

# **INSTITUTE OF TECHNOLOGY BLANCHARDSTOWN**

**SCHOOL OF INFORMATICS & ENGINEERING**

**DEPARTMENT OF ENGINEERING & TRADES**

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## **PROGRAMME VALIDATION 2016**

### **BN535 Master of Engineering (MEng) in Internet of Things Technologies**

#### **INDICATIVE RESEARCH PROJECTS HANDBOOK**

This handbook is intended to provide the necessary guidelines to both students and academic supervisors on the Research Project elements of both Programme Pathways of the MEng in IoT Technologies, i.e., Modules MIOT H6022, MIOT H6023 & MIOT H6024.

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## 1 INTRODUCTION

Figure 1 below outlines the structure of the MEng in Internet of Things that is covered by this handbook. The handbook should be read in conjunction with the detailed syllabus descriptions for Modules MIOT H6023, MIOT H6022, and MIOT H6024. The following structure accounts for the 30 and 60 ECTS Credits Research Project Modules (Distinction between the two modules is defined in Sections 3 and 4 of the Handbook):

- MIOT H6023 Research Project (Part 1: Research Methods) and MIOT H6022 Research Project (Part 2: Implementation) constitute the 30 ECTS Credits Research Project.
- MIOT H6023 Research Project (Part 1: Research Methods) and MIOT H6024 Research Project (Part 2: Implementation) constitute the 60 ECTS Credits Research Project.

