



INTERNAL ASSESSMENT APPROVAL FORM (INCLUDING COLLABORATIVE PROVISION)

This form is used to ensure that assessment specifications have been through an internal review process prior to external examination/approval and release to students. It should be completed for each assessment for a particular module. The assessment tasks, criteria and marking scheme should accompany this form.

PARTNER (and taught location if relevant):	Coleg Sir Gar				
EXTERNAL EXAMINER NAME:	Dr Arfan Ghani				
ASSESSMENT AUTHOR :	Robert Davies				
MODULE TITLE:	Power Electronics and Drives				
MODULE CODE:	PSDE6016		MODULE LEVEL:	6	
COMPONENT NO. (e.g. 1 of 2):	1 of 2		COMPONENT WEIGHTING (e.g. 50% of the module):	50%	
ASSESSMENT PERIOD	☒ Semester 1	☐ Semester 1 <i>Re-sit</i>	☐ Semester 2	☐ Semester 2 <i>Re-sit</i>	<i>Other, please state</i>
TYPE OF ASSESSMENT:	☒ Coursework		☐ Examination		☐ Practical
LANGUAGE OF ASSESSMENT:	English		TRANSLATION REQUIRED (Y/N):	N	
FOR EXAMINATIONS ONLY. SPECIFY BELOW ANY ADDITIONAL MATERIAL(S) TO BE USED IN THE EXAMINATION					
<i>This box will expand as you type</i>					

INTERNAL MODERATOR PLEASE TICK TO INDICATE THAT THE ASSESSMENT INCLUDES:		<i>Please</i> ✓		Comments
		YES	NO	
1	Tasks that are specified clearly, accurately and comprehensibly, with appropriate use of language and neat presentation	☒	☐	
2	Tasks which enable the module learning outcomes to be demonstrated (as per the module syllabus)	☒	☐	
3	Tasks which conform to the assessment described in the module syllabus	☒	☐	
4	Tasks which are written at the appropriate level of the Framework for Higher Education Qualifications (see http://www.gaa.ac.uk/docs/gaa/quality-code/qualifications-frameworks.pdf?sfvrsn=170af781_14).	☒	☐	
5	Clear criteria for assessment and guidance about how marking/grading will be applied	☒	☐	
6	Guidance about expected evidence for submission, e.g. essay or report, word count, bibliography and references	☒	☐	
7	Reference to good academic conduct, for example referencing, plagiarism and Turnitin	☒	☐	
8	Actions to complete No further action required. <i>This box will expand as you type</i>			

SIGNATURE OF APPROVAL:	SIGNATURE	DATE
INTERNAL MODERATOR: I confirm that this version of the assessment specification is ready to be sent to the Partnership Team Leader		9 th Nov 2018

ONLY TO BE COMPLETED IF THE ASSESSMENT IS LINKED TO A COLLABORATIVE PARTNER

PARTNERSHIP TEAM LEADER PLEASE TICK TO INDICATE THAT THE ASSESSMENT INCLUDES:		Please ✓		Comments
		YES	NO	
1	Tasks that are specified clearly, accurately and comprehensibly, with appropriate use of language and neat presentation			
2	Tasks which enable the module learning outcomes to be demonstrated (as per the module syllabus)			
3	Tasks which conform to the assessment described in the module syllabus			
4	Tasks which are written at the appropriate level of the Framework for Higher Education Qualifications (see http://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf?sfvrsn=170af781_14).			
5	Clear criteria for assessment and guidance about how marking/grading will be applied			
6	Guidance about expected evidence for submission, e.g. essay or report, word count, bibliography and references			
7	Reference to good academic conduct, for example referencing, plagiarism and Turnitin			
8	Actions to complete <i>This box will expand as you type</i>			

SIGNATURE OF APPROVAL:	SIGNATURE	DATE
PTL: I confirm that this version of the assessment specification is ready to be sent to the External Examiner		

UWTSD PROVISION: please submit the completed document to the appropriate Programme Director.

COLLABORATIVE PROVISION: please submit the completed document (or make available electronically) to the Partnership Team Leader. This must be in accord with specific arrangements for sharing electronic documents (e.g. via SharePoint or similar).

