

LEVEL 4 ASSESSMENT SPECIFICATION

Student name:	Yacob Alkarim	Student ID number:	ALK25882786
Programme:	HNC/HND in Electrical and Mechanical Engineering.		
Module	Engineering Applications and Study Skills		
Module code:	GOEN 4000	Contribution to Overall Module Assessment (%):	40%
Lecturer:	Calvin Williams	Internal Verifier:	Rabya Kadhim
Assignment Title:	Academic and Employability Skills for Engineers.	Word count (or equivalent);	2000
Submission deadline:	10/01/2025	Return date of provisional marks & written feedback:	03/02/2025

Submission method:	All written assessments, where practical and possible, must be submitted via Turnitin unless otherwise instructed by the Lecturer. (Please DO NOT put this assessment specification into Turnitin or it will match many similarities with other students' submissions.) Alternative submission method (if applicable): Late submission of the assessment will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 40%. Over one week late, 0%. Only the Extenuating Circumstances Panel may approve a change to submission dates.
Academic honesty/ referencing:	Academic honesty is required. In the main body of your submission you must give credit to authors on whose research and ideas your work is based. Append to your submission a reference list that indicates the books, articles, etc. that you have used, cited or quoted in order to complete this assessment.

Module Learning Outcomes (from module syllabus)

Demonstrate transferable skills in a learning environment. Apply an academic, positive and professional approach to their studies. Identify suitable and relevant sources of information to meet a research topic of your choice

Task 1

Learning styles

Visual learning- Visual learners prefer to process information through images, diagrams, charts, and spatial understanding.

Strengths of visual learners are that Visual learners prefer to process information through images, diagrams, charts, and spatial understanding.

Can struggle with purely auditory or text-based instruction.

Auditory Learning Style- Auditory learners learn best through listening and verbal communication. They prefer lectures, discussions, podcasts, and reading aloud.

Strengths of Auditory Learning is that they are excellent at remembering spoken information and following verbal instructions.

May find it difficult to focus in visually cluttered or silent environments.

Kinesthetic Learning Style - Kinesthetic learners learn best through hands-on experiences and physical activities. They prefer to engage in experiments, role-playing, and practical applications.

Strengths of Kinesthetic learning Strong problem-solving skills and the ability to learn by doing. May struggle in traditional lecture-based or sedentary learning environments.

Reading/Writing Learning Style - These learners prefer to process information through written words. They excel with textbooks, note-taking, essays, and written instructions.

The strengths are that they have strong reading comprehension and writing skills.

They May find visual or auditory-only materials less effective.

Why learning styles are not creditable

Lack of Scientific Evidence: There is no strong scientific evidence supporting the idea that specific learning styles (e.g., visual, auditory, kinesthetic) improve learning outcomes. Research has shown that people learn effectively through a variety of methods, and focusing on one style may limit their potential.

Over-Simplification of Learning: Learning styles oversimplify the complexity of how people learn. Human learning is a dynamic process influenced by many factors, including prior knowledge, motivation, and context. Reducing it to a single style ignores this complexity and can lead to ineffective teaching strategies.

Risk of Labeling: Labeling students as having a specific learning style can create fixed mindsets, where they believe they can only learn in one way. This can discourage them from trying other methods or developing skills in areas they find challenging, ultimately hindering their growth.

Bibliography

<https://bau.edu/blog/types-of-learning-styles/>

<https://www.britishcouncil.org/voices-magazine/four-reasons-avoid-learning-styles-one-alternative>

Task 2.



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United Kingdom · [Contact info](#)

[1 connection](#)

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Open to work 
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Share that you're hiring and attract qualified candidates. 
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Task 3.

Short and medium term	Action required	Constraints	Resources – who or what can help me?	Target dates for action
Pay off my student det.	Frist make a budget that allow me to spend too much and not be able to pay off my debt.	The high interest rates. They would be keeping me paying the student debt for maybe until I'm 40.	Halifax fiancé advisor. And a money tracking app.	As soon as possible. Hopefully get a good chunk of it gone in the next ten years.
Find a good job in a electronic engineering field.	Have good connection. Be open and active in finding a job. Build a strong resume. Work small to then gather good experience.	It will be challenging to get those roles as other will try to get them as well. Limited knowledge on what the industry is looking for.	LinkedIn. Indeed jobs. Going to local council seeing if they have any open slots.	Hopefully after the first year after graduation.
Have a house with a payed off mortgaged	Same the student debt makes a budget and the work to not go over that budget and not to spend too much.	How expensive house can be. With starting value at around £120K	A finical advisor. Can help me see if I'm able to pay off the debt faster with add monthly instalments.	Hopefully have payed a good bit of it off in the first ten years.
Keep having a healthy relationship with the friends and family I have now.	Make sure to keep in touch with them. Not to get too focus on work or other things. Allow yourself to go out with them and have fun	Work and family. Would be too busy to go out. Could be too tired to go out with them.	A group chat with all of them in it. A local league to allow us to play and have fun in a competitive way	Hopefully as long as possible

Gower College Swansea

Underwater Turbine Generator.

[task 4 - report]

ALK25882786 (Yacob Alkarim)
11-11-2024

Underwater turbine generator

Assignment1 Task 4 – The report

Abstract

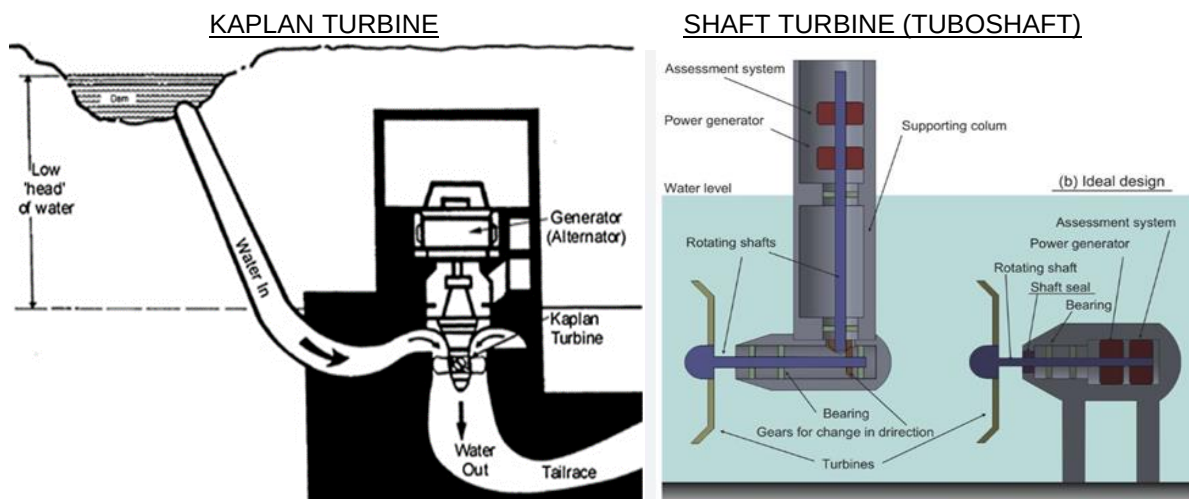
An overall summary of my report and giving the conclusion. (conclusion – will just be my opinion as I'm doing no primary research).

