wanderers*



# *The University [www.Bolton.ac.uk](http://www.Bolton.ac.uk)*

*Circa - 8000 students. Located on 3 campuses in Bolton  
Schools/Faculties*

- *School of Engineering, including National Centre for Motorsport Engineering*
- *Arts*
- *Creative Technologies*
- *Law*
- *Sport & Biological Sciences*
- *Institute of Management*
- *Faculty of Health & Wellbeing = Nursing Dental Technology*
- *Education*
- *Psychology*
  
- *Off\_Campus locations throughout the world - e.g. Malawi, Zambia, Sri-Lanka, Ras Al-Khaimah, Shanghai, Kuala Lumpur, Athens, Prague, South Westphalia etc.*



# *Strong Performance For University Of Bolton In National Student Survey (NSS)*



<https://www.bolton.ac.uk/strong-performance-for-university-of-bolton-in-national-student-survey-nss/>

# *University Of Bolton Storms Up Whatuni\* National League Table, And Takes First Place In Greater Manchester*



<https://www.bolton.ac.uk/university-of-bolton-storms-up-whatuni-national-league-table-and-takes-first-place-in-greater-manchester/>

# *University Of Bolton Scores For 'Student Satisfaction' In Complete University Guide 2019*



<https://www.bolton.ac.uk/university-of-bolton-scores-for-student-satisfaction-in-complete-university-guide-2019/>

# *University Of Bolton Ranked 6th Overall In UK Engagement Survey 2018*



<https://www.bolton.ac.uk/university-of-bolton-ranked-6th-overall-in-uk-engagement-survey-2018/>

# *Stop Press*

- The University of Bolton is featured in The Times and The Sunday Times Good University Guide 2019 highlighting that students rate their teaching among the best in the UK.*
- The guide says that in the most recent National Student Survey, students ranked Bolton fourth in the UK for satisfaction with teaching quality under a Sunday Times analysis of the outcomes.*



# *Engineering Heritage at Bolton*

- *Established 1825 as Mechanics' Institute*
- *Bolton Institute of Technology - 1963*
- *Bolton Institute of Higher Education - 1982*
- *Incorporated in 1989*
- *Degree awarding powers 1992*
- *Research Degree awarding powers 1995*
- *University title in 2005*



# Our New Engineering Building

£13m Development 2017



# *National Centre for Motorsport Engineering*



# *Recent Investment in Facilities*

- *Recent circa £1 Million invested in facilities for engineering*
- *Centre for Advanced Performance Engineering*
- *Electrical and Electronic Engineering laboratories*
- *Projects workshop*
- *CNC machinery*
- *New facilities planned for Civil Engineering and Construction this year*

# *School of Engineering Programme Areas*

- *Automotive / Motorsport*
- *Bio Medical Engineering*
- *Civil Engineering*
- *Construction Project Management*
- *Electrical & Electronic Engineering*
- *Mathematics*
- *Mechanical Engineering*
- *Mechatronics*
- *Systems Engineering*



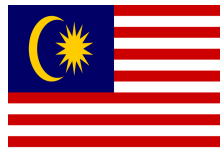
*Programmes from Foundation Programme through to PhD*

# *School of Engineering Programmes*

- ***BEng** - Mechanical, Electrical & Electronic, Civil Engineering, Bio-Medical Engineering, Automotive - All accredited by professional bodies (Full-Time & Part-Time)*
- ***BSc** - Construction Project Management & Motorsport Technology*
- ***MSc** - Systems Engineering and Engineering Management - Mechanical, Electrical & Mechatronics.*
- ***MRes** - Engineering Management & Environmental Management*
- *All undergraduate programmes in top-up mode with summer school attendance.*
- *<https://www.bolton.ac.uk/subject-areas/all-subjects/>*

# *Multidisciplinary International Staff Team*

- Our staff come from over 10 different countries bringing an international dimension to all our programmes
- We have collaborative partners delivering our programmes throughout the world





# *Professional Body Accreditation*

*The Institution  
of Structural  
Engineers*

 INSTITUTE OF  
HIGHWAY  
ENGINEERS

ice

 CIHT

 The Institution of  
Engineering and Technology

 **cabe**  
chartered association  
of building engineers

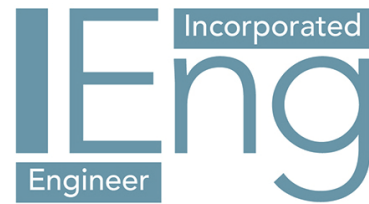
 Engineering  
Council

 **CIOB**  
THE CHARTERED INSTITUTE OF BUILDING

 Institute of  
mathematics  
& its applications

**Institution of  
MECHANICAL  
ENGINEERS**

# *Professional Registration*



# *Our Ethos*

- *We deliver a wide range of taught undergraduate & Postgraduate programmes.*
- *Strong research background, delivering a number of PhD's both on campus, and off-campus with collaborative partners.*
- *Strong ethos of working with industry*
- *All undergraduate programmes developed as UK Apprentice Degrees for delivery to industrial based students.*
- *Track record of delivering KTP's (UK Government sponsored - Knowledge Transfer Partnerships)*
- *Up to date modern facilities with dedicated Engineering building.*
- *Majority of staff practice based with significant industrial and research experience.*
- *Over 90% staff qualified at Doctorate Level or Chartered Engineers.*

# *Strong Links with Industry*

- *Industrial Advisory Board helps develop our programmes*
- *Research Projects*
- *Help with placements*
- *Good employment record for all our students*
- *Apprenticeship programmes*
- *Links with employer groups*