The assessment tasks, criteria and marking scheme should accompany this form

THIS DOCUMENT IS ALSO AVAILABLE IN WELSH

LEVEL 6 ASSESSMENT SPECIFICATION

Student name:		Student ID number:	
Programme:	BSc (Hons) Electrical and Electronic Engineering		
Module:	Power Electronics and Drives		
Module code:	PSDE6016	Contribution to Overall Module Assessment (%):	50%
Lecturer:	Robert Davies	Internal Verifier:	Michael Hall
Assignment Title:	Investigation into DC drives and control methods	Word count (or equivalent):	3000
Submission deadline:	25 th January 2019	Return date of provisional marks & written feedback:	22 nd February 2019
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)

1. Critically evaluate advanced power electronic circuits, electrical machines and drive systems, and applications.
2. Apply methods and techniques to critically analyse the design and performance of electrical machine drives by simulation, modelling and practical experiment in order to determine the most appropriate control strategy for a range of industrial applications

TASK DESCRIPTION

Aims and Objectives

The overall aim of the assignment is to demonstrate a systematic understanding of power electronic devices, circuits and systems, and electrical machine drives enabling you to critically analyse electrical drive system design and performance and associated control techniques employed in a range of industrial applications.

The objectives of the assignment are to:

- Critically evaluate advanced power electronic circuits, electrical machines and drive systems, and applications.
- Apply methods and techniques to critically analyse the design and performance of electrical machine drives by simulation, modelling and practical experiment in order to determine the most appropriate control strategy for a range of industrial applications.

The assignment will focus on DC motor drives where research, simulation and practical investigations will be carried out. At this level, practical results must be compared with predicted performance from theory and simulation. All work must be submitted through Turnit-in and, if necessary, handwritten work must be scanned in and combined to form one 'pdf' file for submission.

Assignment Tasks

Task 1 – Research

Carry out individual research into the following areas using credible and appropriate sources.

- Evaluation of current technologies used in modern DC drives and their evolution
- Configuration and control techniques employed in commercial DC drives for a range of industrial applications with consideration given to business, customer and user needs including wider engineering context and aesthetics.
- Consider the improvement of a three-phase DC drive over a single-phase DC drive in terms of operation, maintenance and reliability.

Critically evaluate the information, ensure its relevance and organise in a logical format. You must write in a succinct way and avoid repetition. Use a wide range of source, insert in-text citations and list your sources using the Harvard method. See further guidance later in this brief and note the great demands for level 6 research. You must summarise your research and produce some conclusions.

Task 2 – Simulation

- (a) Derive suitable formulae for the average voltage from a single-phase fully-controlled full-wave rectifier and a three-phase fully-controlled full-wave rectifier when used to control a DC motor.
- (b) A permanent magnet DC motor can be modelled as a load containing an inductance L , a resistance R and a back emf E . Using a suitable simulation program, design the power handling circuit for a single-phase, full-wave, fully controlled rectifying DC drive, providing full explanations of choice of components, firing and suppression methods.
- (c) With $L = 100\text{mH}$, $R = 10\Omega$, $E = 100\text{V}$, and the supply voltage set to 240V , 60Hz , select two suitable firing angles to show continuous and discontinuous current. Record voltage and current waveforms and include all timings from the waveforms to allow for the calculation of average voltage using the

formulae derived above. Measure the average armature voltage. Make suitable comparisons between calculations from theory and simulation results. Account for any differences.

- (d) Adapt the design solution of the circuit of part (b) for a three-phase supply and carry out an analysis of the circuit performance as in part (c) with $L = 200\text{mH}$, $R = 30\Omega$, $E = 200\text{V}$, for continuous current only.
- (e) Analyse all your results and produce conclusions about the performance of these systems and components.

Task 3 – Practical Investigation

This task will require you to work in a small team to carry out practical experiments using the Parker 514 DC drive connected to a suitable DC motor, “Feedback” VSD drive, prony brake and measuring instruments. Be sure to observe all Health and Safety precautions. You are permitted to share results, such as waveforms, but all other evidence and write-ups must be done individually.