Introduction

Report 1

When reading into a paper written by (Manuel Ayala-Chauvin, 2021) it highlights the need for a change as quoted *"fossil fuel depletion and economic vulnerability are some of the main drivers of the model changes"*. This report then investigates the ability to achieve a way in having a quote *"Underwater Turbine Generator prototype with a gravitational vortex and siphon"*. The report then summarizes the reason in making the Underwater Turbine is *"to promote the decentralized generation and sustainable growth between the territory and its resources"*. When looking into this report I will be going in a detailed summary of how this report is either effective or not.

When reading into this report it was stated that *"Kaplan and Shaft type turbines were chosen as optimal solutions"*. The Kaplan turbine is used when there is a water level dam. This then allows it to be used in a wider range of situations. The main feature of a Kaplan is that it is a adjustable pitch feature. This is important as the generator is going to be running at a constant speed when there is water travelling through it. The shaft turbine is used more for moving water. Using Kinetic Energy to power the generator this is the main advantage of a shaft turbine. As-well as support low-speed also, it reduces the friction in the moving parts giving more support in the rotor not damaging the shaft.



When looking into the overall cost of the system, the underwater turbine cost \$3,000 (£2375.20), Canal and vortex \$6,000 (£4750.41) Electrical components \$5,000 (£3958.67). In total the whole system cost \$14,000 (£11084.28). In the paper they go over the average cost rate of electrical energy in Ecuador that being 0.058\$/kWh. Then using the annual generation of 2019 data. The generation of the hydroelectric group was 52,727 kWh with 4,157 hours of operation. This number can be greater however, due to dry season from June to October, the hours was almost cut in half.

Using the rate of electrical energy in Ecuador 0.058\$/kWh then multiplying it by the total amount of kWh used during the 2019 Annual generation 52,727.

$$\frac{52,727 \times 0.058}{\text{kWh}} = 3,058 \$ / \text{year}.$$

This would take 4.5 years to become profitable. This is only if it gives the same conclusion or better every year. However, this doesn't account for the overall maintenance and operating expenses. If subtracted the *"net flow of saving per year will be 1,058\$/year"*.

To then calculate the profit, you would need to take the initial payment and divide it by the Net flow saving per year.

Conclusion to Report 1

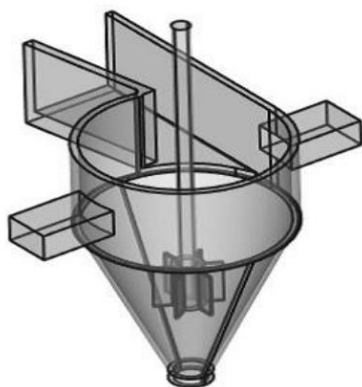
For looking into a way in having renewable electricity supply to rural or isolated communities. As a need for less dependent need for fossil fuel was a favourable result as there were able to get efficiency on *"7.5 kW of useful electrical energy with an efficiency of 35 to 37%"*. This allowed the local of these rural or isolated communities to get a *"more than 5000 hours at full load, just like a conventional hydroelectric plant"*. This would also, allow this design to be reproduced in my other contexts to allow *"generation and sustainable growth between the territory and its resources"*. What makes this report so good that is that it has real world values and that you can truly know whether it was effective or that it wasn't. Many of the reports that I have investigated don't have any real-world test only going into a theoretical perception.

Report 2

The report (include report here). This report I read into of low head water vortex turbine is a way of creating a clean and sustainable energy. As is a report they consider many different types of vortex turbines. Hopefully finding the most effective vortex turbine. Looking into a base prototypes of a vortex turbine there can be energy that can have an overall efficiency of 53.67%. Aswell going into detail on how the flow rate of the vortex turbine is a factor that would need to be investigated.

In the introduction, the authors highlight several key researchers and their contributions to water vortex turbine technology. Frank Zotlöterer, an Austrian engineer, developed Gravitational Water Vortex Power Plants (GWVPP) for low-head power generation. Hakim (referenced by Ersoy, 2014) studied how the distance between oscillating parts affects vortex-induced power generation. Permana (2011) explored the impact of the free surface on oscillating parts, finding that lower positions increase water level amplitude. Bernitsas and Raghavan (2006) created the VIVACE converter, which harnesses energy from ocean or river currents. Punit Singh and Franz Nestmann (2009) optimized a water-free vortex propeller for micro-hydro systems. Piyawat Sritram and Ratchaphon Suntivarakorn (2017) compared water-free vortex turbines to undershot water turbines, achieving 35.92% efficiency at 50 rpm. Saleem et al. (2020) found that vortex height and shape significantly impact turbine performance, with optimal results at mid-range speeds. Rahman et al. (2018) showed that higher inlet flow rates improve efficiency, while Ullah et al. (2020) demonstrated that multistage turbines with Savonius-type blades perform better with larger deflectors and narrower penstocks. Lastly, Bajracharya et al. (2020) emphasized that runner height is a critical design parameter. These studies collectively provide a strong foundation for the authors' research on low-head water vortex turbines. And add a greater number of evidence to back their ideas.

Gravitational Water Vortex turbine



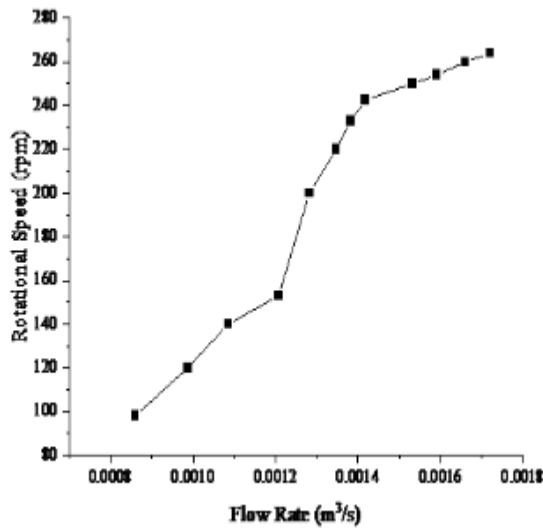
How the system is put together, it is done by placing the turbine into a conical basin where a vortex is then generated. *“When water is introduced into a conical basin tangentially, it creates a vortex and energy is harnessed”*. this was then carried out in a real-world test and seen if it can be made.