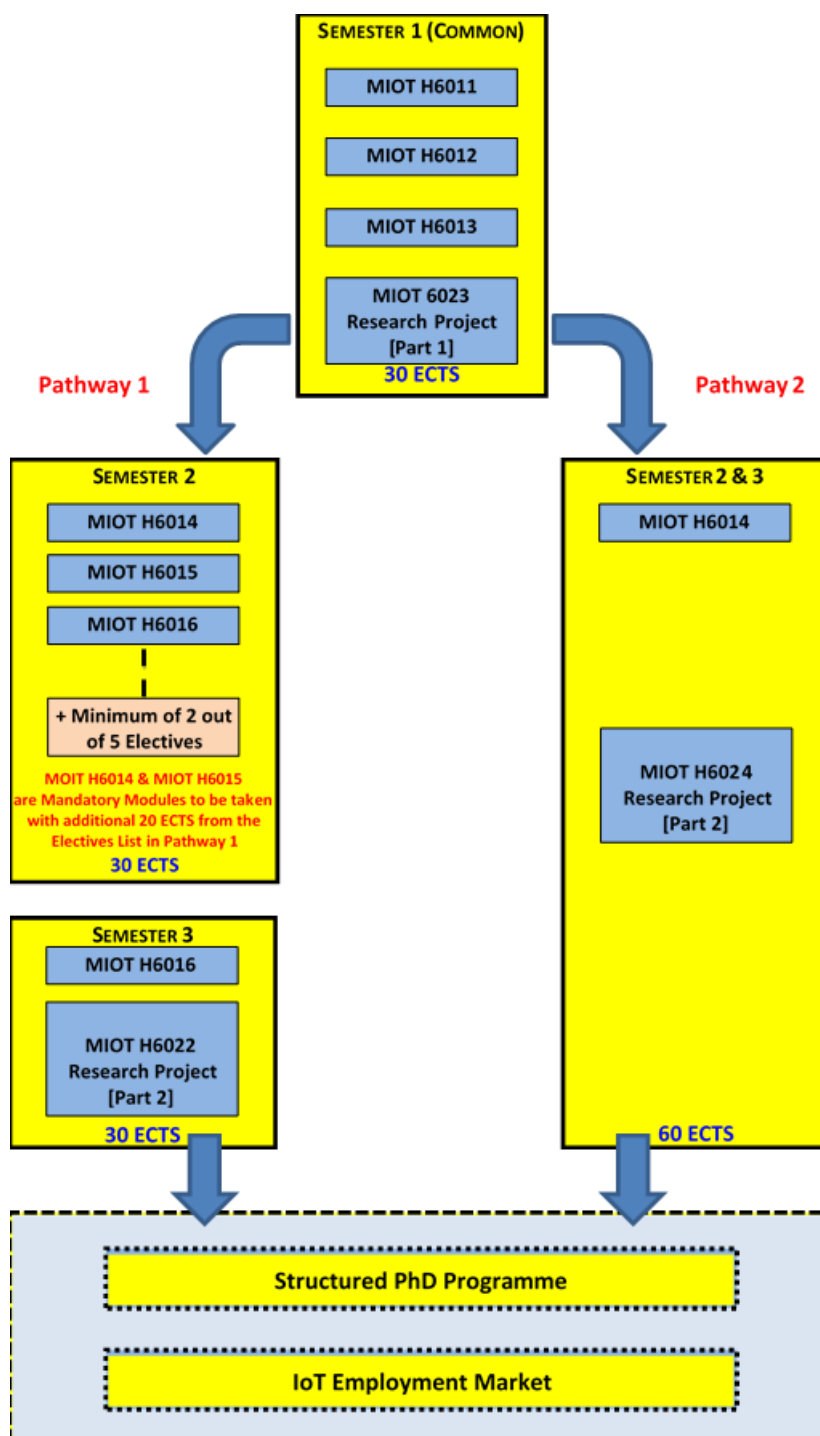


Figure 1. Pathways for the Proposed MEng in IoT Technologies

## 2 PROJECT SCHEDULE, DELIVERABLES & SUBMISSION METHODS

Students will be required to; attend common tutorials sessions, undertake individual research project activities, and submit deliverables throughout the duration of the programme. Every deliverable will have a specified deadline and submission method. The default submission document type is electronic MSWord or PDF file format to be submitted/uploaded via appropriate links in Moodle VLE Courses. The Course Coordinator will specify the Module Milestones and Deadlines, Project Activity, and Deliverables applicable to each Pathway in the duration of the programme. An *Indicative Project Schedule* is outlined in Table 1.

## 3 OBJECTIVES AND AIMS OF RESEARCH PROJECT

### 3.1 Aims

The Research Project modules in the *MEng in IoT Technologies*, aim to educate learners in research methods and techniques; specifically, the formation of knowledge inquiry, critical evaluation, and project management skills that are pertinent to their chosen research topics/areas. In the process, learners will be able to demonstrate how they can utilise and extend the knowledge and skills acquired in the preceding taught modules, including their applications to plan and execute a substantive research-based IoT Technologies related projects. Technical presentation and periodic reporting on the process, and the final research findings will be required. With the exception of any 60 ECTS Research Project that is aimed for transferring to the structured PhD programme (therefore different assessment criteria), it is not a requirement that the *Research Project* be original. However, for a masters level research, it is important that the investigation be structured, carefully executed, and be presented appropriately to peers, the professional community, and the society at large.

### 3.2 Learning Outcomes

#### 3.2.1 30 ECTS Credits Research Project

##### **Part 1: Research Methods [Common with 60 ECTS Credits Research Project]**

On completion of the 30 ECTS Credits Level 9 Project module, the learner will be able to:

- (1) Demonstrate understanding of the basis for scientific research and the structured methodology employed when undertaking a research project;
- (2) Define the elements and develop a research project from vague descriptions or problem statements and specific research questions that should be addressed, primarily by self-directed inquiry;
- (3) Search, critically review and appropriately cite literature sources that are relevant to generic research topics, and synthesize appropriate discussion of findings and conclusions, including any limitations of such work;
- (4) Demonstrate understanding of the roles of ethics in research, and its relevance to experimental design and compliance with Standards of Best Practice.
- (5) Design and develop a comprehensive Research Proposal that encompasses appropriate method(s), coherent project outline and project plan, that could be applied to successfully execute a research project within a defined timeframe

##### **Part 2: Implementation**

On completion of the 30 ECTS Credits Level 9 Project module, the learner will be able to:

- (1) Search, critically review, and appropriately cite literature sources that are relevant to a proposed research project, and synthesize appropriate conclusions and findings through knowledge and systematic understanding of the research process and any limitations of the work.
- (2) Design physical/model of IoT Technology-Specific experiment and apply the appropriate software tools, sensors, and instrumentation to obtain pertinent service and/or performance data.

- (3) Undertake error analysis on the experimental data or numerical results and identify the major contributing factors to such errors (if any).
- (4) Apply ethical considerations in the preparation of a research project and experimental design through compliance with the prevailing ethical considerations and Standard of Best Practice.
- (5) Communicate the outcomes of each stage of the research project to professional standards, via oral presentations, and through a project thesis/dissertation.