# *Our Approach to Teaching*

- *Small Class sizes -Less than 30 students in most cases*
- *Lots of individual support*
- *Industrially relevant curriculum*
- *Dedicated team of mathematicians*
- *Enhanced Personal Tutor System*
- *Specialist study support modules on a range of topics*
- *Formative assessment policy with lots of feedback*
- *A focus on innovation and problem solving in all programmes*
- *Teaching Intensive Research Informed (TIRI)*

# *Teaching Intensive Research Informed*

- Our principal focus is on teaching and supporting students*
- We like all our staff to engage in research*
- We have a strong research profile with over 70% of our research deemed to be of international standing and excellent in the last Research Excellence Framework*
- The research activity helps our staff to be up to date in their teaching*
- We challenge students with industrially relevant problems*

# *MRes - Master of Research*

- *A UK based Level 7 qualification focussing on research training.*
- *A Foundation for a research career in industry and study at PhD level.*
- *Can give advanced standing for entry into a Doctorate programme.*
- *Study modes - Full-Time and Part-Time.*
- *Industry based.*

# *Origins of the MRes - Master of Research*

*Borne out of our successful off-campus PhD Programme*

- *Currently being delivered in:*
  - *Malawi*
  - *Zambia*
  - *Greece*
  - *Germany*
  - *Ras Al-Khaimah*
- *Based on practitioner model where students work full-time in industry or in industrial led research centres, combining practice with research.*
- *Supported by University led workshops within the off-campus centres.*
- *Each year culminates in a Research Conference where all students present with industry and external stakeholder presence.*



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# *MRes Philosophy*

- *Research Methods core to the programme.*
- *Practice based - combining industrial practice with academic study and research.*
- *A problem solving philosophy.*
- *Work towards publishable research outcomes.*
- *Culminates in a Conference where all students present a paper based on their research and industrial practice.*

# *MRes - Master by Research*

Master by Research (MRes)	Final Award	Level 7	Environmental Management
Postgraduate Diploma (PgDip)	Exit or Fallback Award	Level 7	Environmental Management
Postgraduate Certificate (PgCert)	Exit or Fallback Award	Level 7	Environmental Management

# *MRes Programme Specification*

- <http://programmes.bolton.ac.uk/ENG006-F-UOB-MX-01>
- <http://programmes.bolton.ac.uk/CIE007-F-UOB-MX-01>



## *Validated Modules - Engineering Management*

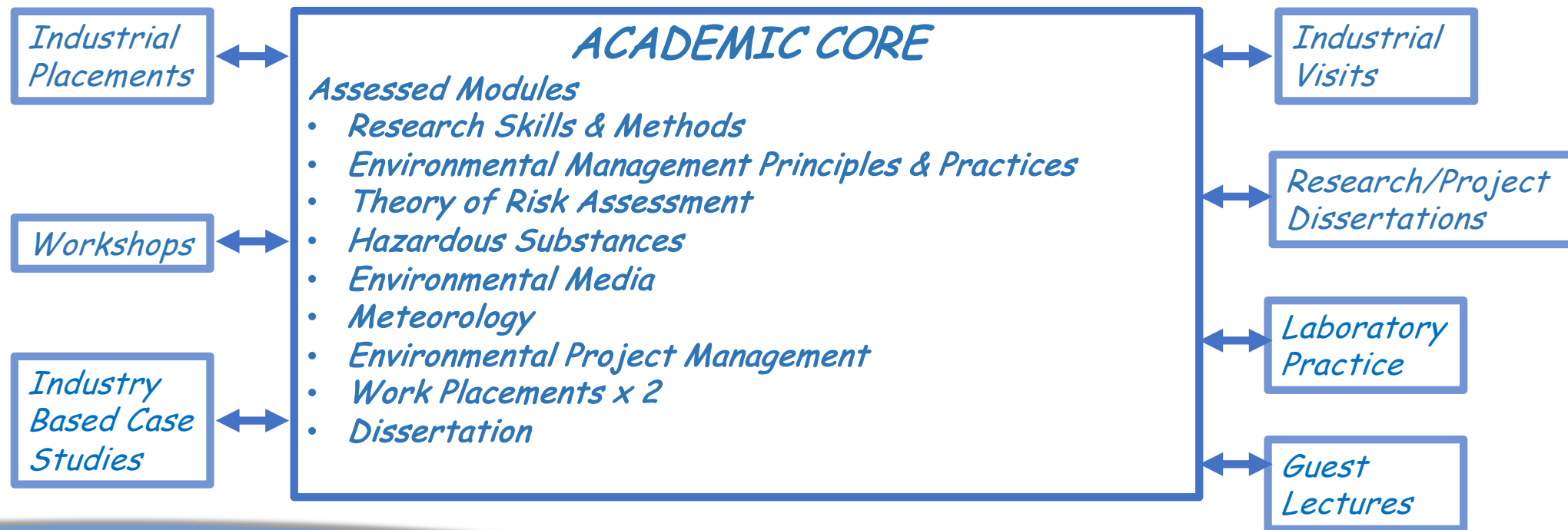
<i>Title</i>	<i>Module Code</i>	<i>Credits</i>
<i>Research Skills and Methods</i>	<u><a href="#">ENG7000</a></u>	<i>Core - 20</i>
<i>Integrated Management Systems</i>	<u><a href="#">ENG7001</a></u>	<i>Optional -20</i>
<i>Project Management</i>	<u><a href="#">ENG7002</a></u>	<i>Optional-20</i>
<i>Business and Management in Engineering</i>	<u><a href="#">ENG7003</a></u>	<i>Core-20</i>
<i>Work-based Project 1</i>	<u><a href="#">ENG7004</a></u>	<i>Core-20</i>
<i>Work-based Project 2</i>	<u><a href="#">ENG7005</a></u>	<i>Core-40</i>
<i>Dissertation</i>	<u><a href="#">ENG7006</a></u>	<i>Core-60</i>
<i>TOTAL Credits</i>		<i>180 (incl. 1 option)</i>

