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Engineering Education Scheme Wales is grateful for the EU funds which have supported STEM Cymru II and the continued support from the Welsh Government.

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# Engineering Education Scheme Wales

## PROJECT BROCHURE





# 2021-22

# Sponsorship of EESW Awards

North Wales – Venue Cymru, 28<sup>th</sup> April 2022

	<p><b>Best Application of Engineering and Technology</b></p>		<p><b>Best Use of STEM for Sustainability and the Environment</b></p>
	<p><b>Ian Binning award for Best Use of Mechanical Engineering Principles</b> (Merseyside &amp; North Wales Region)</p>		<p><b>Best Overall Written Report</b></p>

South Wales – Cardiff City Stadium, 4<sup>th</sup> May 2022

	<p><b>Best Chemical/Process Engineering Design</b></p>		<p><b>Best Use of STEM for Sustainability and the Environment</b></p>
	<p><b>Best Application of Engineering and Technology</b></p>		<p><b>Most Innovative Solution to the Project Set</b></p>
	<p><b>Best Appreciation of Safety Issues</b></p>		<p><b>Most Efficient Use of Energy</b></p>
	<p><b>Most Effective Presentation of the Chosen Solution</b></p>		<p><b>Best Overall Written Report</b></p>

# Our Sponsors and Partners

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Calderfoot High School



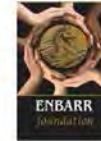
Crickhowell High School



Cyntffig Comprehensive School



Fitzalan High School



Lewis Girls' School



St JOHN'S COLLEGE



St Joseph's Catholic School and Sixth Form Centre



St Teilo's Church in Wales High School



Ysgol Gyfun Gymraeg Plasmawr



Ysgol Maes Garmon



Ysgol Y Preseli



# Engineering Education Scheme Wales

The EESW 6th Form Project encourages young people to consider engineering as a career. Professional engineers from link companies have worked with teams of Year 12 students and their teacher for six months on a real engineering problem. The Project is an approved WJEC Enterprise brief for the Skills Challenge Certificate of the Advanced Welsh Baccalaureate. Students are also able to gain a Gold CREST Award through participation in the scheme by developing a range of essential skills.

This year, we are pleased that the Project has also been approved by CPD UK, which allows teachers, engineers, company representatives and volunteer assessors to gain a certified certificate in recognition of their time spent working with us.

In addition, we are pleased that the professional engineering institutions are also in agreement that the scheme is beneficial to their member companies, and particularly contributes to the development of young graduates.

*“With the introduction of UK-SPEC 4, there has been further focus on D&I, and I believe that volunteering to increase the diversity of those wanting to become engineers is a great CPD activity. This scheme also allows engineers to support and manage the progress of others in a technical setting and will add to any application process.”*

Lydia Amarquaye CEng MIMechE, Professional Development & Education Policy Advisor, Institution Of Mechanical Engineers

*“Having been involved in EESW events for some 20 years and finding them stimulating and thought provoking, I find the evaluation of some of the students’ projects, which are often complex, requires examiners to research outside their comfort zones to achieve fair results. These experiences will add to everyone’s Continuing Professional Development and would be of great benefit to new and experienced engineers’ career development.”*

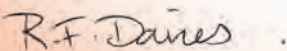
Phil Hourahine MBA, MSc. CEng. FIET., Chair South Wales Institute of Engineers (Education Trust) 2007

Once again, this year has been particularly challenging. We would like to thank students and their teachers for their commitment and determination, despite the ongoing disruptions during the year. We would also like to thank all professionals and academics from link companies and organisations for continuing to support us whilst working remotely.

We are delighted that many organisations have kindly sponsored a variety of awards again this year. We gratefully acknowledge the support of all the schools, universities, companies and sponsors shown on the following pages, who have allowed us to continue offering this opportunity to young people across Wales.

STEM Cymru 2 is funded by the European Social Fund through the Welsh Government to operate in North, West Wales and the Valleys. We are also grateful to have received continued funding from the Welsh Government Education Directorate to undertake activities in other areas of Wales.

**Finally, congratulations to all students who have participated this year and good luck for the future.**



**Rebecca Davies**  
EESW Chief Executive Officer

# EESW Teams 2021-22

## North Wales – Venue Cymru, 28th April 2022

<b>Team</b>	<b>School/College</b>	<b>Company</b>	<b>Page</b>
Conwy			
1	Ysgol Bryn Eliau	Toyota	1
2	Ysgol Dyffryn Conwy 1	Mott MacDonald Bentley	1
3	Ysgol Dyffryn Conwy 2	Mott MacDonald Bentley	2
4	Ysgol Eirias	Bangor University	2
Flintshire			
5	Ysgol Maes Garmon	Waterco	3
Gwynedd			
6	Coleg Meirion Dwyfor, Dolgellau / Pwllheli	Aberystwyth University	3
7	Ysgol Friars 1	TATA Steel, Shotton	4
8	Ysgol Friars 2	TATA Steel, Shotton	4
9	Ysgol Friars 3	Enbarr Foundation & Delta Rock	5
10	Ysgol Friars 4	Enbarr Foundation & Delta Rock	5

# EESW Teams 2021-22

## South Wales – Cardiff City Stadium, 4th May 2022

<b>Team</b>	<b>School/College</b>	<b>Company</b>	<b>Page</b>
<b>Blaenau Gwent</b>			
1	Coleg Gwent Ebbw Vale 1	Thales/ University of South Wales	6
2	Coleg Gwent Ebbw Vale 2	Thales/ University of South Wales	6
3	Coleg Gwent Ebbw Vale 3	Thales/ University of South Wales	7
4	Coleg Gwent Ebbw Vale 4	Thales/ University of South Wales	7
<b>Bridgend</b>			
5	Brynteg School 1	Western Power Distribution	8
6	Brynteg School 2	Western Power Distribution	8
7	Bryntirion Comprehensive School	Zimmer Biomet	9
8	Coleg Cymunedol Y Dderwen	Sony UK Technology	9
9	Cynffig Comprehensive School	Zimmer Biomet	10
10	Maesteg Comprehensive School	FSG Tool & Die	10
<b>Caerphilly</b>			
11	Lewis Girls School	Transport for Wales Rail Services/Amey	11
<b>Cardiff</b>			
12	Cardiff Sixth Form College 1	Network Rail	11
13	Cardiff Sixth Form College 2	Network Rail	12
14	Fitzalan High School 1	Kier Construction	12
15	Fitzalan High School 2	Kier Construction	13
16	Howells College	Transport for Wales Rail Services	13
17	Llanishen High School	AECOM	14
18	St David's Catholic Sixth Form College	University of South Wales	14
19	St John's College	Royal Mint	15
20	St Teilo's Church in Wales High School	Eastman Chemical Company	15
21	Ysgol Gyfun Gymraeg Plasmawr 1	Arup	16
22	Ysgol Gyfun Gymraeg Plasmawr 2	Arup	16
<b>Carmarthenshire</b>			
23	Ysgol Dyffryn Aman	Dŵr Cymru Welsh Water	17
24	Ysgol Dyffryn Taf 1	University of Wales Trinity St David - Computing	17
25	Ysgol Dyffryn Taf 2	Swansea University	18