### 3.2.2 60 ECTS Credits Project

#### ***Part 1: Research Methods [Common with 30 ECTS Credits Research Project]***

On completion of the 30 ECTS Credits Level 9 Project module, the learner will be able to:

- (1) Demonstrate understanding of the basis for scientific research and the structured methodology employed when undertaking a research project;
- (2) Define the elements and develop a research project from vague descriptions or problem statements and specific research questions that should be addressed, primarily by self-directed inquiry;
- (3) Search, critically review and appropriately cite literature sources that are relevant to generic research topics, and synthesize appropriate discussion of findings and conclusions, including any limitations of such work;
- (4) Demonstrate understanding of the roles of ethics in research, and its relevance to experimental design and compliance with Standards of Best Practice.
- (5) Design and develop a comprehensive Research Proposal that encompasses appropriate method(s), coherent project outline and project plan, that could be applied to successfully execute a research project within a defined timeframe

#### ***Part 2: Implementation***

On completion of the 30 ECTS Credits Level 9 Project module, the learner will be able to:

- (1) Search, critically review, and appropriately cite literature sources that are relevant to a proposed research project, and synthesize appropriate conclusions and findings through knowledge and systematic understanding of the research process and any limitations of the work.
- (2) Design physical/model of Integrative/Systemic IoT systems experiments to proof/verify underlying theories/hypotheses developed as part of the project, and apply the appropriate software tools, sensors, and instrumentation to obtain pertinent service and/or performance data.
- (3) Undertake error analysis on the experimental data or numerical results and identify the major contributing factors to such errors (if any).
- (4) Apply ethical considerations in the preparation of a research project and experimental design through compliance with the prevailing ethical considerations and Standards of Best Practice.
- (5) Develop a comprehensive draft publication of the research, to Peer-review Research Journal standards.
- (6) Communicate the outcomes of each stage of the research project to professional standards, via oral presentations, and through a project thesis/dissertation.

**Table 1. Indicative Schedule of Research Project Activities**

Milestones & Deliverable Deadlines	MIOT H6022 Research Project [30 ECTS]		MIOT H6023 Research Project [60 ECTS]	
	Activity	Deliverable	Activity	Deliverable
<b>Semester 1</b>	<b>Project Part 1</b>		<b>Project Part 1</b>	
Week 1 – Week 8				
	Tutorial 1: Library & Databases, Literature Search		Tutorial 1: Library & Databases, Literature Search	
	Tutorial 2: Maintaining a Project Workbook, managing IP, referencing, plagiarism,	Submit <i>Project Outline Document</i>	Tutorial 2: Maintaining a Project Workbook, managing IP, referencing, plagiarism,	Submit <i>Project Outline Document</i>
Week 9- Week11	Tutorial 3: Turnitin <sup>®</sup> session		Tutorial 3: Turnitin <sup>®</sup> session	
	Tutorial 4: writing a Project Proposal		Tutorial 4: writing a Project Proposal	
Week 12: Date & Time	Meet supervisor & Finalise Proposal	Submit Research Project Proposal	Meet supervisor & Finalise Proposal	Submit Research Project Proposal
<b>Semester 2</b>	<b>Project Part 1</b>		<b>Project Part 2</b>	
Week 1- Week3	Start Project (Literature Review)		Start Project Implementation	
Week 4-Week 8			Tutorial 5: Writing Lit. Review, Mid-term Report, Project Management	
Week 12: Date & Time			Prepare Mid-term report	Mid-term Report & Literature Review
<b>Semester 3</b>	<b>Project Part 2</b>		<b>Project Part 2</b>	
Week 1- Week3	Start Project Implementation	Submit Literature Review	Select target peer reviewed Journal	Submit outline draft of research paper
Week 4- Week6	Tutorial 5: Writing a Mid-term Project Report; Project Management		Compile Progress Report (Draft Thesis)	Submit Draft Thesis
Week 7-10	Compile mid-term report (Draft Thesis)	Mid-term Report (Draft Thesis) & Presentation	Compile Draft Publication	Submit Draft Publication
	Prepare for Final Presentation Seminar	Final Presentation	Prepare for Final Presentation Seminar	Final Presentation
Week 12: Date & time	Compile Thesis & electronic documentation	Submit Thesis & Electronic files	Compile Thesis & electronic documentation	Submit Thesis & Electronic files

## 4 RESEARCH PROJECTS KEY FEATURES & INDICATIVE STANDARD

The Research Project modules in the *MEng in IoT Technologies*, aim to educate learners in research methods and techniques; specifically, the formation of knowledge inquiry, critical evaluation, and project management skills that are pertinent to their chosen research topics/areas. In the process, learners will be able to demonstrate how they can utilise and extend the knowledge and skills acquired in the preceding taught modules, including their applications to plan and execute a substantive research-based IoT Technologies related projects. Technical presentation and periodic reporting on the process, and the final research findings will be required. It is not a requirement that the *Research Project* be original, but it is important that the investigation be structured, carefully executed, and be presented appropriately to peers, the professional community, and the society at large.