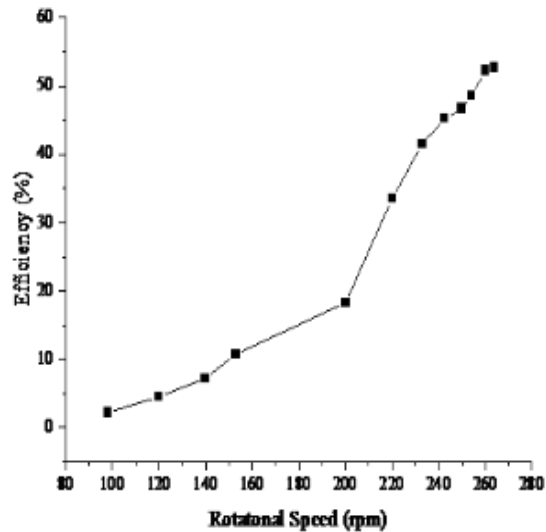
The experimental results of the low-head water vortex turbine are visually summarized in the following graphs to illustrate the relationships between key performance parameters. Graph 1 shows the variation of rotational speed with flow rate, highlighting how increased water flow leads to higher turbine speeds. Graph 2 depicts the relationship between rotational speed and efficiency, demonstrating that efficiency peaks at higher speeds. Graph 3 illustrates the variation of output power with rotational speed, revealing a significant increase in power generation as the turbine spins faster. Finally, Graph 4 explores the relationship between flow rate and torque, showing that higher flow rates result in greater torque. Together, these graphs provide a comprehensive overview of the turbine's performance under varying conditions, offering valuable insights for optimizing its design and operation.

Graph 1

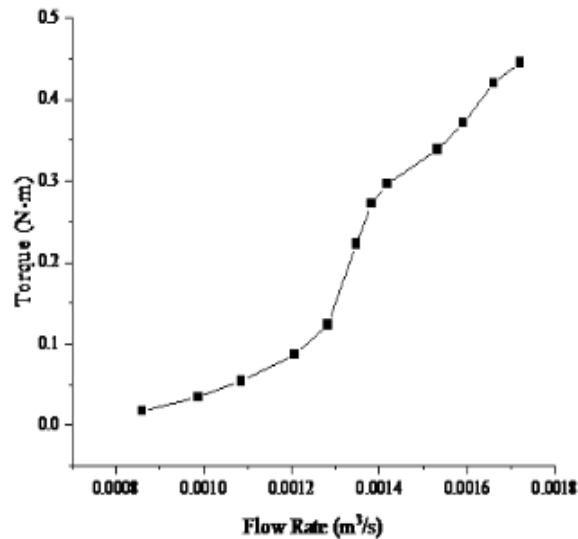
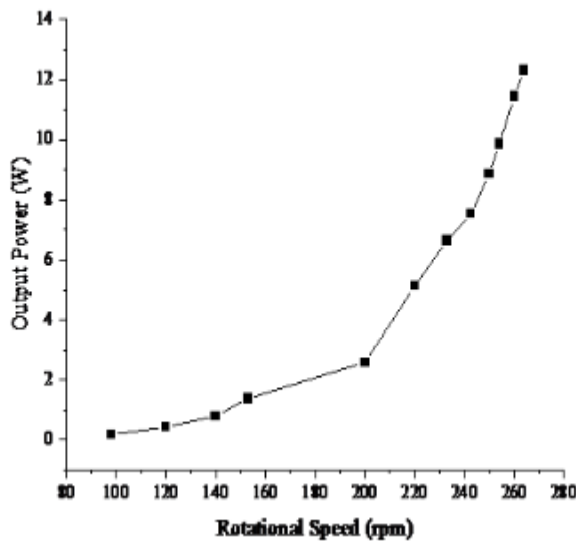
Graph 2



Graph 3



Graph 4



For looking into a way in having renewable electricity supply to rural or isolated communities. As a need for less dependent need for fossil fuel was a favourable result as there were able to get efficiency on “7.5 kW of useful electrical energy with an efficiency of 35 to 37%”. This allowed the local of these rural or isolated communities to get a “more than 5000 hours at full load, just like a conventional hydroelectric plant”. This would also, allow this design to be reproduced in my other contexts to allow “generation and sustainable growth between the territory and its resources”. What makes this report so good that is that is has real world values and that you can truly know whether it was effective or that its wasn't. Many of the reports that I have investigated don't have any real-world test only going into a theoretical perception. (report 1).

Conclusion to report 2

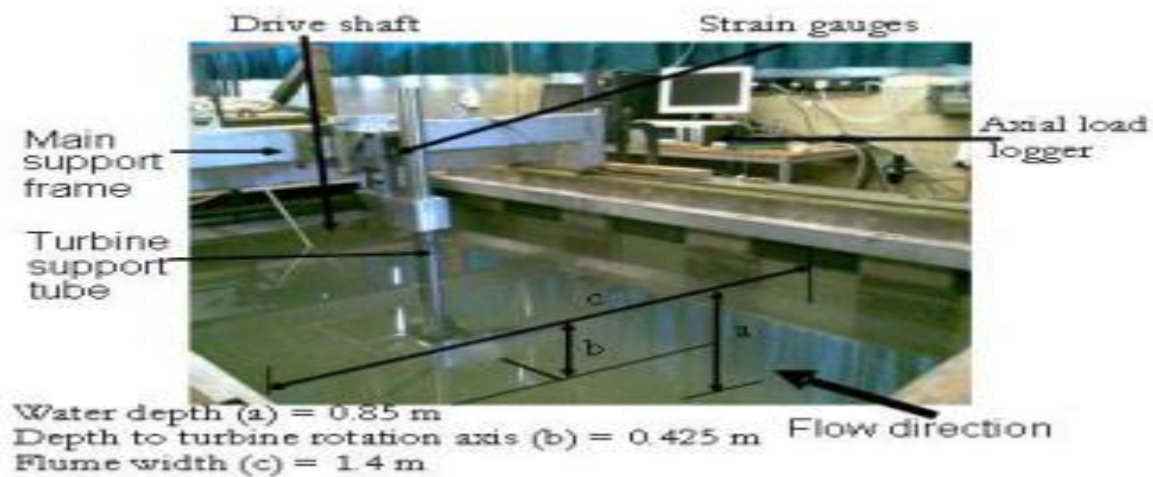
This report task I'm looking into how and advantages way out of the disadvantages. And one of the best advantages of the vortex turbine is its simple design, low maintenance requirements, and minimal environmental impact, making it a practical option for rural or off-grid electrification. However, there is potential for further improvement. Future research could explore the use of curved blades or optimize geometric parameters to enhance efficiency and scalability. This study contributes to the growing field of renewable energy technologies, offering a sustainable and cost-effective solution for harnessing hydropower in resource-limited settings. Aswell, what makes this report so good is that it investigates so many reports and takes them all into consideration, allowing there to be a wider range of testing. There is also a real-world test allowing for there to be a greater understanding of how much energy is generated from the vortex turbine.