# EESW Teams 2021-22

## South Wales – Cardiff City Stadium, 4th May 2022

<b>Team</b>	<b>School/College</b>	<b>Company</b>	<b>Page</b>
Merthyr Tydfil			
26	The College Merthyr 1	Future Valleys Construction	18
27	The College Merthyr 2	Future Valleys Construction	19
28	The College Merthyr 3	Future Valleys Construction	19
29	The College Merthyr 4	Future Valleys Construction	20
30	The College Merthyr 5	Future Valleys Construction	20
Monmouthshire			
31	Caldicot High School 1	Nexperia	21
32	Caldicot High School 2	Microchip	21
Neath Port Talbot			
33	St Joseph's School & Sixth Form Centre	Vale Europe Limited	22
Newport			
34	Rougemont School 1	Meritor	22
35	Rougemont School 2	Meritor	23
Pembrokeshire			
36	Ysgol Y Preseli	Aberystwyth University	23
Powys			
37	Crickhowell High School Team 1	Big Pit National Coal Museum	24
38	Crickhowell High School Team 2	Big Pit National Coal Museum	24
Rhondda Cynon Taf			
39	Treorchy Comprehensive School 1	RCT County Borough Council	25
40	Treorchy Comprehensive School 2	RCT County Borough Council	25
41	Ysgol Gyfun Gymraeg Rhydywaun	BBC	26
Swansea			
42	Bishop Gore School	University of Wales Trinity Saint David	26
43	Bishop Vaughan Catholic School	Associated British Ports	27
44	Gowerton School 1	Swansea University	27
45	Gowerton School 2	Kier Construction	28
46	Ysgol Gyfun Gŵyr	Swansea University	28

## North Wales

### Conwy

#### Team 1

##### **Ysgol Bryn Elian & Toyota**

***Consider wasteful aspects of the manufacture process and reduce cost whilst retaining the participation of Toyota team***

Team: Benjamin Ansell  
Carys Boardman  
Sunshine Bowers  
Thomas Dentith

Teacher: Neil Humphreys

Company link: Mykelia Hill

Toyota Motor Corporation is a Japanese multinational automotive manufacturer who aim to exceed expectations and be rewarded with a smile.

Toyota wants to improve part of its car assembly process. The process currently involves production members manually choosing which, out of two options, to use in the assembly process within an allocated amount of time. Ensuring only a single correct type of gasket is selected slows down the process.

Design a solution to aid the above process. Cost is a factor to be considered in the final design, but the primary intention is to create a reliable solution to reduce the time wasted in waiting for the gasket to be selected, without completely removing the human element of the process.

### Conwy

#### Team 2

##### **Ysgol Dyffryn Conwy 1 & Mott MacDonald Bentley**

##### ***Sustainable Site Cabins***

Team: Aron Jones  
Haf Land  
Teleri Lewis  
Bayleigh Shaw  
Sumeyye Tezgel

Teacher: Penri Jones

Company link: Evan Lewis, Prys Roberts  
and Prithula Roy Choudhury

Mott MacDonald Bentley's work is predominantly in the water sector and varies in scale and complexity from schemes to remediate the UK's dam and reservoir infrastructure to construction of multi-million-pound treatment works to provide clean drinking water and treat raw sewage.

Design sustainable site cabins for sites with between 8 and 50 workers. All sites require a welfare unit adjacent to the site for staff to work.

Sites are often located in remote hard to reach places, with limited access and with limited resources such as power and water.

The team therefore require a welfare unit to work, change and eat. With rising awareness of our impact on the planet, we need to minimise the environmental impact of such units.



## North Wales

### Conwy

#### Team 3

##### **Ysgol Dyffryn Conwy 2 & Mott MacDonald Bentley**

###### **Sustainable Site Cabins**

Team: Adam Fletcher  
Mia Davies  
Josh Witt  
Elis Jones  
Lily Taylor

Teacher: Penri Jones

Company link: Prys Roberts

Mott MacDonald Bentley's work is predominantly in the water sector and varies in scale and complexity from schemes to remediate the UK's dam and reservoir infrastructure to construction of multi-million-pound treatment works to provide clean drinking water and treat raw sewage.

Design sustainable site cabins for sites with between 8 and 50 workers. All sites require a welfare unit adjacent to the site for staff to work.

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### Conwy

#### Team 4

##### **Ysgol Eirias & Bangor University**

###### **How to Locate Somebody With WIFI**

Team: Samuel Richie  
Conner Mccoubrey  
Robert Bartlett

Teacher: Mike Hodges

Company link: Dr Gray

Bangor University is a public university in Bangor, Wales. It received its Royal Charter in 1885 and was one of the founding institutions of the federal University of Wales.

Bangor University is committed to sustainable development and global citizenship. Their aim to promote sustainability in research, business, and enterprise activities.

The project brief requires the team to plan a system that can locate somebody in a room using their devices connection to a WIFI network.

## North Wales

### Flintshire

#### Team 5

##### **Ysgol Maes Garmon & Waterco**

###### **Reducing CO2 emissions from Concrete**

Team: Daniel Ballard  
Elin Henstock  
Erin Griffiths  
Sam Price  
Melys Thomas

Teacher: Adrian Evans

Company link: Mike Wellington

Waterco are a Pump and pumping equipment manufacturing company, that aim to help clients understand the level of which their property is at risk, before supporting them in developing sustainable solutions without damaging the environment.