- (a) With the “Feedback” VSD drive switched off, run the DC motor from the 514C drive for one speed set-point showing discontinuous current in the forward direction, record armature voltage and current waveforms. Use the measuring cursors to find all waveform timings and measure average armature voltage. Calculate average armature voltage using a suitable formula. Make comparisons between theory and practical results and account for any differences. Explain the shape of each waveform with reference to theory. Record voltage and current waveforms when the direction is reversed and comment on these new waveforms with reference to theory.
- (b) Apply 3 different loads for one speed set-point in the forward direction and observe the effects on the performance of the drive through recorded voltage and current waveforms and measurements of average voltage and average current.
- (c) Switch on the “Feedback” VSD drive and record evidence of regenerative braking by running the machine slightly faster. Explain the shape of the waveforms produced and relate to researched theory.
- (d) Demonstrate and explain four quadrant operation by recording the speed and average current trace over a long period during which the speed set-point must be changed from forward motoring to reverse motoring quickly and back again. Analyse the traces and relate to your researched theory.
- (e) Make suitable adjustments to the tuning parameters of the drive control loops to show the effect upon stability at start-up and record the results. Explain the adjustments made and the effect on the performance and stability of the motor and relate to your researched theory.
- (f) Analyse your results and produce conclusions about the performance of the system and its component parts.

Task 4 – Overall Conclusions and Recommendations

Critically analyse all your results for each task, summarise and produce some overall conclusions and recommendations. How do the simulation and practical results compare with theory? What are your conclusions about the DC drive?

What have you learnt overall about the performance of these systems and their component parts from your application of quantitative methods? You must summarise your consideration given to business, customer and user needs including wider engineering context and aesthetics, the improvement of a three-phase DC drive over a single-phase DC drive in terms of operation, maintenance and reliability.

Task 5 – Team Working

Provide a critical evaluation of your role and contribution to the team.

GUIDANCE FOR STUDENTS IN THE COMPLETION OF TASKS

You are required to present an electronic report containing detailed observational notes of your work. This report must be a maximum of 3000 words and should be laid out in the following sections preceded by a title page, table of contents and list of figures:-

1. **Executive Summary**
2. **Research** (1000 words)
3. **Simulation** (700 words)
4. **Practical Experiments** (500 words)
5. **Conclusions and Recommendations** (700 words)
6. **Team Working** (100 words)
7. **Citation List**
8. **Appendix**

The executive summary must be written in non-technical language and it must outline all that is contained in the report. It must also be written in the past tense using around 200 words but these will not count towards the overall total. The appendix will contain any of your handwritten calculations and analysis but you must always summarise in the main body of the report. Your pages should be numbered and your figures must also be numbered and listed at the beginning of the report. You will be assessed against the following common assessment criteria. Note that sections of your report have been identified as places where the marks will be awarded. The Turnit-in rubric will be used to record your marks with your tutor's feedback.

NOTE: The guidance offered below is linked to the five generic assessment criteria overleaf.
Significant differences from level 5 are highlighted in red.

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 make use of scholarly reviews and primary sources, where appropriate (for example, refereed research articles and/or original materials appropriate to the discipline).** You should provide evidence that you have accessed a wide *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 will be assessed by the extent of your reading, relevance of credible sources and the Harvard method used. (Sections 2 and 7).*

2. Knowledge and Understanding Skills

At level 6, you should be able to demonstrate **coherent and detailed** knowledge and **a systematic understanding of the subject area, at least some of which is informed by the latest research and/or advanced scholarship within the discipline.** You should be aware of the uncertainty, ambiguity and limits of knowledge. **Your work must demonstrate the growing extent of your knowledge and systematic understanding of concepts and underlying principles associated with the subject area.** *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. meaningfully to show your understanding. Your mark/grade will also depend upon the *extent* to which you demonstrate your knowledge and understanding; **ideally each should be complete and detailed, with comprehensive coverage.**

Guidance specific to this assessment: *This will be assessed by the knowledge displayed in your research section and your explanations of the simulation circuit and the practical experimental set-up. (Sections 2, 3 and 4).*

3. Cognitive and Intellectual Skills

You should be able to: **critically evaluate evidence, arguments, assumptions, abstract concepts and data some of which are at the forefront of a discipline (and that may be incomplete) to devise and sustain arguments, to make judgements and/or solve problems; describe and comment upon particular aspects of current research, or equivalent advanced scholarship, in the discipline.** Your work must contain evidence of logical, analytical thinking, evaluation and synthesis. 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? At all times, you must provide justification for your arguments and judgements. Evidence that you have reflected upon the ideas of others within the subject area is crucial to you providing a reasoned and informed debate within your work. Furthermore, you should provide evidence that you are able to make sound judgements and convincing arguments using data and concepts. Sound, valid conclusions are necessary and must be derived from the content of your work. Where relevant, alternative solutions and recommendations may be proposed.