Report 3

The report, "Experimental and Computational Analysis of a Model Horizontal Axis Tidal Turbine," explores how well a small tidal turbine performs using both real-world tests and computer simulations. The researchers tested a 0.5-meter turbine in a water flume with a steady flow of 1 m/s, measuring its power and torque. They then compared these results to predictions from CFD models created with FLUENT software. The models matched the real-world data well, especially for power and torque. The study also looked at how different blade angles affect performance, finding that a 6° angle worked best for maximum power. Surprisingly, the turbine wasn't too sensitive to small changes in blade angle, which could make it easier to adjust in real-world conditions. Overall, the research highlights the potential of

tidal turbines as a reliable energy source, while also pointing out the challenges of designing them to survive tough marine environments. By combining experiments with simulations, the study offers useful insights for improving tidal turbine designs and making tidal energy more viable in the future.

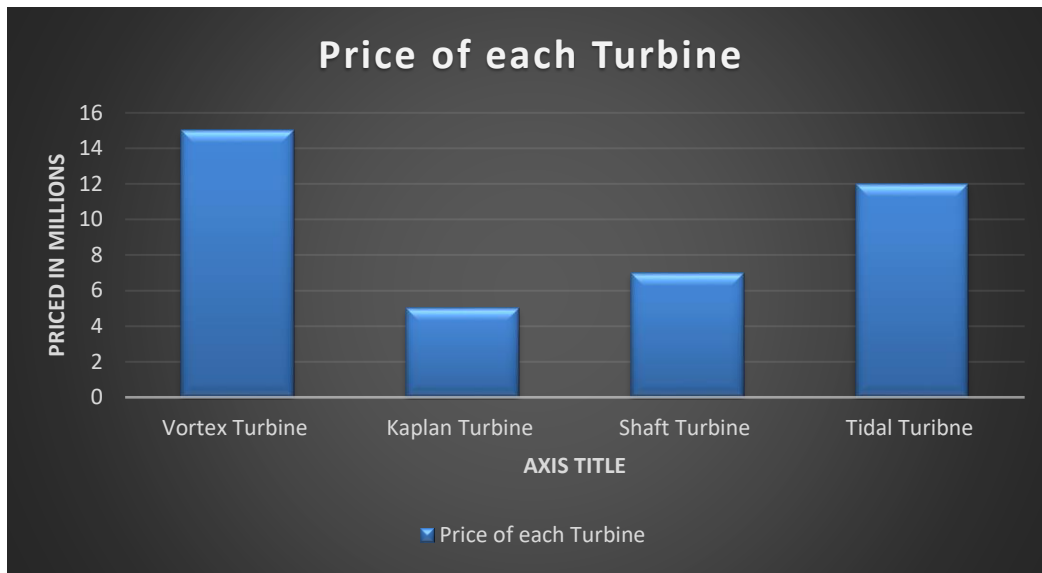
The researchers conducted their experiment by testing a scaled-down horizontal axis tidal turbine (HATT) with a 0.5-meter diameter in a controlled water. The flume provided a uniform water flow of 1 m/s, simulating tidal currents. The turbine was connected to a servomotor, which measured torque and rotational speed, allowing the team to calculate power output. They tested the turbine at different blade pitch angles (3°, 6°, and 9°) to determine the optimal angle for maximum power generation. To validate their experimental results, they created computational fluid dynamics (CFD) models using FLUENT software, simulating the same conditions as the flume tests. The CFD models used different turbulence models to predict the turbine's performance, with the Reynolds Stress Model (RSM) providing the closest match to the experimental data. By comparing the experimental and CFD results, the researchers confirmed the accuracy of their simulations and gained insights into the turbine's behaviour under various conditions. This combined approach helped them optimize the turbine's design and performance.



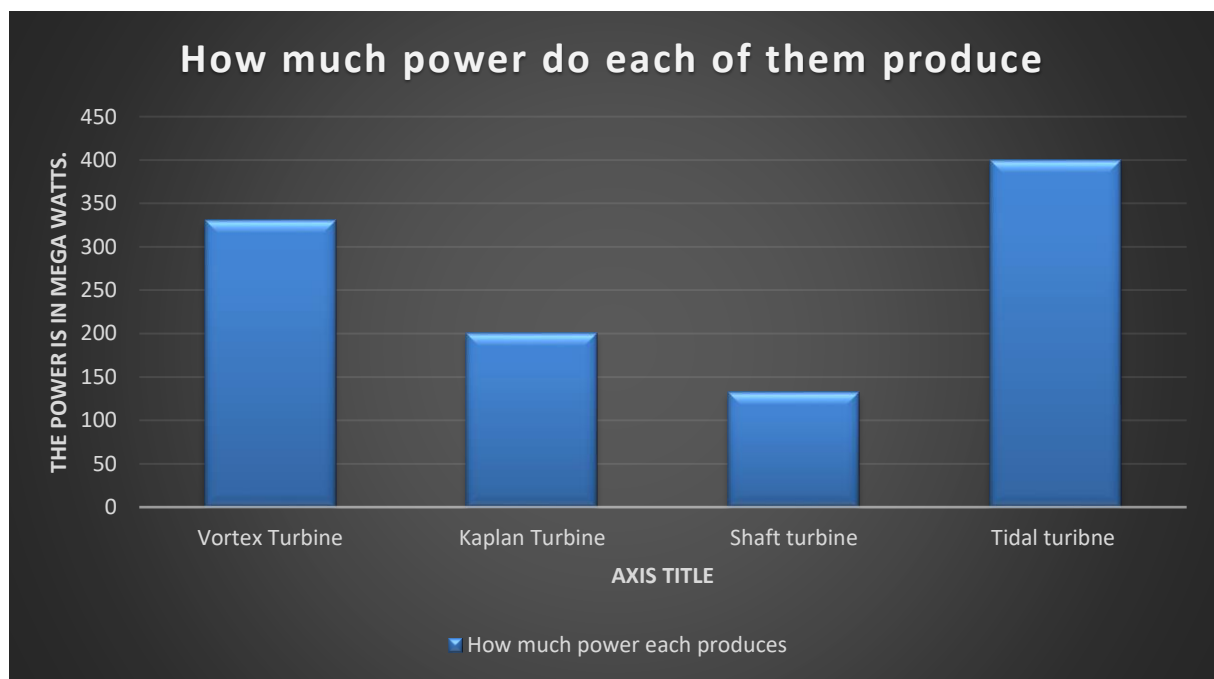
Conclusion to report 3

The report does a great job of showing how well experimental tests and computer simulations can work together to study tidal turbines. The experiments in the water flume gave solid data on power and torque, and the CFD models, especially the Reynolds Stress Model (RSM), matched up well with the real-world results. The team also figured out that a 6° blade angle works best for power and that the turbine isn't too fussy about small changes in blade angle, which is handy for real-world use. That said, there's still room to make things better. The experiments had some scatter in the data, likely because the turbine blades were too close to the support structure. Moving them farther apart or connecting the motor directly to the turbine could help clean up the results. Also, the CFD models didn't account for how the water's surface might affect the turbine, which could matter more at higher speeds or different depths. Looking into these factors in future studies could make the models even more accurate and useful. All in all, this research is a solid step forward for tidal energy, but with a few tweaks, it could give us an even clearer picture of how to make tidal turbines work better in the real world.