The problem faced by the construction industry is the uncontrolled production of CO2 especially in the production and curing of concrete.

How we can reduce the production of CO2 during it is production and use or minimize the impacts of concrete on the environment by mitigation?

The students also need to ensure the main properties of concrete are not affected, such as the compression, tension and compaction of the concrete, but the CO2 emissions are reduced.

## Gwynedd

#### Team 6

##### **Coleg Meirion Dwyfor Dolgellau/Pwllheli & Aberystwyth University**

###### **Affordable CO2 Monitoring**

Team: Joshua Kitteringham  
Gethin Pritchard  
Jack Benjamin Jones  
Harvie Leigh Williams

Teacher: Huw Hughes

Company link: Dr Dave Langstaff

Aberystwyth University's aim is to provide the highest quality education in a friendly and supportive environment and to undertake internationally competitive, collaborative research in Space Physics, Materials Physics and Quantum Physics.

The project brief requires the students to design affordable portable CO2 monitors.

During the current COVID19 epidemic there has been much attention to air quality and the spread of the disease in poorly ventilated places. A good measure of ventilation levels in an enclosed space is the level of carbon dioxide (CO2).

This project is to construct, build, program and test a CO2 monitor for air quality evaluation.

## North Wales

### Gwynedd

#### Team 7

##### **Ysgol Friars 1 & Tata Steel, Shotto**

*Design a system that would separate the two extraction units without causing any condensation in the pipework or other equipment, eliminating the fire risk in the system*

Team: John Zhao  
Christoff Lotter  
Huw Jones  
Ethan Robinson  
Rolan Jovillano

Teacher: Shaun Holdsworth

Company link: Billy Payne

Tata Steel Shotton manufactures approximately 500,000 tonnes of metallic coated and pre-finished steel per year for building envelope, domestic and consumer applications.

Once painted, the steel goes through a series of curing ovens where the solvent is evaporated off and the paint is cured. The steel can then go through an embossing section, whereby depending on the product the paint on the steel is textured. During this, there are still fumes present due to residue gaseous solvent and also some paint evaporation. These have to be extracted and sent to our Regenerative Thermal Oxidiser (RTO) for incineration. The steel then requires cooling and is sent through a quench unit where any remaining fumes are extracted and sent to the RTO. Both extractions currently mix immediately and cause problems of paint condensation in the pipework and other units which can lead to fuming and fire risks.

Design a system that would separate the two extraction units without causing any condensation in the pipework or other equipment, eliminating the fire risk in the system.

### Gwynedd

#### Team 8

##### **Ysgol Friars 2 & Tata Steel, Shotto**

*Design a system that would separate the two extraction units without causing any condensation in the pipework or other equipment, eliminating the fire risk in the system*

Team: Euan Gilroy  
Henry Francis  
Annabelle Pierce-Jones  
Rose Hancock  
William Halpin-Roberts

Teacher: Shaun Holdsworth

Company link: Billy Payne

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Design a system that would separate the two extraction units without causing any condensation in the pipework or other equipment, eliminating the fire risk in the system.

## North Wales

### Gwynedd

#### Team 9

##### **Ysgol Friars 3 & Enbarr Foundation & Delta Rock**

###### ***Create an oasis in an industrial landscape***

Team: Emily Plaister  
Chloe Smalley  
Patrick Laforga  
Efrog Bristow  
Kai Melville-Richards

Teacher: Shaun Holdsworth

Company link: Lee Twist & Gareth Hitchmough

Enbarr Foundation & Delta Rock group main aims are community regeneration, inspire future generations and ensure local people are able to access (science, technology, engineering, arts and mathematics) education alongside Tourism, Hospitality, Construction, and manufacturing / Advanced manufacturing employment opportunities.

Create an oasis in an industrial landscape utilising Innovation and Heritage to support carbon outputs and aid climate change.

The team are to decide upon the most economically viable solution for the site to achieve carbon neutrality and the least impact on resources and climate, looking at elements such as alternative method of electricity production and decide upon an alternative fuel source to satisfy both fuel and steam generation requirements for potential heating.

### Gwynedd

#### Team 10

##### **Ysgol Friars 4 & Enbarr Foundation & Delta Rock**

###### ***Create an oasis in an industrial landscape***

Team: Tasmyn Green  
Eira Diamond

Teacher: Shaun Holdsworth

Company link: Lee Twist & Gareth Hitchmough

Enbarr Foundation & Delta Rock group main aims are community regeneration, inspire future generations and ensure local people are able to access (science, technology, engineering, arts and mathematics) education alongside Tourism, Hospitality, Construction, and manufacturing / Advanced manufacturing employment opportunities.

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## South Wales

### Blaenau Gwent

#### Team 1

##### **Coleg Gwent Ebbw Vale 1 & Thales/ University of South Wales**

###### ***Charging Electric Vehicles***

Team: Ben Watson  
Jack Cherrett  
Chloe Knapp  
Mollie Lewis  
Iestyn Thomas  
Lewis Padfield

Teacher: Dr Shaun Andrews

Company link: Dene Yandle

Thales Group is a French multinational company that designs and builds electrical systems and provides services for the aerospace, defence, transportation, and security markets. Thales aim to continually improve quality and work more efficiently.

The University of South Wales is a public university in Wales, with campuses in Cardiff, Newport and Pontypridd. They aim to add value to students, through applied research and innovation, and through engagement with the economy and society of our region and the wider world.

Thales challenged the pupils to find the most cost-effective solution to install and configure charging for electric vehicles.

### Blaenau Gwent

#### Team 2

##### **Coleg Gwent Ebbw Vale 2 & Thales/ University of South Wales**

###### ***Adapting Electric Vehicles to Make Them More Sustainable***

Team: Sian Harrison  
Eiry Jones  
Evie Summers

Teacher: Dr Shaun Andrews

Company link: Dene Yandle

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## South Wales

### Blaenau Gwent

#### Team 3

##### **Coleg Gwent Ebbw Vale 3 & Thales/ University of South Wales**

###### ***EV street side charging***

Team: Liam Newton-Scofield  
Sam Prince  
Luke Jenkins  
Harvey Wilkes  
Joseph Williams

Teacher: Dr Shaun Andrews

Company link: Dene Yandle

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The brief for the students is to examine how could street side charging be performed as not everyone has a driveway. Is there an alternative method?