Guidance specific to this assessment: *This will be assessed by your derivation of the correct formulae for average voltage and your analysis of the waveforms for simulation and practical experiment, your calculations and by your comparison between theory, simulation and practical experiment together with your conclusions and recommendations. (Sections 3, 4 and 5).*

4. Practical Skills

At level 6, you should be able to **apply the methods and techniques that you have learned to review, consolidate, extend and apply your knowledge and understanding, and to initiate and carry out projects. You will deploy accurately established techniques of analysis and enquiry relevant to the discipline, and apply them in complex and unpredictable contexts, to devise and sustain arguments and/or to solve problems. You should be able to frame appropriate questions to achieve a solution - or identify a range of solutions.** 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 or circumstances, to assess current situations, perhaps to formulate plans or solutions to solve problems, or to create artefacts, some of which may be innovative and creative. 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. You should show awareness of the limitations of concepts and theories when applied in particular contexts.

Guidance specific to this assessment: *This will be assessed by your use of MultiSIM in the simulation section, your use of measuring equipment in the practical section and the quality of the presentation of your test results in both cases. (Sections 3 and 4)*

5. Transferable Skills for Life and Professional Practice

Your work must provide evidence of the qualities and transferable skills necessary for **graduate-level** employment requiring the exercise of initiative and personal responsibility and decision-making in **complex and unpredictable circumstances.** This includes demonstrating: the **learning ability** for professional

development to advance existing skills and acquire new competences of **a professional nature** that will enable you to assume significant responsibility within organisation; that you can initiate and complete tasks and procedures, whether individually and/or collaboratively; that you can use appropriate media to effectively communicate information, arguments and analysis in a variety of forms to specialist and non-specialist audiences; 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 by the written and presentational quality of your report including page numbering, figure quality, figure numbering and listing, writing style, punctuation, grammar and spelling. (All sections) This will also be assessed by your explanation of team working (section 6).*

Achieving the PLOs for IET/Eng Accreditation

The following PLOs have been targeting to be satisfied or partially satisfied by this assignment. Details are given below. The marking scheme on the next page will also be used to record your PLO achievements and comments will be found in the Turnit-in rubric.

SM1i - *Knowledge and understanding of the scientific principles underpinning relevant current technologies, and their evolution.* This will be satisfied by your research and your explanations of each circuit and system in sections 2, 3 and 4.

D2i – *Be aware of business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics.* This will be satisfied by your research in section 2.

D4i - *Apply problem-solving skills, technical knowledge and understanding to create or adapt design solutions that are fit for purpose including operation, maintenance, reliability etc..* This will be partially satisfied by adaption of the circuit design in section 3 and the research carried out in section 2.

EA1i - *Ability to monitor, interpret and apply the results of analysis and modelling in order to bring about continuous improvement.* This will be satisfied by your analysis and modelling of the rectifier circuit and the drive performance, and by your conclusions and recommendations in sections 3, 4 and 5.

EA2i - *Ability to apply quantitative methods in order to understand the performance of systems and components.* This will be satisfied by your analysis of drive performance in section 4, and by your conclusions and recommendations, section 5.

D6i - *Communicate your work to technical and non-technical audiences.* This will be satisfied by your technical report writing and by your executive summary in section 1.

EP7i - *Awareness of team roles and the ability to work as a member of an engineering team.* This will be satisfied by your evaluation of team working in section 6 of the report.

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
1. Engagement with Literature Skills.	
Section 2: Engagement in research, extent of reading, use of credible sources (/10) Section 7: Use of Harvard method for listing and citing (/5)	15
2. Knowledge and Understanding Skills	
Section 2: Advanced knowledge and critical understanding demonstrated through research (/10) Section 3: Explanation and critical evaluation of simulation circuit (/5) Section 4: Explanation and critical evaluation of practical experiment (/5)	20
3. Cognitive and Intellectual Skills	
Section 3: Derivation of formula, analysis of waveforms, calculations and simulation test results (/10) Section 4: Critical analysis of waveforms, calculations and critical evaluation of practical test results (/10) Section 5: Conclusions and recommendations (/10)	30
4. Practical Application Skills	
Section 3: Design of circuits. use of MultiSIM software, presentation of results (/10) Section 4: Use of test equipment, presentation of test results (/10)	20
5. Transferable Skills for Life and Professional Practice	
Section 1: Executive summary (/5) All Sections: Quality of the report – (/5) Section 6: Explanation and evaluation of team role (/5)	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 6