## Validated Modules - Environmental Management

<i>Title</i>	<i>Module Code</i>	<i>Credits</i>
Research Skills and Methods	<a href="#"><u>ENV7000</u></a>	Core - 20
Environmental Management Principles and Practices	<a href="#"><u>ENV7001</u></a>	Core - 20
Theory of Risk Assessment	<a href="#"><u>ENV7002</u></a>	Optional -20
Hazardous Substances	<a href="#"><u>ENV7003</u></a>	Optional-20
Environmental Media	<a href="#"><u>ENV7004</u></a>	Optional-20
Meteorology	<a href="#"><u>ENV7005</u></a>	Optional-20
Environmental Project Management	<a href="#"><u>ENV7009</u></a>	Optional-20
Work-based Project 1	<a href="#"><u>ENV7006</u></a>	Core-20
Work-based Project 2	<a href="#"><u>ENV7007</u></a>	Core-40
Dissertation	<a href="#"><u>ENV7008</u></a>	Core-60
<i>TOTAL Credits</i>		<i>180 (incl. 1 option)</i>

# MRes Structure & Delivery

60 Credits - Taught  
120 Credits - Work  
based/Research



# *Current School Research Partners*

*DSTL/EMA(France) UK-France Partnership 2016- to date*

*Hylomar-KTP (MPhil Student) 2017-19*

*Walker seals Cumbria (PhD/MSc students) 2015 to date*

*Shanghai University (PhD exchange) 2005 to date*

*US Police force (PhD Student) 2014 to date*

*ITECH France 2002 to date*

*South Westphalia University of Applied Sciences for Engineering Systems/Renewables Systems-MSc/PhD dual awards 1998-to date ( 25 PhDs and > 500 MScs)*

*Oxford Brookes(MORTEC), Albatec, Williams F1 2017*

*KCMC Darsbury, Manchester, Bristol & Liverpool Universities 2014-onwards*

*Philips Medical Instruments 2017*

*Keating Supercars*

# *EE Research Activities*

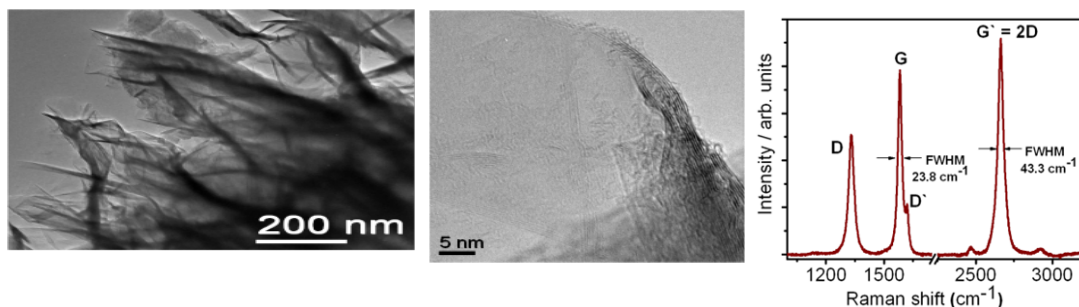
- 1. Nanomaterials: ZnO, TiO<sub>2</sub>, CNTs, graphene etc*
- 2. Processing (ALD, PVD) and devices*
- 3. Sensors, microfluidics & lab-on-chip systems*
- 4. Flexible, dissolvable, transitional electronics*
- 5. Energy harvesting devices & wireless power transfer*
- 6. Wireless, self-powered and passive sensors*
- 7. Wireless sensing for healthcare and medicine*
- 8. Expert systems*



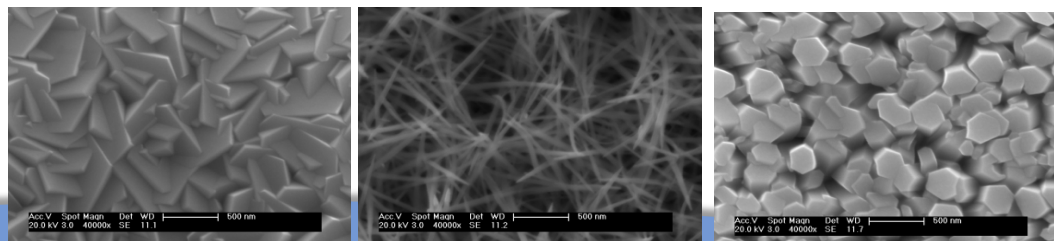
# Nanomaterial synthesis & applications

Able to synthesize/process nanomaterials: ZnO, TiO<sub>2</sub>, MnO, graphene, graphene oxide, CNTs

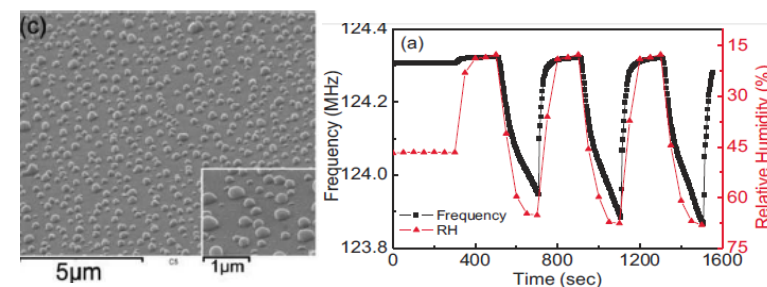
## Vertically Aligned Graphene (FLG) Synthesis