### Blaenau Gwent

#### Team 4

##### **Coleg Gwent Ebbw Vale 4 & Thales/ University of South Wales**

###### ***Energy Saving Phone Chargers***

Team: Taylor Hitchcock  
Millie Takel  
Aneirin Jenkins-Belohorska  
Madelyn Drake  
Carys Jones

Teacher: Dr Shaun Andrews

Company link: Dene Yandle

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The project brief is to re-engineer the phone charging system to save energy as current phone chargers consume energy even without a device being plugged in.

## South Wales

### Bridgend

#### Team 5

##### **Brynteg School 1 & Western Power Distribution**

###### *Heat Recovery system*

Team: Daniel Morgan  
Inseo Baek  
Jacob Cox  
Thomas Morris  
Samuel Harries  
Jacob King  
Owen Martinez

Teacher: Paul Webber

Company link: Tomos Jameson

Western Power Distribution distribute electricity to over 8 million customers over a 55,500 square kilometre service area employing over 6,500 staff throughout South Wales, the South West, East and West Midlands.

The brief tasks the students to solve a problem that the company was facing. They had discovered that the grid transformers, which transform voltage on the Distribution Network from a higher to a lower voltage, were experiencing losses in the form of waste heat and at times of high loading need to be cooled with fans and oil pumps.

### Bridgend

#### Team 6

##### **Brynteg School 2 & Western Power Distribution**

###### *11kV Flood Defence Project*

Team: Bethan Jones  
Sia Riley  
Will Furlong  
Lucy John  
Aditi Bhor  
Phoebe Kwan  
Cara Sweeney

Teacher: Paul Webber

Company link: Ryan Watkins

Western Power Distribution distribute electricity to over 8 million customers over a 55,500 square kilometre service area employing over 6,500 staff throughout South Wales, the South West, East and West Midlands.

With the worlds temperatures rising due to climate change. An effect of global warming that is currently causing problems for WPD is an increase in extreme weather events, in particular intense rainfall causing severe flooding across our operational areas.

The project brief is to research, design and build flood protection schemes to protect low distribution transformers and investigate remote monitoring and alarm systems for these locations.

## South Wales

### Bridgend

#### Team 7

##### **Bryntirion Comprehensive School & Zimmer Biomet**

##### ***Design a non-invasive reusable instrument for hip replacement surgery***

Team: William Bevan  
Scott Jones  
Dylan Barker  
Tom Watkins  
Grzegorz Bialobrzewski  
Jake Briscoe

Teacher: Leighton James

Company link: Jeffery Kong and Siôn Owens

Zimmer Biomet is a publicly traded medical device company. Their mission is to alleviate pain and improve the quality of life for people around the world.

The team are tasked with designing a reusable acetabular cup inserter surgical instrument which does not damage the articulating surface of the acetabular cup when inserting it into the acetabulum during a total hip replacement.

### Bridgend

#### Team 8

##### **Coleg Cymunedol Y Dderwen & Sony UK Technology**

##### ***Design a real-time monitoring system to monitor machine actuators for breakdown or failure***

Team: Harri Gould  
Justin Ruck  
Ieuan Lee  
Noah Langridge  
Dylan Evans

Teacher: Hazel Deeming & Chloe Pritchard

Company link: Joel Manning

Sony is a multinational company infamously known for its technological advances. Sony aims, through continuous technological innovation and new business initiatives, to contribute positively to the natural environment and the dreams of future generations.

The project brief is to design a real-time monitoring system to monitor machine actuators for breakdown or failure.

The system should be able to predict if failures or breakdowns occur and will save time and money on hours of engineering by helping to address potential failures before they get out of hand.



## South Wales

### Bridgend

#### Team 9

##### **Cynffig Comprehensive School & Zimmer Biomet**

###### ***Design a non-invasive reusable instrument for hip replacement surgery***

Team: Oliver Howe  
Madison Jones  
Cerys Powell  
Chloe Russell

Teacher: Dan Morrish

Company link: Sian Williams, Olivia Gillions  
and Annabelle Boardman

Zimmer Biomet is a publicly traded medical device company. Their mission is to alleviate pain and improve the quality of life for people around the world.

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### Bridgend

#### Team 10

##### **Maesteg Comprehensive School & FSG Tool & Die**

###### ***Create a solution to measure four thousand testers a month***

Team: Lola Videan  
Tye Williams  
Jack Isaac  
Harly Videan  
Samuel Nicholas

Teacher: Will Jones

Company link: Steve Cope

FSG Tool & Die are the largest, privately-owned design and build toolmaking company in Europe. Their current facility in Llantrisant, South Wales, was opened in 2006 and is a model of excellence in a wide range of technical disciplines, housing the very latest technology for the design and manufacture of high precision tooling.

The team have been assigned a brief to create a solution to the metrology problem that FSG Tool & Die must measure 4 thousand testers a month by hand.

## South Wales

### Caerphilly

#### Team 11

##### **Lewis Girls School & Transport for Wales Rail Services/ Amey**

###### ***Redesign Bedwlwyn Bridge to allow electrification of the railway underneath***

Team: Amelia Evans  
Lucy Ozkivrak  
Lowri Davies  
Emily Meyrick  
Kayleigh Slade

Teacher: Steve Pole

Company link: Robyn-Jo Williams

Transport for Wales is a wholly-owned, not-for-profit company providing support and expertise to the Welsh Government's transport projects.

The aim of Transport for Wales Rail Services / Amey is to provide a high-quality, safe, integrated, affordable, and accessible transport network that the people of Wales are proud of.

The project brief is to alter and redesign or replace the Bedwlwyn Road Overbridge for the electrification of the rail to meet the requirements.

## Cardiff

#### Team 12

##### **Cardiff Sixth Form College 1 & Network Rail**

###### ***Severn Tunnel resilience planning***

Team: Ahmad Shahmi Nazli Bin  
Anjolaoluwa Sonowo  
Lok Him Karsten Ho  
Norah Hiu Laam Chan  
Ifeoluwakitan Adedigba  
Rohan Oruganti  
Toluwaninyin Ojo-Osagie

Teacher: Gareth Jenkins

Company link: Thomas Garner

Network Rail Limited is the owner and infrastructure manager of most of the railway network in Great Britain.