Gathered data



The gathered data above allow you to see in a visual on how much each of the machines cost to make. The Vortex turbine is the most expensive as it had to be implemented in a more natural environment. So often the vortex turbine is man-made. We however there is a difference with the tidal turbine as they are hard to implement due to the strong tidal currents make them very expensive to install. The shaft and Kaplan turbine are very mainstream so they are easy to manufacture and implement.



The data above shows how much power each of the Turbine generates allowing them to supply the power that they were built for. As shown there is a link in cost to power, the greater the cost of set-up of the turbine the greater power output there will be. With the strong tidal currents the Tidal turbine is able to produce a high amount of power output.

Underwater Generator

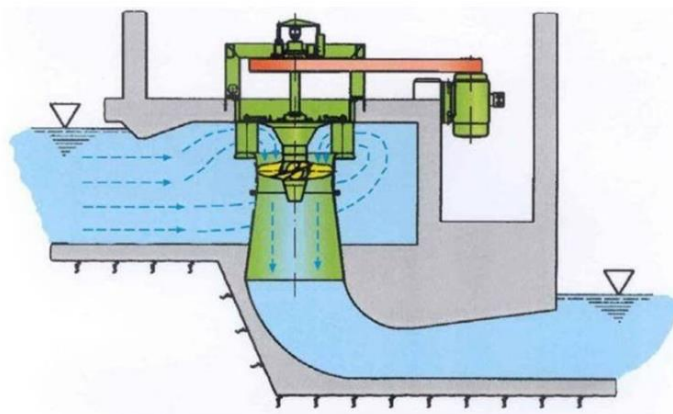
By Yacob Alkarim

Kaplan turbine

The turbine works by converting the kinetic and potential energy of flowing water into mechanical energy. This then can be transformed into electrical energy via a connected generator.

A Kaplan turbine is great as it can adjust its blades to match the varying water-flows. This allows it to be used in a wide range of operating conditions.

The Kaplan turbine there-fore is widely regarded for its adaptability and performance in renewable energy applications.

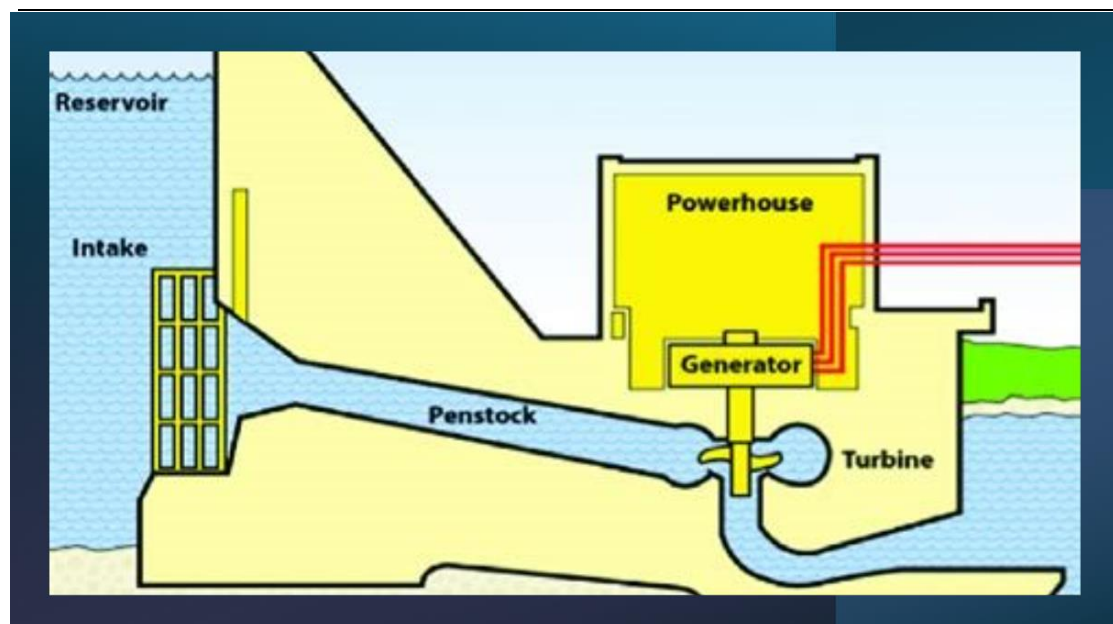


Shaft turbine

A shaft turbine converts the kinetic and potential energy of flowing or falling water into mechanical energy. Which is then used to generate electricity.

The shaft turbine works by directing water through a penstock to get funneled towards the turbines. This then causes the turbine and the connecting shaft to rotate.

The power that the shaft turbine produces, its ability to consistent power generation and often its long lifespan makes it a great choice for an environmentally friendly system.