## ZnO nanorods and devices

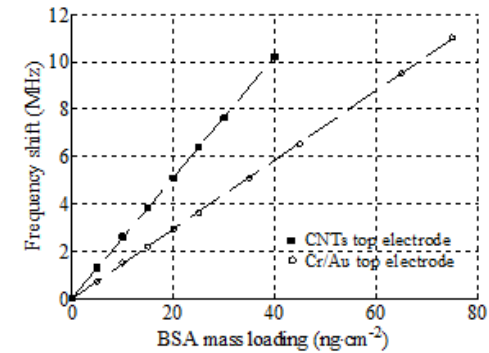
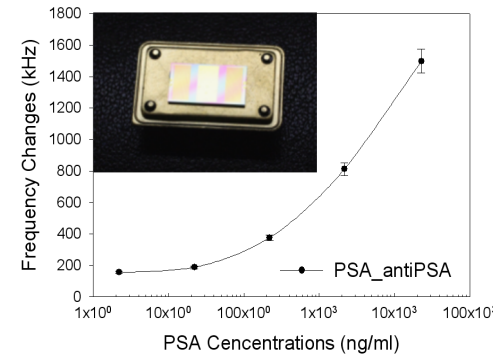
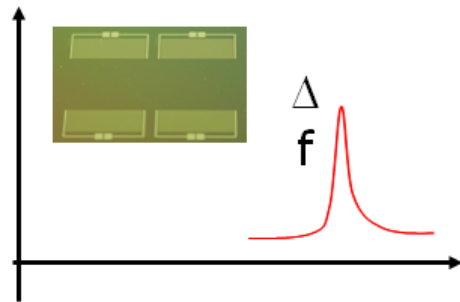


## Silver nanoparticles/H-sensors

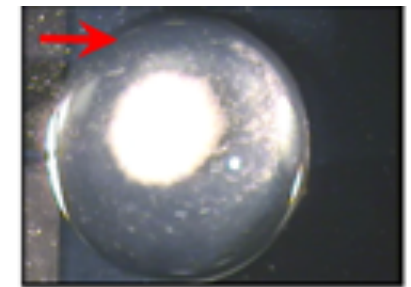
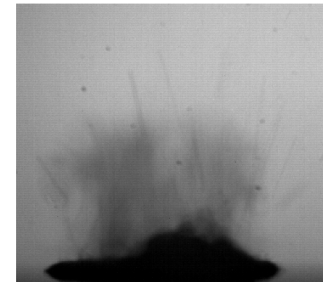
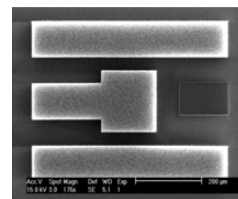
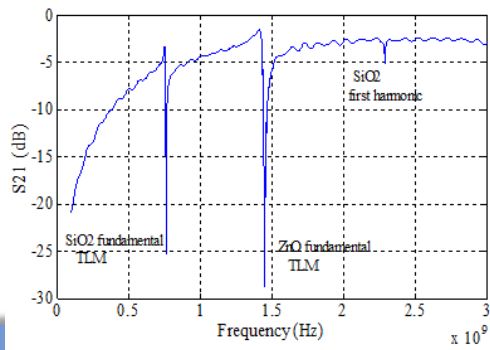


# Physical and Biochemical sensors

## SAW Biosensor for PSA sensing

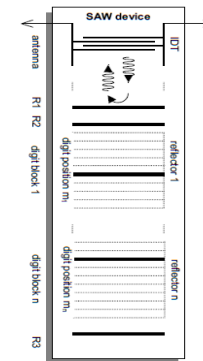
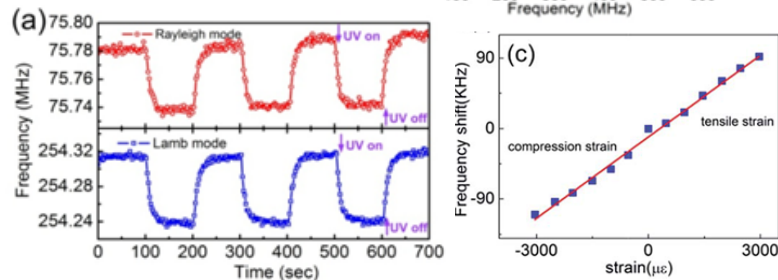
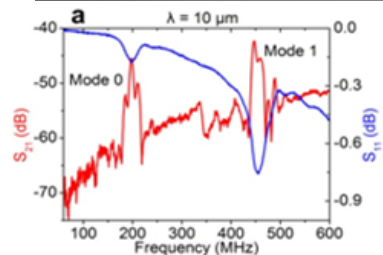
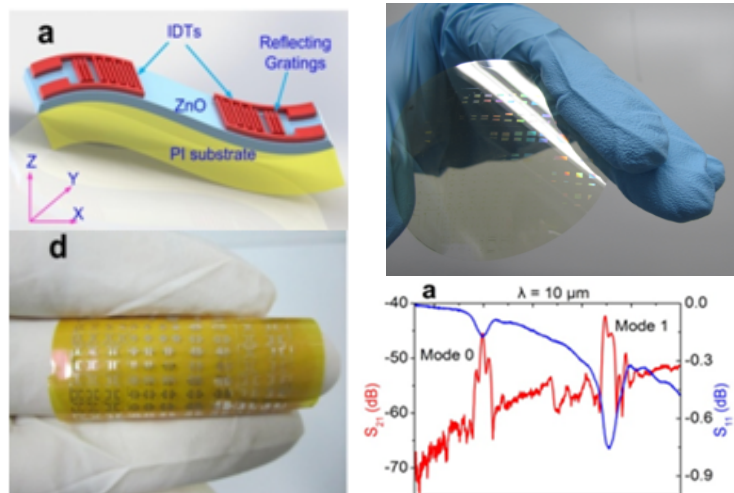