They aim to operate a safe, dependable and well-ordered railway network that serves customers and communities excellently.

The project brief requires students to look at the current challenges facing the Severn Tunnel and provide potential solutions to these issues. For example, the water ingress from the estuary which causes the corrosion of metallic components.

## South Wales

### Cardiff

#### Team 13

##### **Cardiff Sixth Form College 2 & Network Rail**

###### **Severn Tunnel resilience planning**

Team: Mariam Mehrez  
Ahmed Mehrez  
Ho Ying Lam  
Stephen Yiu  
Yu (Milly) Wong  
Junrong (Andrew) Yang  
Methapon (Ling) Leelarasamee

Teacher: Gareth Jenkins

Company link: Thomas Garner

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### Cardiff

#### Team 14

##### **Fitzalan High School 1 & Kier Construction**

###### **Creating a water pump to reduce plastic use on site**

Team: Moaz Ahmed  
Ali-Ahbab Raza  
Ayman Rehman  
Ahmed Abaid  
Hussain Miah  
Adnaan Khan  
Libban Musa  
Harbinder Kumar

Teacher: Jordan Wright

Company link: Nick Hamersley

Kier Construction are the UK's largest regional builder, with a network of 88 offices across the UK, delivering over £2bn of projects annually to both private and public-sector clients.

Our local Office is based in St Mellons, Cardiff. The construction industry is always working hard to reduce their impact on the environment and to build for a sustainable world. We are continually faced with the changing requirements to reduce our carbon emissions and use of plastics.

The project brief is to reduce Carbon emissions on site reduce their use of plastics or develop a way to re-use/recycle plastics on site.

## South Wales

### Cardiff

#### Team 15

##### **Fitzalan High School 2 & Kier Construction**

###### **Creating a water pump to reduce plastic use on site**

Team: Ewan Henderson  
Farzana Alam  
Raisa Sarkar  
Alex Mingo  
Aminur Rahman  
Ahmed Hassan  
Adnan Mohammed  
Nabil Taufiqurrahman

Teacher: Jordan Wright

Company link: Nick Hamersley

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The project brief is to reduce Carbon emissions on site reduce their use of plastics or develop a way to re-use/recycle plastics on site.

### Cardiff

#### Team 16

##### **Howells College 1 & Transport for Wales Rail Services**

###### **Train Door Interlock Switch Testing**

Team: Percy Cheung  
Cyrus Yau  
Samuel McCarthy  
Ali Mahdi  
Ruhaima Chowdhury  
Mohammad Toor  
Eloise Rathbone-Jones  
Meg Gawne

Teacher: Andrew Ford

Company link: Tom Parker

Transport for Wales operates and maintains a fleet of trains covering commuter and long-distance routes across Wales and the borders. New trains are on the horizon but maintaining our ageing fleet of diesel trains presents a number of challenges.

Train doors are a safety-critical system, and their correct function is vital to passenger safety as well as train performance. The door interlock circuit proves that all doors are securely locked before allowing the driver to release the brakes and take power. The doors receive maintenance at regular intervals, ranging from a functional test to full examination. Part of maintenance job OZS 0615 tests the interlock microswitches.

Currently this requires two technicians, one to operate each individual switch and another in the cab to release and monitor the brakes. During this task the engines must be running inside the depot. This leads to an increase in noise and emissions which impacts on worker's health, as well as using excessive fuel. The project brief is to design and prototype a device for monitoring the correct operation of door interlock microswitches.

## South Wales

### Cardiff

#### Team 17

##### **Llanishen High School & AECOM**

###### **Utilising Stored Energy**

Team: Ellis-Anthony Willis  
Jon Wales  
Luke Evans  
James Vaughn

Teacher: Richard Lawson

Company link: Dan Welsh

AECOM design, build, finance and operate infrastructure assets for governments, businesses, and organisations in more than 150 countries. AECOM has grown to become the world's No.1 ranked engineering firm – delivering integrated, sustainable solutions that help clients and communities in every region of the world create and unlock new opportunities. In today's climate, saving energy is essential.

As building engineers, AECOM are dedicated to providing energy efficient buildings. Although renewable technologies are becoming more efficient and producing more electricity to offset building consumption, they feel as though they could make greater strides in efficiency if we could reduce the consumption within the buildings.

The project brief is to determine a way to reduce the use of mains power by utilising the stored energy in a laptop battery.

### Cardiff

#### Team 18

##### **St David's Catholic College & University of South Wales**

###### **Produce a solution to allow a village to access the nearest school and hospital on the opposite side of a river**

Team: Freya Hayes-Wynn  
Blyddwyn Hurford  
Sophie Morris  
James Qian  
Nerissa Scott  
Hedagwi Gwom  
Alamin Kadir  
Sebastian Szczech

Teacher: Batool Akmal

Company link: Paul Davies

The University of South Wales is a public university in Wales, with campuses in Cardiff, Newport and Pontypridd.

University of South Wales add value to students, through applied research and innovation, and through engagement with the economy and society of our region and the wider world.

The project brief is to produce a solution to allow a village to access the nearest school and hospital on the opposite side of a river.

## South Wales

### Cardiff

#### Team 19

##### **St John's College & Royal Mint**

***Employing a modern approach in finding a solution to a historical coin inscription conundrum***

Team: Harri Thomas  
Oliver Spear  
Ben Passant  
Michal Pyzik  
Jamie Lawrence  
Julie Zhu  
Tilly Speake  
Zakriya Ahmed

Teacher: Rhian Bate

Company link: Amy Williams

The Royal Mint Museum houses coins, medals, artwork and minting equipment previously owned by the Royal Mint.

The museum seeks to inspire a diverse audience to discover, explore and learn about 1000 years of making money.

The purpose of the project assigned by the Royal Mint Museum is to establish a realistic and era appropriate method of inscribing the lettering onto the edge of coins.

### Cardiff

#### Team 20

##### **St Teilo's Church in Wales High School & Eastman Chemical Company**

***Replacement and Containment of Ion Exchange Resin in Demineralisation Water Process***

Team: Isra Berkani  
Ifteka Rahman  
Sirat Gandhi  
Connor O'Leary  
Shaker Hamdi  
Ethan Pratten

Teacher: Samantha Barry

Company link: Matthew Griffiths

Eastman Chemicals manufactures and markets chemicals, fibers and plastics. It provides coatings, adhesives and specialty plastics products, is a major supplier of cellulose acetate fibers, and produces copolyesters for packaging.