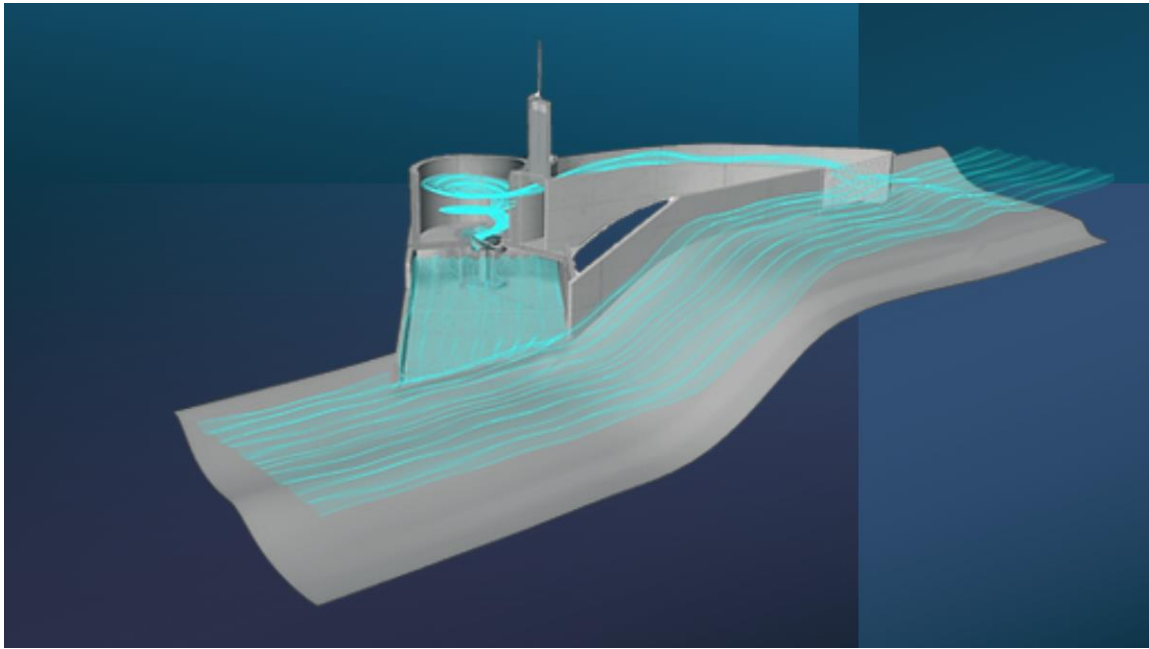


Vortex turbine

The vortex gets its energy by taking converting rotation energy into mechanical energy and then into electricity.

A vortex turbine works by generating energy by using kinetic energy of a controlled swirling water vortex. Water is entered into a funnel-shaped basin. This then creates a vortex that then would spin the turbine at the bottom.

This design offers several advantages, it can be used in projects for rural or remote areas. Also, it has minimal disruption to aquatic ecosystem. One of the main reasons is that it doesn't need to have large dams to create energy.

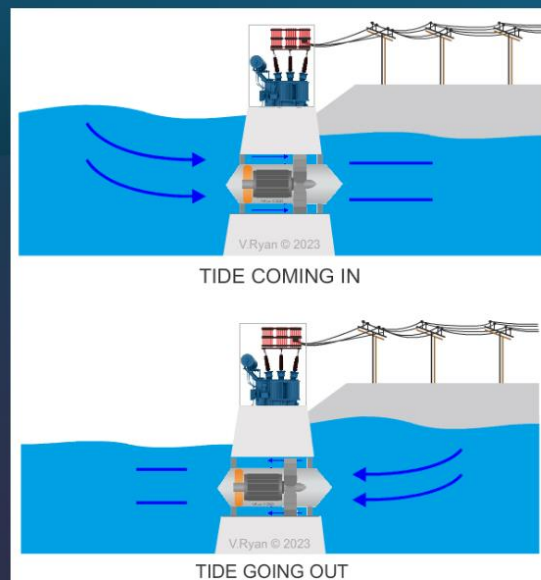


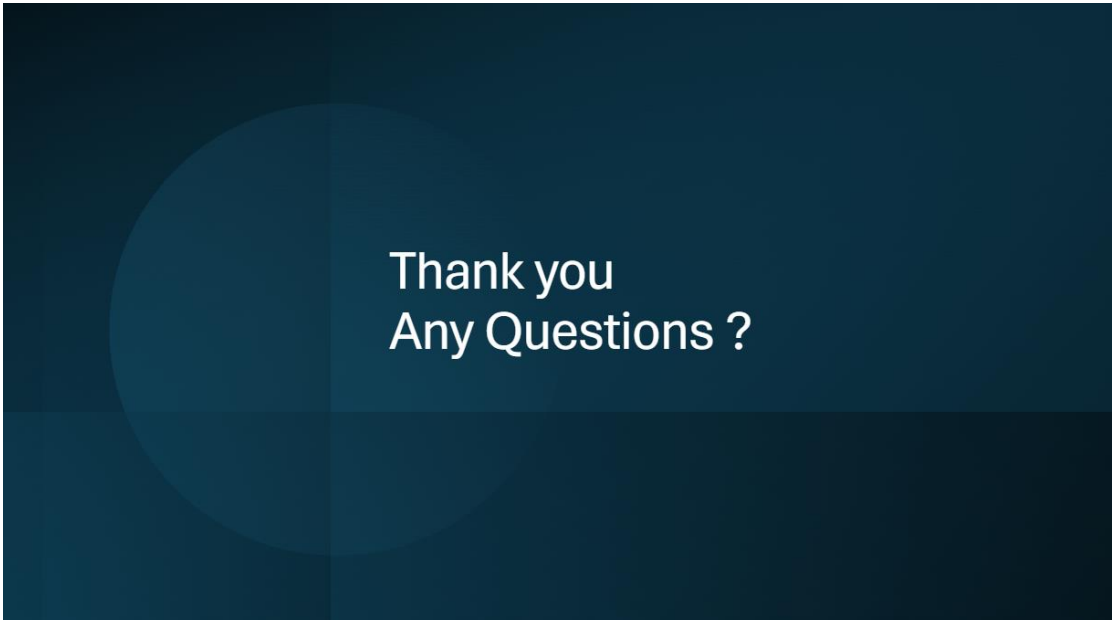
Tidal turbine

Tidal turbine get their energy from kinetic energy of the tidal currents. They use the moon and sun to generate electricity. They work almost similarly to wind turbines however; they are submerged into water.

The tidal turbine foundation or mounting system is secure to the seabed or it can be a floating platform. With the tidal current flow, it allows to produce reliable and predictable energy due to the consistent nature of tides.

With advantage for the tidal turbine being minimal greenhouse gas emissions and producing a high energy due to the density of water. And its long lifespan. This makes tidal turbine a great option.





Thank you
Any Questions ?

Bibliography

Graph websites.

<https://www.esi-africa.com/africa/high-cost-of-a-kaplan-turbine-project-the-whys-explained/#:~:text=from%2072MW%20to-,4%2C900MW.,plants%20examined%20is%20%24414%2FkW.>

<https://www.renewableenergyhub.co.uk/main/hydroelectricity-information/costs-associated-with-hydroelectricity>

report graphs

<https://www.sciencedirect.com/topics/engineering/kaplan-turbines#:~:text=The%20adjustable%20pitch%20feature%20of,water%20level%20in%20the%20dam>

<https://www.amacoil.com/news-articles/linear-drive-with-adjustable-pitch-enables-variable-speed/#:~:text=In%20applications%20where%20it%20is,to%20the%20drive%20motor%20speed>

<https://mijst.mist.ac.bd/mijst/index.php/mijst/article/view/297/276> (report 2)

GUIDANCE FOR STUDENTS IN THE COMPLETION OF TASKS

NOTE: The guidance offered below is linked to the five generic assessment criteria overleaf.