## SAW atomizer, pump, particle concentration

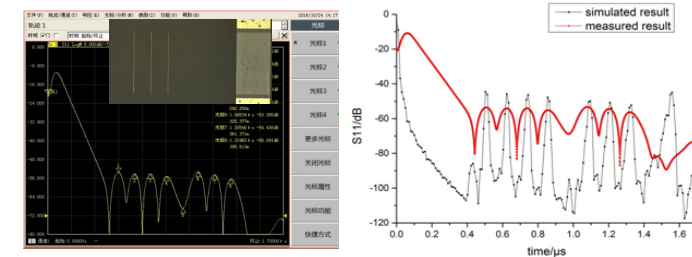


# Flexible/Transparent Sensors

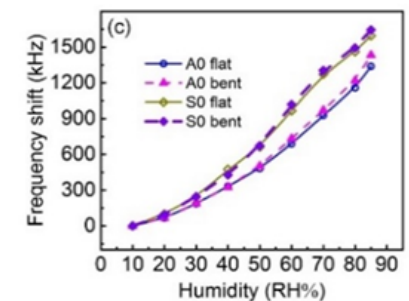
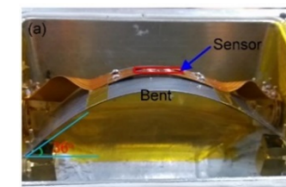
High sensitivity temp., UV, strain sensors  
—wearable applications



Passive wireless high-T SAW sensors

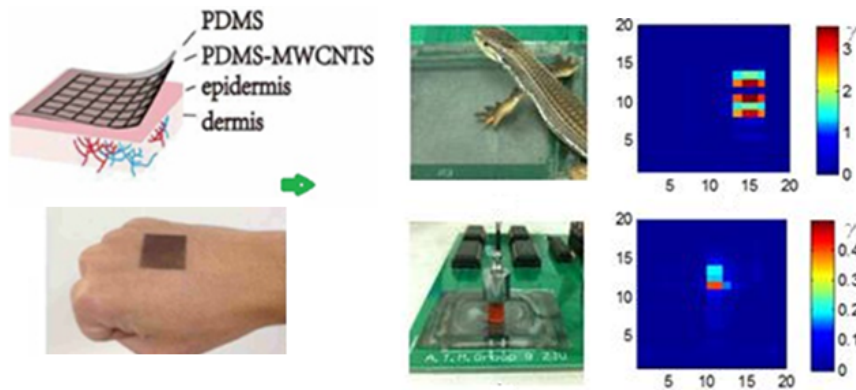


Humidity sensing

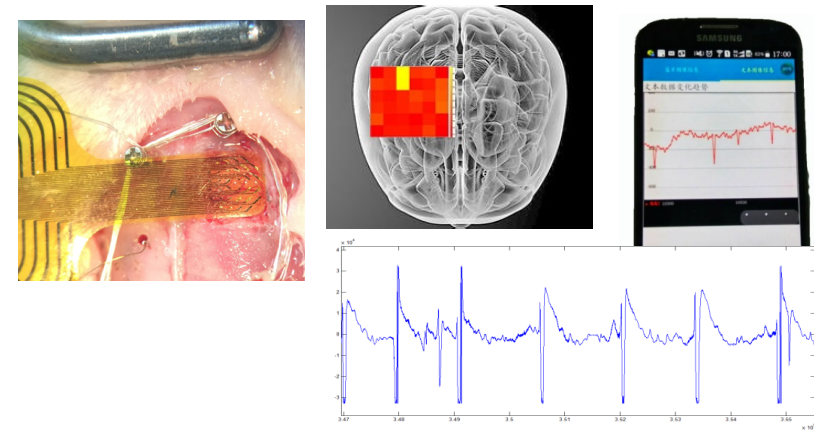


# Flexible/Dissolvable Electronics for Biomedicine

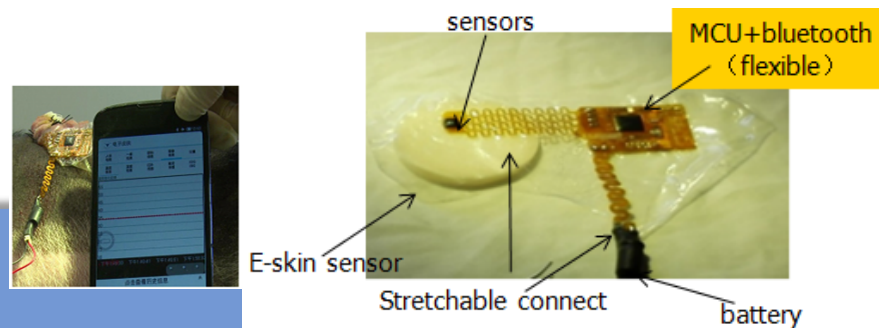
## Electronic-skin sensors



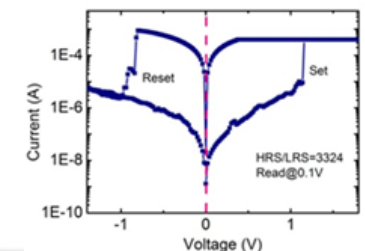
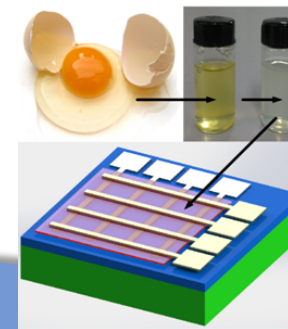
## Portable brain-phone epilepsy detector