In accordance with the Framework for Higher Education Qualifications, at the end of Level 6 students should have coherent and detailed knowledge and a systematic understanding of their subject area, at least some of which is informed by the latest research and/or advanced scholarship within the discipline. They will be able to accurately deploy established techniques of analysis and enquiry within a discipline, using their conceptual understanding to devise and sustain arguments and/or to solve problems. They should be aware of the uncertainty, ambiguity and limits of knowledge. They should be able to critically evaluate evidence, arguments, assumptions, abstract concepts and data (that may be incomplete), to make judgements, and to frame appropriate questions to achieve a solution - or identify a range of solutions. They will apply the methods and techniques that they have learned to review, consolidate, extend and apply their knowledge and understanding, and to initiate and carry out projects. They will have the ability to manage their own learning, and to make use of scholarly reviews and primary sources (for example, refereed research articles and/or original materials appropriate to the discipline). They will demonstrate the qualities and transferable skills necessary for employment requiring: the exercise of initiative and personal responsibility; decision-making in complex and unpredictable contexts; the learning ability needed to undertake appropriate further training of a professional or equivalent nature.

Level 6	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. Some omissions and minor errors. Referencing conventions evident though not always applied accurately or consistently.	Engagement with an appropriate range of research-informed literature, including sources retrieved independently. Some over-reliance on texts. Referencing may show minor inaccuracies or inconsistencies.	Engagement with a wide range of research-informed literature, including sources retrieved independently. Selection of relevant and credible sources. Very good use of referencing, with no/very few inaccuracies or inconsistencies.	Engagement with an extensive range of relevant and credible literature, informed by the latest research. Consistently accurate application of referencing.	Exceptional engagement with an extensive range of relevant and credible literature, informed by the latest research. High-level referencing skills consistently and professionally applied.
Knowledge and understanding (Coherent and detailed knowledge and systematic understanding of the subject area,	Major gaps in knowledge and systematic understanding of the subject matter. Substantial inaccuracies. No awareness of knowledge of the	Gaps in knowledge, with only superficial systematic understanding. Some significant inaccuracies and/or irrelevant material. No awareness of	Limited knowledge and systematic understanding of the relevant concepts and principles within the subject area which to some limited extent, is	Knowledge is reasonably detailed, accurate with a good systematic understanding of the field of study and to some extent, current	Knowledge is reasonably extensive coherent and detailed. Exhibits very good understanding of the breadth and depth of established views,	Excellent coherent and detailed knowledge and systematic understanding of the principles and theories of current research and scholarship. Clear	Exceptionally coherent and detailed knowledge and systematic understanding of the principles and theories of the subject, well-informed by current

Level 6	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%
at least some of which is informed by the latest research and/or advanced scholarship within the discipline.)	latest research and/or advanced scholarship within the discipline.	knowledge of the latest research and/or advanced scholarship within the discipline.	informed by current research and scholarship.	research and scholarship.	and the work is, at least in part, well-informed by current research and scholarship.	awareness of challenges to established views and the limitations of the knowledge base.	research and scholarship. A critical, sophisticated and nuanced awareness of the ambiguities and limitations of knowledge.
Cognitive and intellectual skills (Conceptual and critical thinking, analysis, synthesis and evaluation of research, assumptions, abstract concepts and data (that may be incomplete); logic, argument and judgement.)	Wholly or almost wholly descriptive work. Little or no analysis, synthesis or evaluation. Failure to develop arguments, leading to illogical or invalid judgements. Unsubstantiated generalisations, made without use of any credible evidence.	Largely descriptive work, with superficial use of critical evaluation. Weak 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 critical thinking, analysis, synthesis and evaluation, tending towards description. Some evidence to support emerging arguments and judgements but these may be underdeveloped or with a little inconsistency / mis-interpretation. Asserts rather than argues a case.	Some critical thinking, analysis, synthesis and evaluation. Can analyse new and/or abstract concepts and data without guidance. An emerging awareness of different stances and ability to use evidence (that may be incomplete) to support the argument. Mostly valid arguments and logical judgements. Some tendency to assert/state opinion rather than argue on the basis of reason and evidence.	Sound critical thinking, analysis, synthesis and evaluation demonstrating critical thinking. Ability to devise and sustain persuasive arguments, and to review the reliability, validity and significance of evidence (that may be incomplete) to make mostly appropriate and valid judgements.	Excellent critical thinking, analysis, synthesis and evaluation. Ability to investigate contradictory or incomplete information and make strong, persuasive, arguments and sophisticated judgements. Some evidence of independent thought and ability to 'see beyond the question', suggesting a grasp of the broader field and wider concepts.	Exceptional critical thinking, analysis, synthesis and evaluation based on judiciously selected evidence. Ability to investigate contradictory or incomplete information and make strong, persuasive, arguments and sophisticated, nuanced, judgements. Evidence of independent thought and ability to 'see beyond the question', suggesting an outstanding grasp of the broader field and wider concepts.
Practical skills (Apply/deploy accurately established tools	Limited or no use of methods, materials, tools and/or techniques.	Rudimentary application of methods, materials, tools	An adequate awareness and mostly appropriate application of well-	A good and appropriate application of standard methods,	A very good application of a range of methods,	An advanced application of a range of methods,	Exceptional levels of application and deployment skills in unpredictable,