1. Engagement with Literature Skills

Your work must be informed and supported by scholarly material that is relevant to and focused on the task(s) set. You should provide evidence that you have accessed an appropriate range of sources, which may be academic, governmental and industrial; these sources may include academic journal articles, textbooks, current news articles, organisational documents, and websites. You should consider the credibility of your sources; academic journals are normally highly credible sources while websites require careful consideration/selection and should be used sparingly. Any sources you use should be current and up-to-date, mostly published within the last five years or so, though seminal/important works in the field may be older. You must provide evidence of your research/own reading throughout your work, using a suitable referencing system, including in-text citations in the main body of your work and a reference list at the end of your work.

Guidance specific to this assessment:

This section will be assessed by your response to Task 1. This specifically relates to referencing and engagement with literature.

You need to show evidence of engagement with an extensive range of relevant and credible literature and high-level referencing skills. The Harvard system of referencing must be employed to evidence research.

2. Knowledge and Understanding Skills

At level 4, you should be able to demonstrate knowledge of the underlying concepts and principles associated with your area(s) of study. Knowledge relates to the facts, information and skills you have acquired through your learning. You demonstrate your understanding by interpreting the meaning of the facts and information (knowledge). This means that you need to select and include in your work the concepts, techniques, models, theories, etc. appropriate to the task(s) set. You should be able to explain the theories, concepts, etc. to show your understanding. Your mark/grade will also depend upon the extent to which you demonstrate your knowledge and understanding.

Guidance specific to this assessment:

In Task 2 you will have the opportunity to show a sound knowledge of learning styles. You will need to show a good level of knowledge and analysis of theories and techniques.

3. Cognitive and Intellectual Skills

You should be able to present, evaluate and interpret qualitative and quantitative data, in order to develop lines of argument and make sound judgements in accordance with basic theories and concepts of your subject(s) of study. You should be able to evaluate the appropriateness of different approaches to solving problems related to your area(s) of study and/or work. Your work must contain evidence of logical, analytical thinking. For example, to examine and break information down into parts, make inferences, compile, compare and contrast information. This means not just describing what! But also justifying: Why? How? When? Who? Where? At what cost? You should provide justification for your arguments and judgements using evidence that you have reflected upon the ideas of others within the subject area and that you are able to make sound judgements and arguments using data and concepts. Where relevant, alternative solutions and recommendations may be proposed.

Guidance specific to this assessment:

The Self-assessment Audit carried out in task 3 will give you the opportunity to evidence your cognitive and intellectual skills. Critical evaluation and analysis of your findings need to be shown.

4. Practical Skills

At level 4, you should be able to apply the basic underlying concepts and principles to evaluate and interpret these within the context of your area of study. You should be able to demonstrate how the subject-related concepts and ideas relate to real world situations and/or a particular context. How do they work in practice? You will deploy models, methods, techniques, and/or theories, in that context, to assess current situations, perhaps to formulate plans or solutions to solve problems, or to create artefacts. This is likely to involve, for instance, the use of real world artefacts, examples and cases, the application of a model within an organisation and/or benchmarking one theory or organisation against others based on stated criteria.

Guidance specific to this assessment:

This will be assessed in Task 4.

You will need to produce a well-structured and self evaluative action plan that accurately reflects your needs and goals. This applying knowledge gained to real world situations will provide evidence for this area.

5. Transferable Skills for Life and Professional Practice

Your work must provide evidence of the qualities and transferable skills necessary for employment requiring the exercise of some personal responsibility. This includes demonstrating: that you can communicate the results of your study/work accurately and reliably, and with structured and coherent arguments; that you can initiate and complete tasks and procedures, whether individually and/or collaboratively; fluency of expression; clarity and effectiveness in presentation and organisation. Work should be coherent and well-structured in presentation and organisation.

Guidance specific to this assessment:

This will be assessed in Task 5.

This will be assessed in the way that you present your work. A 2000 word report incorporating, diagrams, spreadsheets, and photographs is required. Your report should be presented in a professional manner, be easy to read with each of the above tasks clearly addressed. You will be required to make a 5 minute presentation to your class-mates and faculty staff, thus covering the relevant criteria for this unit.

STUDENT FEEDBACK FORM

This section details the *extent* to which the assessment criteria are demonstrated by you, which in turn determines your mark. The marks available for each category of skill are shown. Lecturers will use the space provided to comment on the achievement of the task(s), including those areas in which you have performed well and areas that would benefit from development/improvement.

Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills		
Task 1	5 10	
2. Knowledge and Understanding Skills		
Task 2	10	
3. Cognitive and Intellectual Skills		
Task 3 Skills Self-Assessment Audit	10	
4. Practical Application Skills		
Task 4 Developed the personal development plan	25	
5. Transferable Skills for Life and Professional Practice		
Task 5 A report satisfying the criteria in the student guidelines. A presentation	25 15	

Assessment Mark (Assessment marks are subject to ratification at the Exam Board. These comments and marks are to give feedback on module work and are for guidance only until they are confirmed.)	Late Submission Penalties (tick if appropriate)		%
	Up to 1 week late (40% Max)		
	Over 1 week late (0%)		

GENERIC ASSESSMENT CRITERIA

Level 4

In accordance with the Framework for Higher Education Qualifications, at the end of Level 4 students will be expected to have demonstrated knowledge of the basic underlying concepts and principles of a subject, and an ability to evaluate and interpret these within the context of that area of study. They should be able to present, evaluate and interpret qualitative and quantitative data in order to develop lines of argument and make sound judgements in accordance with basic theories and concepts of their subject(s) of study. They will have learned how to evaluate different approaches to solving problems, and will be able to communicate the results of their study/work accurately and reliably, and with structured and coherent arguments. They will be able to undertake further training and develop new skills within a structured and managed environment and will have the qualities and transferable skills necessary for employment requiring the exercise of some personal responsibility.