## Mobile phone based wound monitoring

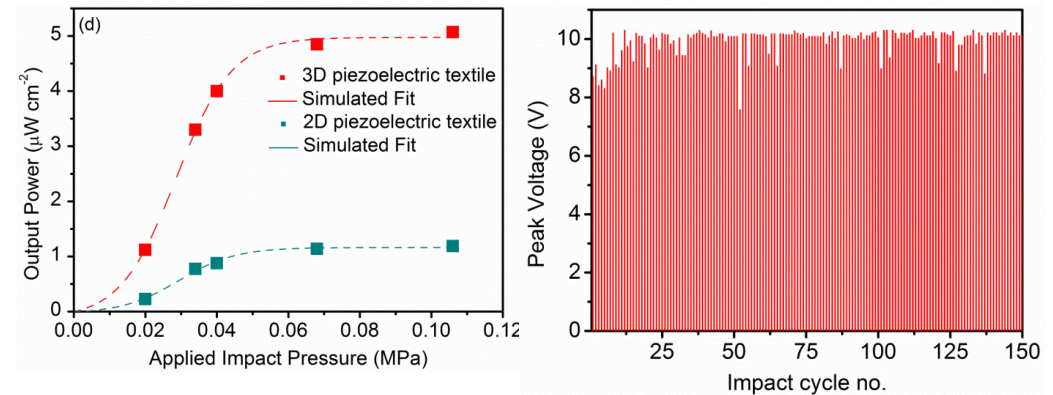
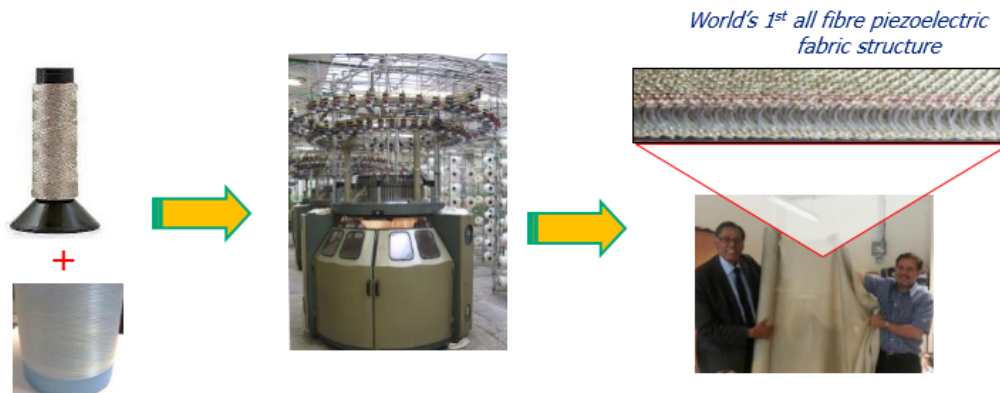


## Dissolvable electronics

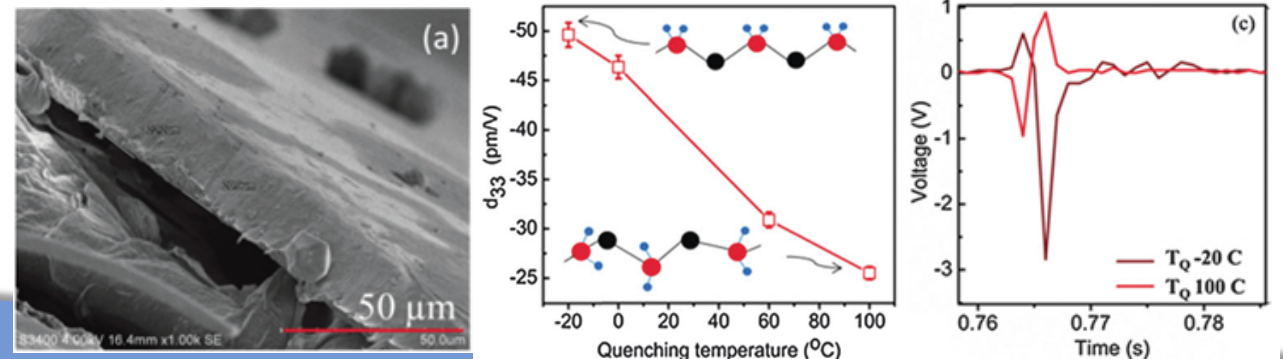
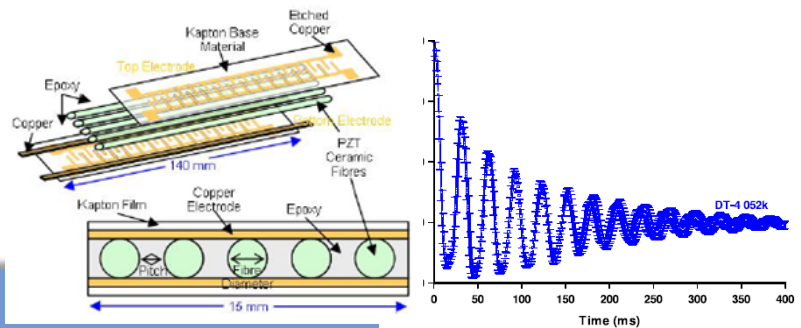




# Piezoelectric polymer based generators

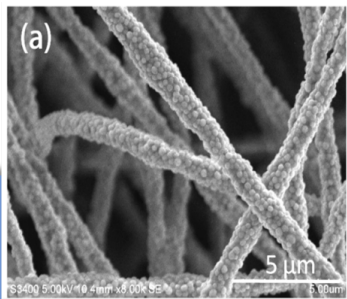
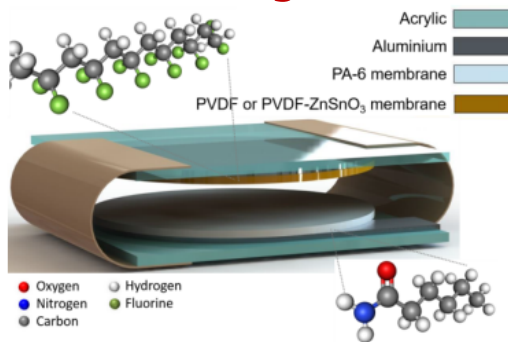