Level 6	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%
and techniques; initiate and carry out projects; formulate solutions to solve problems in complex and unpredictable contexts.)	Little or no appreciation of the context of the application. Limited understanding of the application of theory to practice or making appropriate links between the two. Very weak problem-solving skills in complex and unpredictable contexts.	and/or techniques but without consideration and competence. Flawed appreciation of the context of the application. Weak understanding of the application of theory to practice, with only occasional evidence of making appropriate links between the two. Weak problem-solving skills in complex and unpredictable contexts.	established methods, materials, tools and/or techniques. Basic appreciation of the context of the application. Theoretical knowledge and understanding applied in practice, but not always making logical links between the two. Can identify problems and propose basic solutions in complex and unpredictable contexts without fully appreciating the complexity.	materials, tools and/or techniques. Clear appreciation of the context of the application. Mainly consistent, accurate and logical application of theory to practice, making appropriate links between the two. Can identify problems and propose mostly appropriate solutions in complex and unpredictable contexts.	materials, tools and/or techniques. Very good consideration of the context of the application, with perceptive insights. Can identify problems and propose appropriate solutions in complex and unpredictable contexts. Evidence of some innovation and creativity.	materials, tools and/or techniques. The context of the application is well considered, and insightful. Application and deployment extend beyond established conventions. Can identify complex problems and propose excellent solutions. Innovation and creativity evident.	practical contexts, drawing skilfully on the latest research within the discipline. Can identify complex problems and propose sophisticated solutions. Assimilation and development of cutting edge processes and techniques.
Transferable skills for life and professional practice (Exercise of initiative and personal responsibility; professional development; initiate and complete tasks and procedures; individually and/or collaboratively; use appropriate media to	Communication medium is inappropriate or misapplied. Work is poorly structured, disorganised and/or confusingly expressed. Very weak use of language and/or very inappropriate style. Little or no evidence of autonomy (or collaboration, where relevant) in	Communication medium is poorly designed and/or not suitable for the audience. 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.	Can communicate in a suitable medium but with some room for improvement. Mostly ordered presentation and structure in which relevant ideas / concepts are reasonably expressed. Work may lack coherence in places. Can work as part of a team, but with limited	Can communicate effectively in a suitable format, but may have minor errors. Mostly coherent, organised 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.	Can communicate well, confidently and consistently in a suitable format. Work is coherent, fluent, well-structured and organised. Can work very well autonomously and/or as part of a team, with very good contribution to group activities. Demonstrates very good graduate employment skills,	Can communicate professionally confidently and consistently in a suitable format. Work is coherent, very fluent and is presented professionally. Can work autonomously with initiative. Where relevant can work professionally within a team, showing leadership skills as appropriate,	Can communicate with an exceptionally high level of professionalism. Work is exceptionally coherent, very fluent and is presented professionally. Can work exceptionally well and professionally within a team, showing advanced leadership skills.

Level 6	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%
communicate effectively; fluency of expression; clarity and effectiveness in presentation and organisation.)	the completion of tasks. Little or no evidence of the skills required in graduate employment.	Weak independent initiative (or collaboration, if relevant). Limited evidence of the skills required in graduate employment.	involvement in group activities. Demonstrates the basic skills required in graduate employment, with some areas of minor weakness.	Demonstrates the skills required in graduate employment, with some areas of strength and some of minor weakness.	with just occasional minor weakness.	managing conflict and meeting obligations. Demonstrates excellent graduate employment skills and an appetite for further development.	Demonstrates exceptional graduate employment skills and an appetite for further development.