They aim to deliver innovative products and solutions while maintaining a commitment to safety and sustainability. Eastman have identified an issue with the replacement and containment of ion exchange resin in the process of demineralisation of water.

The team is tasked with finding a more efficient engineering solution to this method.

## South Wales

### Cardiff

#### Team 21

##### **Ysgol Gyfun Gymraeg Plasmawr 1 & ARUP**

*Research methods and create a plan to make Ysgol Plasmawr a carbon neutral establishment*

Team: Aled Crane  
Cai Landon  
Eban Lawrence  
Iestyn Ellis

Teacher: Gareth Hall Williams

Company link: Ashleigh Davies & Jack Cook

Ove Arup & Partners is a global firm of independent engineers, designers, planners and consultants offering a broad range of professional services.

Arup employs fire, highway, acoustic and building services engineers to name a few. Arup Cardiff is based in Pierhead Street in Cardiff Bay and has over 350 employees. Ranging from civil & structural engineers to ecology consultants and scientists.

Global warming is a threat to our current existence, and this is something that needs to be considered when developing plans for a new building.

The challenge for students is to conduct an LZC on their school, and to prioritize reducing the overall impact on the environment your school has.

### Cardiff

#### Team 22

##### **Ysgol Gyfun Gymraeg Plasmawr 2 & ARUP**

*Research methods and create a plan to make Ysgol Plasmawr a carbon neutral establishment*

Team: Bruno Berry  
Gethin Williams  
Luke Borja  
Madog Hammond  
Max Davies

Teacher: Gareth Hall Williams

Company link: Ashleigh Davies & Jack Cook

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## South Wales

### Carmarthenshire

#### Team 23

##### **Ysgol Dyffryn Aman & Dwr Cymru Welsh Water**

###### ***Harnessing nature to reduce carbon emissions***

Team: Phoebe Davies  
Megan Bevan  
Megan Rees  
Ieuan Phillips

Teacher: James Thomas

Company link: Ben Burggraaf & Emma Atkinson

It is Welsh Water's ambition to become a world class, resilient and sustainable water service for the benefit of future generations. As part of this ambition, Welsh Water is targeting full carbon neutrality by 2040.

As part of our decarbonisation strategy, Welsh Water is investigating the possibility to implement nature-based solutions to improve the water quality in the river Teifi.

To support this project the students are challenged to design and develop a water quality monitoring program to support the "Citizen Science" water quality programme, including selecting the most suitable water sampling technology, frequency and locations to help understand 'hotspot' locations and where we should focus water quality improvement schemes.

### Carmarthenshire

#### Team 24

##### **Ysgol Dyffryn Taf 1 & University of Wales Trinity Saint David Computing**

###### ***DIGITAL HOME Management***

Team: Oliver Broadhurst  
Ethan Wells  
Aaron Allen

Teacher: Richard James

Company link: Nitheesh Kaliyamurthy

The University of Wales Trinity Saint David (UWTSD) was formed on 18 November 2010 through the merger of the University of Wales Lampeter and Trinity University College Carmarthen, under Lampeter's Royal Charter of 1828.

On the 1 August 2013, Swansea Metropolitan University became part of UWTSD. The University's Royal Charter is the oldest in Wales and England after the universities of Oxford and Cambridge.

The project brief is to find a solution to address day-to-day problems that come with "SMART HOMES" and SMART appliances. Ensuring the solution is very simple, cost-effective, customizable based on End User Requirements.



## South Wales

### Carmarthenshire

#### Team 25

##### **Ysgol Dyffryn Taf 2 & Swansea University Mechanical Engineering**

###### **Cost effective sustainable solution to outdoor cooking**

Team: Isaac Walker  
William Carpenter  
Joseph Hartt

Teacher: Richard James

Company link: Dr Sarah Jane Potts

Swansea University's Engineering department aim to develop the potential to become future leaders and champions of industry, or to be equipped to meet the challenges and opportunities for a career in research.

The challenge facing the students is to create a cost-effective sustainable solution to outdoor cooking.

Also consider aspects such as safety considerations around the storage and use of highly flammable gases.

## Merthyr Tydfil

#### Team 26

##### **The College Merthyr 1 & Future Valleys Construction**

###### **Connecting the Taff Trail Across the A465 Dual Carriage Way**

Team: Marnie Jones-Clarke  
Lucia Rowburrey  
Ethan Jones  
Joshua Kennedy  
Jack Kahl  
Alisha Roberts

Teacher: Sophie Hulbert

Company link: Martin Gallimore, Alec Care,  
Rhodri Oates and Alison Graham

Future Valleys comprises large international construction companies alongside established financial investors, partnered with Welsh contractors and designers with knowledge of the area of local supply chain. It comprises FCC, Roadbridge, Meridiam, Alun Griffiths (Contractors) and Atkins.

Future valleys constructions is supporting the objectives of our Valleys Task Force, delivering economic and community benefits in a post-coronavirus recovery period.

The project brief is to build a bridge that will connect the Taf Trail across the new Heads of the Valleys road to replace the old one which has been demolished due to new layout plans.

## South Wales

### Merthyr Tydfil

#### Team 27

##### **The College Merthyr 2 & Future Valleys Construction**

###### ***Connecting the Taff Trail Across the A465 Dual Carriage Way***

Team: Kian Jay Jessett  
Josh Meek  
Dylan Hopkins  
Gabriela Viazzani  
Aaron Goddard  
Lucas Kacperski

Teacher: Sophie Hulbert

Company link: Martin Gallimore, Alec Care,  
Rhodri Oates and Alison Graham

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### Merthyr Tydfil

#### Team 28

##### **The College Merthyr 3 & Future Valleys Construction**

###### ***Connecting the Taff Trail Across the A465 Dual Carriage Way***

Team: Ethan Williams  
Brandon Price  
Tomos Evans  
Thomas Griffiths  
Ieuan Davies