Exclusive self-aligned  $\beta$ -phase PVDF films have  $d_{33} \sim 50\text{pm/V}$

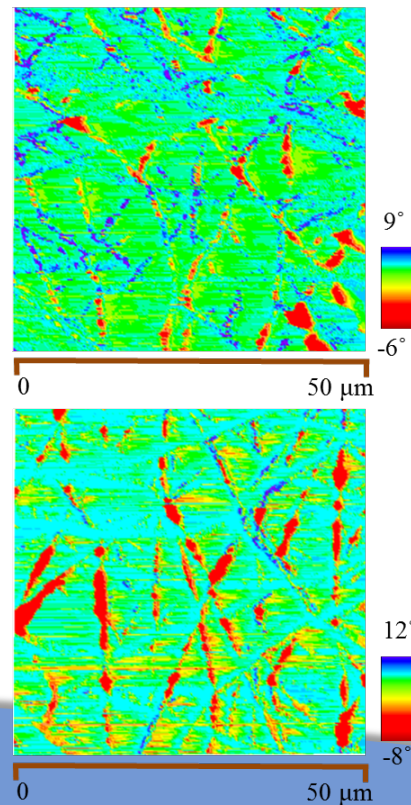


# Micro-energy sources

## Triboelectric generators

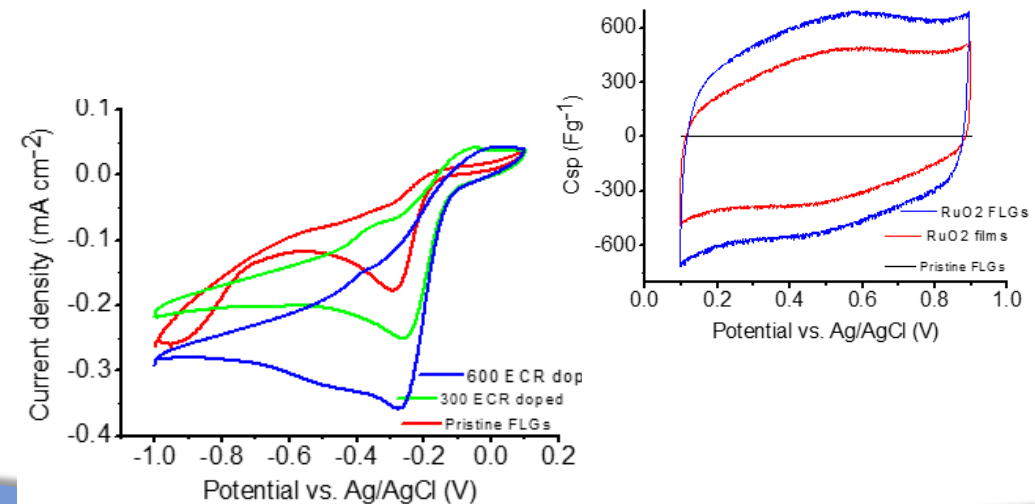


EFM Phase



Material synthesis;  
Structures optimization/modelling;  
Electronics for storage/application;  
Self-powered sensors.