Level 4	FAIL	MARGINAL FAIL	SATISFACTORY (3 rd / Pass)	GOOD (2.2 / Pass)	VERY GOOD (2.1 / Merit)	EXCELLENT (1 st / Distinction)	EXCEPTIONAL (1 st / Distinction)
Category	0-29%	30-39%	40-49%	50-59%	60-69%	70-84%	85-100%
Engagement with literature (including reading, referencing, academic conventions and academic honesty)	Little or no evidence of reading and/or reliance on inappropriate sources. Views and findings mostly unsupported and non-authoritative. Referencing conventions used incoherently or largely absent.	Poor engagement with essential reading. No evidence of wider reading. Reliance on inappropriate sources, and/or indiscriminate use of sources. Heavily reliant on information gained through class contact. Inconsistent and weak use of referencing.	Engagement with a limited range of mostly relevant and credible sources but with some reliance on information gained through class contact. Some omissions and minor errors. Referencing conventions evident though not always applied accurately or consistently.	Engagement with an appropriate range of literature, including sources retrieved independently. Some over-reliance on texts rather than other sources. Referencing may show minor inaccuracies or inconsistencies.	Engagement with a wide range of literature, including sources retrieved independently. Selection of relevant and credible sources. Generally sound referencing, with no/very few inaccuracies or inconsistencies.	Engagement with an extensive range of relevant and credible literature. Consistently accurate application of referencing.	Exceptional engagement with an extensive range of relevant and credible literature. High-level referencing skills consistently applied.
Knowledge and understanding (Knowledge of the basic underlying concepts and	Major gaps in knowledge and understanding of the basic underlying concepts and	Gaps in knowledge of the basic underlying concepts and principles, with flawed or	Limited knowledge and understanding of the basic underlying concepts and	Knowledge of the basic underlying concepts and principles is accurate with a	Competent knowledge of the basic underlying concepts and principles. Exhibits very	Excellent knowledge and understanding of the basic underlying concepts and	Exceptional, detailed knowledge and understanding of the basic underlying

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Category	0-29%	30-39%	40-49%	50-59%	60-69%	70-84%	85-100%
principles of a subject.)	principles of the subject matter. Inclusion of irrelevant material. Substantial inaccuracies.	superficial understanding. Some significant inaccuracies and/or irrelevant material.	principles within the subject area. Some elements may be missing.	good understanding of the field of study but lacks depth and/or breadth.	good understanding.	principles of the subject.	concepts and principles
Cognitive and intellectual skills (Evaluate underlying concepts and principles of a subject and interpret qualitative and quantitative data in order to develop lines of argument and make sound judgements.)	Wholly or almost wholly descriptive work. Little or no evaluation of the underlying concepts and principles. Failure to develop arguments, leading to illogical or invalid judgements. Minimal or no use of evidence to back up views.	Largely descriptive work, with superficial evaluation of the underlying concepts and principles. Weak interpretation of data, flawed development of arguments and judgements. Information accepted uncritically, uses generalised statements made with scant evidence and unsubstantiated opinions. Ideas sometimes illogical and contradictory.	Limited attempt at evaluation of the underlying concepts and principles, tending towards description. Can interpret qualitative and quantitative data but with some errors. Some evidence to support emerging arguments and judgements but these may be underdeveloped or with a little inconsistency / mis-interpretation.	Good evaluation of the underlying concepts and principles. Can interpret qualitative and quantitative data, with minor errors. An emerging ability to use evidence to support the argument. Mostly valid arguments and logical judgements.	Sound evaluation of the underlying concepts and principles. Can interpret qualitative and quantitative data accurately. Ability to devise arguments using evidence to make mostly appropriate and valid judgements.	Excellent evaluation of the underlying concepts and principles. Can interpret qualitative and quantitative data accurately and with some insight. Excellent ability to devise arguments using evidence and make appropriate and valid judgements.	Exceptional evaluation of the underlying concepts and principles based evidence. Outstanding interpretation of qualitative and quantitative data. Exceptional ability to devise arguments using evidence and make wholly appropriate and valid judgements.
Practical skills (Different approaches to solving problems in particular contexts.)	Limited or no use of taught, basic methods, materials, tools and/or techniques. Little or no appreciation of the context of the application.	Rudimentary application of taught, basic methods, materials, tools and/or techniques but without consideration and	An adequate awareness and mostly appropriate application of basic methods, materials, tools and/or techniques.	A good and appropriate application of basic methods, materials, tools and/or techniques. Clear appreciation of	A very good application of a range of basic methods, materials, tools and/or techniques. Very good consideration of the context of	An advanced application of a range of taught, basic methods, materials, tools and/or techniques. The context of the application is	Exceptional levels of application and deployment skills in particular practical contexts. Outstanding identification of

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Category	0-29%	30-39%	40-49%	50-59%	60-69%	70-84%	85-100%
	Very weak evidence of different approaches to problem-solving in particular contexts.	competence. Flawed appreciation of the context of the application. Weak evidence of different approaches to problem-solving in particular contexts.	Basic appreciation of the context of the application. Can identify problems in particular contexts and propose basic alternative approaches or solutions though there may be errors.	the context of the application. Good evidence of different approaches to problem-solving in particular contexts and proposes mostly appropriate solutions.	the application. Very good evidence of different approaches to problem-solving in particular contexts and proposes appropriate solutions.	well considered, and insightful. Excellent evidence of different approaches to problem-solving in particular contexts and proposes appropriate solutions.	problems in particular contexts and formulation of wholly appropriate, thoughtful solutions / different approaches.
Transferable skills for life and professional practice (Communicate the results of their study/work accurately and reliably, and with structured and coherent arguments; the qualities needed for employment requiring the exercise of some personal responsibility within a structured and managed environment.)	Work is poorly structured, disorganised, inaccurate and/or confusingly expressed. Very weak use of language and/or very inappropriate style. Failure to work effectively individually or as part of a group. Little or no evidence of the skills for employment requiring the exercise of some personal responsibility.	Work is poorly presented in a disjointed manner. It is loosely, and at times incoherently, structured, with information and ideas often poorly expressed. Weak use of language and/or inappropriate style. Flawed approach to individual or group work, meeting only partial obligations to others. Limited evidence of the skills for employment requiring the exercise of some personal responsibility.	Mostly ordered presentation and structure in which relevant ideas / concepts are reasonably expressed. Work may lack coherence and/or accuracy in places. Can work as part of a group, meeting most obligations to others but perhaps with limited involvement in group activities. Demonstrates the basic skills for employment requiring the exercise of some personal responsibility, with some areas of minor weakness.	Mostly coherent, organised and accurate work, in a suitable structure and is for the most part clearly expressed. Can work effectively independently and/or as part of a team, with clear contribution to group activities. Demonstrates the skills for employment requiring the exercise of some personal responsibility, with some areas of strength and some of minor weakness.	Work is accurate, coherent, fluent, well-structured and organised. Can work effectively independently and/or as part of a team, with very good contribution to group activities. Demonstrates very good skills for employment requiring the exercise of some personal responsibility, with just occasional minor weakness.	Work is coherent, very fluent and is presented professionally. Can work effectively independently and/or as part of a team, with an excellent contribution to group activities. Demonstrates excellent skills for employment requiring the exercise of some personal responsibility with an appetite for further development.	Work is accurate, exceptionally coherent, very fluent and presented well. Can work effectively independently and/or as part of a team, with an exceptional contribution to group activities. Demonstrates exceptional skills for employment requiring the exercise of some personal responsibility with an appetite for further development.

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