Teacher: Lisa Handscomb

Company link: Martin Gallimore, Alec Care,  
Rhodri Oates and Alison Graham

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## South Wales

### Merthyr Tydfil

#### Team 29

##### **The College Merthyr 4 & Future Valleys Construction**

###### ***Connecting the Taff Trail Across the A465 Dual Carriage Way***

Team: Lewys Bennett  
Evan Forrest  
Ryan Jones  
Amberley Yanez

Teacher: Lisa Handscomb

Company link: Martin Gallimore, Alec Care,  
Rhodri Oates and Alison Graham

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### Merthyr Tydfil

#### Team 30

##### **The College Merthyr 5 & Future Valleys Construction**

###### ***Connecting the Taff Trail Across the A465 Dual Carriage Way***

Team: Thomas Mckeown  
Jacob Evans  
Cai Jones  
Lilly Phillips

Teacher: Lisa Handscomb

Company link: Martin Gallimore, Alec Care,  
Rhodri Oates and Alison Graham

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## South Wales

### Monmouthshire

#### Team 31

##### **Caldicot High School 1 & Nexperia**

###### ***Efficiently manage inventory of Microchips***

Team: Jake Hoffrock  
Evan Stone  
Diesel Williams  
Adam Kartal  
Toby Williams  
Beth Marriot

Teacher: Mark Sheridan

Company link: Adam Bill and Joanne Daniels

Nexperia is a leading expert in the high-volume production of essential semiconductors, components that are required by every electronic design in the world.

The brief of this project is to efficiently manage inventory within Microchip's manufacturing environment to ensure the continued throughput and cycle time of the product fabrication, by creating an automated system to signal when the shelves need to be replenished by the relevant members of staff to ensure maximum production efficiency.

### Monmouthshire

#### Team 32

##### **Caldicot High School 2 & Microchip**

###### ***Designing inventory storage and monitoring systems***

Team: Isabelle Attewell  
Finley Thomas  
Libby Murray  
Josh Collett

Teacher: Mark Sheridan

Company link: Rob Bowen, Tom Farley  
and Alex George

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## South Wales

### Neath Port Talbot

#### Team 33

##### **St Joseph's RC School & Sixth Form Centre & Vale Europe**

###### ***New Method of Hydrogen Production***

Team: Sofia-Elisa Greenway  
Jess Tomkins  
Chen Xin Chen  
Emily John

Teacher: Sam Williams

Company link: Peter Martin

Vale is the largest nickel producer in the world and supplies a wide range of customers from large steel manufacturers to oil and gas automotive industries.

The project brief is to provide a solution to the issue of nickel production producing carbon dioxide into the environment.

The team should consider a low carbon method of hydrogen production that not only produces the quantity of hydrogen we require but also at a cost-effective capital and operational cost.

## Newport

#### Team 34

##### **Rougemont School 1 & Meritor**

###### ***Storage Management and Automation***

Team: Rhys Bosley  
Harvey Davies  
Harri Huckstep  
Lloyd Jackson  
Evelyn Tanaka  
Elliot Church

Teacher: Michael Grimes

Company link: Adeed Ayaz Khan

Meritor is a leading global supplier of drivetrain, mobility, braking, aftermarket and electric powertrain solutions for commercial vehicle and industrial markets.

Meritor's aim is to be the recognized leader in providing advanced drivetrain, mobility, braking and aftermarket solutions to the global commercial vehicle and industrial markets.

The project brief is to provide a solution to the problem Meritor had identified, which is that 500 unorganised pallets and parts are to be taken out and there is no way to locate the parts once they have been removed.

## South Wales

### Newport

#### Team 35

##### **Rougemont School 2 & Meritor**

###### ***Storage Management and Automation***

Team: James Lewis  
Ralph Jones  
Safa Mohammed  
Senaya Jayamanne  
Hannah Viney-Long

Teacher: Michael Grimes

Company link: Adeed Ayaz Khan

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## Pembrokeshire

#### Team 36

##### **Ysgol Y Preseli & Aberystwyth University**

###### ***Renewable Energy on Mars***

Team: John Griffith  
Mia Elliott  
Matthew Cockwell  
Brooke Evans-Harries  
Kyle Day  
Tomos Gwilliam  
John Phillips  
Ash Roberts

Teacher: Duncan Richmond

Company link: Dr Matt Gunn and Tally Roberts

Physics and Astronomy have been taught at Aberystwyth since the University was established in the Old College on the sea front in 1872.

Their scientists are part of the ESA/Roscosmos led ExoMars rover mission. The mission will see the ExoMars rover travel across the Martian surface to search for signs of life as well as take high resolution colour images of its findings.

The project brief involves looking into how to best generate renewable energy on Mars and how to provide a constant power source as it is needed to provide the survival needs of heating, cooling, oxygen production, water generation, and lighting.

## South Wales

### Powys

#### Team 37

##### **Crickhowell High School Team 1 & Big Pit National Coal Museum**

*Investigate and design a suitable renewable energy system for Big Pit*

Team: Pietro Niel  
Sam Johns  
Lloyd Jeremiah  
Benedict Masters  
Raushan Wilk  
Charlie Tanner  
Jonty Heffaran

Teacher: Carron Goold

Company link: Matthew Saunders  
and Benjamin Price

Big Pit National Coal Museum is set in the unique Blaenafon Industrial Landscape and designated UNESCO World Heritage Site, Big Pit used to employ up to 1,300 workers.

Now, museum attendees can follow in their footsteps through award-winning interactive exhibits and our world-famous underground tour

The Project brief is to propose a design of renewable energy system as well as investigate and design a suitable renewable energy system for Big Pit.

The challenge the students face is National Coal Museum, utilising existing mine infrastructure, specifically Mine wastewater outflows.

### Powys

#### Team 38

##### **Crickhowell High School Team 2 & Big Pit National Coal Museum**

*Investigate and design a suitable renewable energy system for Big Pit*

Team: Alex Lee  
Jac Newitt-Law  
Sam King  
Jewel Jikki  
Jack Handyside

Teacher: Carron Goold

Company link: Matthew Saunders  
and Benjamin Price

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## South Wales

### Rhondda Cynon Taf

#### Team 39

##### Treorchy Comprehensive School 1 & RCT Council

###### *Create an active travel route for Treorchy*

Team: Jesse Holt  
Isobel Vaughan  
Oscar Shi  
Samuel Devinett  
Heather Berry

Teacher: Owen Nelson

Company link: Rachel Evans & Rhys Jenkins

Rhondda Cynon Taf County Borough Council was formed by the merger of the former Mid Glamorgan districts of Rhondda, Cynon Valley and Taff Ely (with the exceptions of Creigiau and Pentyrch).