## Fuel Cells, Supercapacitors



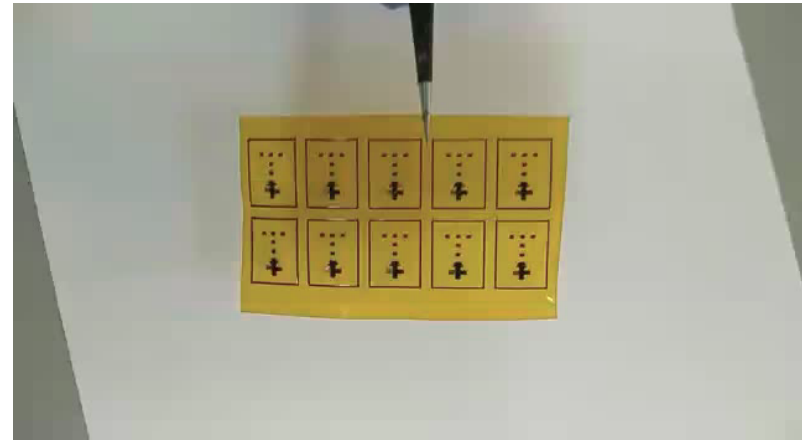


# Antenna design & wireless sensor networks

## Drainage infrastructure monitoring



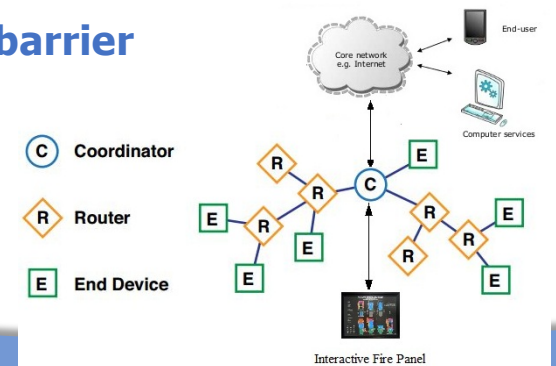
## Laser printed 5G antennas



## Traffic control

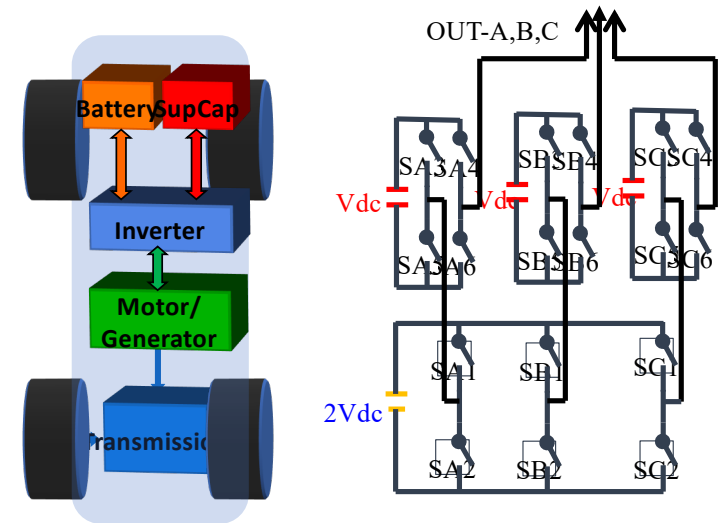
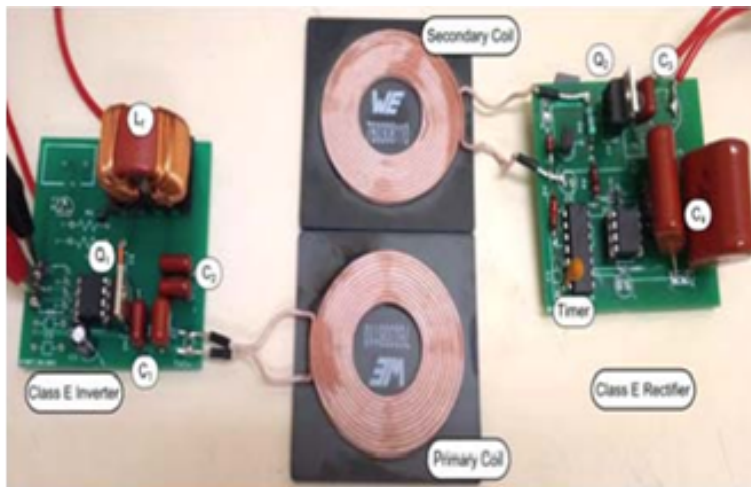


## WSN for fire protection barrier



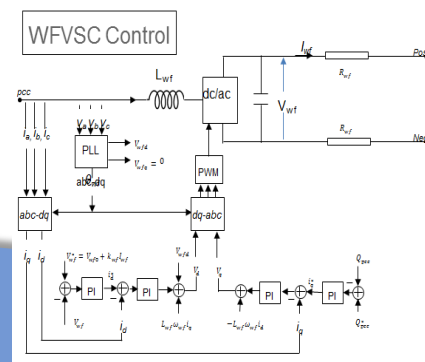
# Wireless power transfer/power electronics

## Wireless power transfer: 1-100W



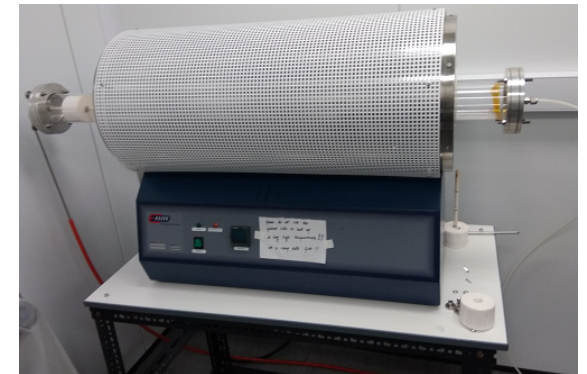
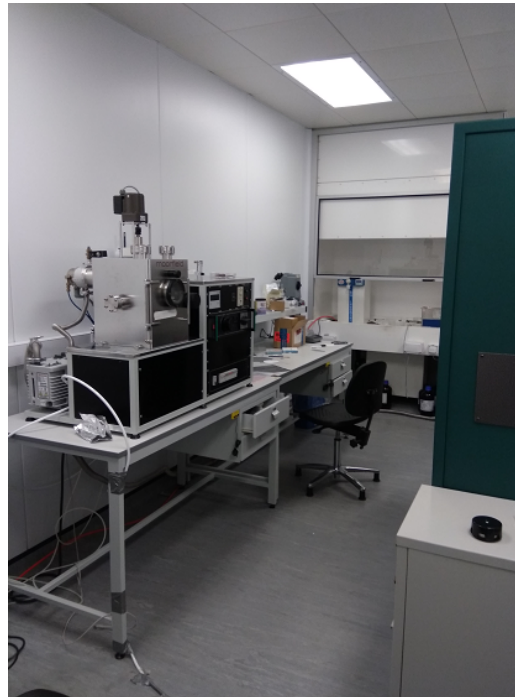
## For vehicle power regulation

## For wind turbines power generators



# Facilities & Equipment

- *Class 1000 cleanroom*
- *Thin film process equipment:*
  - *ALD*
  - *Rf, DC Plasma Sputtering*
  - *E-beam evaporator*
  - *Thermal furnace*
  - *Wet bench*
- *Electrical test lab:*
  - *IV, CV, Hall meas.,*
  - *Probe station,*
  - *UV Vis.,*
  - *Solar cell meas.*
  - *SEMs, AFM*



# *Research Collaborators*

## *National collaborators:*

*Universities of Cambridge, Warwick, Birmingham, Newcastle, West Scotland, Bradford, Sheffield, Chester, Imperial College*

## *International collaborators:*

*Virginia Commonwealth University, USA*

*Zhejiang University (China)*

*Shanghai 2<sup>nd</sup> Polytech University (China)*

*University of Alberta (Canada)*

*University of South Africa*


*IIT Mumbai (India)*

# *The Offering for 2020/2021*

- £7700 per student, with students paying for their own accommodation. The University will assist students to find private accommodation in Bolton.*
- Summer School £400/student. Date to be mutually agreed.*
- Typically private accommodation in Bolton is £50 to £90 per week per student.*



Teaching Intensive, Research Informed

 @BoltonEng