The challenge for the students is that award-winning high street which attracts visitors from surrounding communities as well as further afield in the village of Treorchy has a lack of suitable active travel provision in the area which can deter users from walking or cycling to access key facilities.

The brief is to develop an active travel route/network from River Terrace in Treorchy to North of Ynyswen Industrial Estate to provide a safe and accessible walking and cycling link in order to connect the nearby communities.

### Rhondda Cynon Taf

#### Team 40

##### Treorchy Comprehensive School 2 & RCT Council

###### *Create an active travel route for Treorchy*

Team: Tamzin Jones  
Carys Foale  
Isobel Davies  
Liam Evans  
Owen Rutledge

Teacher: Owen Nelson

Company link: Rachel Evans & Rhys Jenkins

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## South Wales

### Rhondda Cynon Taf

#### Team 41

##### **Ysgol Gyfun Gymraeg Rhydywaun & BBC**

###### ***Build a portable and convenient podcasting device***

Team: Alys Watkins  
Eleanor Hope  
Caitlin Jones

Teacher: Kevin Davies

Company link: Brian Davidge and Guto Thomas

The BBC are the world's leading public service broadcaster.

They aim is to act in the public interest, serving all audiences through the provision of impartial, high-quality and distinctive output and services which inform, educate and entertain.

Zoom, Facetime and Skype are amongst a number of apps we all use daily to talk with friends and family. But during the Covid pandemic, broadcasters like the BBC have been using these platforms to broadcast to radio and television. Despite this standards are important, therefore the BBC has to use some apps which are more specialised, therefore providing a higher performance specification with greater reliability.

The project brief is to build a portable and convenient podcasting device.

## Swansea

#### Team 42

##### **Bishop Gore School & University Of Wales Trinity Saint David**

###### ***Create a renewable system to generate and store energy to charge electric vehicles using street furniture***

Team: Max Beasley  
Samer Almasraf  
Szymon Wolinski  
Ioan Rees  
Aran Pateman  
Thomas Mclean  
Olivia Wilcock

Teacher: Jessica Gibson

Company link: Andy Tibbott

The University of Wales Trinity Saint David is a multi-campus university with three main campuses in South West Wales, in Carmarthen, Lampeter and Swansea, a fourth campus in London, England, and learning centres in Cardiff, Wales, and Birmingham, England. University Of Wales Trinity Saint David aim to transform education in Wales and by doing so transform the lives of the individuals and communities who are connected to them.

The project brief is to create a renewable system to generate and store energy to charge electric vehicles using street furniture.

## South Wales

### Swansea

#### Team 43

##### **Bishop Vaughan Catholic School & Associated British Ports**

###### ***Accelerated corrosion of plant and equipment at the fertiliser terminal***

Team: Adrian Badua  
Leon Maristela  
Scott Lacey  
Ervin Arguelles  
Sajad Alkarim  
Yacob Alkarim  
Adrian Badua  
Leon Maristela

Teacher: Andrew Smith

Company link: Craig Lyle

Associated British Ports is the UK's leading and best-connected port owner and operator. Our 21 ports around Britain offer unparalleled marine, road and rail access to domestic and international markets. ABP also owns the UK's busiest rail freight terminal at Hams Hall, located in the heart of the country.

The challenge for the students is to investigate the accelerated corrosion of plant and equipment at the fertiliser terminal.

The fertiliser products they handle are hygroscopic in nature and all equipment that comes into contact with it, directly and indirectly suffers with severe corrosion.

### Swansea

#### Team 44

##### **Gowerton School 1 & Swansea University**

###### ***Printed resistive heaters as an alternative method for remote/off-grid cooking***

Team: Steven Button  
Maddie Denny  
Alyssa Reynolds  
Lucia Amieni  
Toby Blackmore-Watson

Teacher: Amy John

Company link: Dai Warren

The Department of Mechanical Engineering (DME) in Swansea University consists of multiple groups of researchers with specialities in the themed engineering application areas of: Ocean; Cybernetics; Digital; Bionics and Ultra-precision.

The project brief is to design, prototype, and test a resistive heater that can be used for cooking in remote/off-grid locations, research into existing remote cookers to identify the current market as well as the effect of different print patterns of the carbon paste on different substrates.

## South Wales

### Swansea

#### Team 45

##### **Gowerton School 2 & Kier**

*Design a method of generating electricity using water gathered from guttering across a school*

Team: Leo Braddock  
Cai Rees  
James Jones  
Ben Lewis  
Mackenzie Fitzjohn

Teacher: Victoria James

Company link: Chris Sawyer

Kier Group plc is a British construction, services, and property group active in building and civil engineering, support services, and the Private Finance Initiative. They aim to sustainably deliver infrastructure which is vital to the UK.

The School has been constructed with several large buildings with varying heights and areas which equates to significant surface collection areas; each of the roof have several rainwater downpipes which can be utilised to funnel/collect surface water which would be used to harness energy from the rainwater as a sustainable fuel source for the school.

Design a method of generating electricity using water gathered from guttering across a school.

### Swansea

#### Team 46

##### **Ysgol Gyfun Gwyr & Swansea University**

*Making a novel cube satellite propulsion system for altitude and attitude control*

Team: Aedan Cousins  
Anna Heatley  
Elena Ruddy  
Elliot Riordan  
Gethin Rogers  
Harry Kaminaris  
Osian Jones

Teacher: Alun Rennolf

Company link: Dr Zoran Jelic,  
Joseff Parke Sturrock  
and Dr Ben Evans

Through their range of undergraduate and postgraduate study opportunities Swansea University's Engineering department aim to develop students into future leaders and champions of industry or to be equipped to meet the challenges and opportunities for a career in research.

The project briefs set by the Aerospace Engineering department. They challenged pupils is to make a novel cube satellite propulsion system for altitude and attitude control as well as investigate and make a prototype of micro propulsion systems for a Cube satellite based on general type of "colloidal thrusters".

The task is related to analysis and calculation of design, as well as experimentation related to spacecraft propulsion.