Since Programme BN535 MEng in IoT Technologies does not have exemplar projects of its own at this point in time, this outline draws from the relevant published material<sup>1</sup> that are deemed to be *Indicative* exemplar-outputs of the two project streams in the programme. The exemplar projects are adjudged to meet the QQI Level 9 Awards Standards for Engineering.

### 4.1 30 ECTS Credits Project

**Typical 30 ECTS Credits Projects will be generally Stand-alone IoT Subsystems and IoT Subject Specific (e.g., a product design oriented project).**

The following publications are indicative of the expected standard of the 30 ECTS Credits projects:

- Lovett TR, J Flint, DS Fonseca & IH Daniel. 2014. **Novel Broadband Antenna for Wearables**. *The 2014 IEEE Loughborough Antennas and Propagation Conference (LAPC)*, 10-11 November, 2014.
- Warwick B, N Symons, X Chen, K Xiong. 2015. **Detecting Driver Drowsiness using Wireless Wearables**. *2015 IEEE 12th International Conference on Mobile Ad Hoc and Sensor Systems*, pp585-588.
- Worgan P, O Pappas, T Omirou & M Collett. 2015. **Flexible On-Body Coils for Inductive Power Transfer to IoT Garments and Wearables**. 2015 IEEE 2nd World Forum on IoT, pp 297 - 298, DOI: 10.1109/WF-IoT.2015.7389069.
- Khalifa S, M Hassan & A Seneviratne. 2015. **Energy-Harvesting Wearables for Activity-Aware Services**. *IEEE Internet Computing*19 (5): 8 – 16. DOI: 10.1109/MIC.2015.115
- Tran T & QP Ha. 2015. **Dependable control systems with Internet of Things**. *ISA Transactions* 59: 303–313.
- Shrouf F & G Miragliotta. 2015. **Energy management based on Internet of Things: practices and framework for adoption in production management**. *Journal of Cleaner Production* 100: 235-246.

### 4.2 60 ECTS Credits Project

**Typical 60 ECTS Credits Projects will be Integrative, Systemic or Semi-Systemic and/or Significant Segment-Contexts, e.g., Optimisation in Monitoring/Operations/Life/Attainment segments.**

The following publications are indicative of the expected standard of the 60 ECTS Credits projects:

- Tao F, Y Wang, Y Zuo, H Yang & M Zhang. 2016. **Internet of Things in product life-cycle energy management**. *Journal of Industrial Information Integration* (2016): Article in press. 14 pp.
- Moosavia SR, TN Gia, E Nigussie, AM Rahmania, S Virtanen, H Tenhunena & J Isoaho. 2016. **End-to-end security scheme for mobility enabled healthcare Internet of Things**. *Future Generation Computer Systems* (2016): article in press.
- Hossain MS & G Muhammad. 2016. **Cloud-assisted Industrial Internet of Things (IIoT) –Enabled framework for health monitoring**. *Computer Networks* (2016): 1–11 (article in press).

<sup>1</sup>All the papers listed are available on ScienceDirect & IEEE Explore Research Publication Databases

Verdouw CN, J Wolfert, AJM Beulens & A Rialland. 2016. **Virtualization of food supply chains with the internet of things.** *Journal of Food Engineering* 176: 128-136.

Dave B, S Kubler, K Främling & L Koskela. 2016. **Opportunities for enhanced lean construction management using Internet of Things standards.** *Automation in Construction* 61: 86–97.

## 5 DETERMINATION OF PROJECT TOPIC AND ASSIGNMENT OF PROJECT SUPERVISOR

### 5.1 Choice of Research Project Topic

Generally, students should undertake a project drawing from their particular research interests, skills, and possibly industry knowledge and experience. It is the responsibility of each student to identify a suitable research topic and related project supervisor. This should be undertaken during the designated research projects preparation phase (see Table 1 for the schedule). Three reasonable approaches to identifying research project topics are:

- (1) Consult the MIOT Research Projects Database for indicative research projects and/or project areas, or where applicable, consult the proposing supervisor or the affiliated Principal Investigator for topics emanating from a recognised Research Group/Unit at ITB);
- (2) Project is identified through the learner's academic and/or industry background, and the indicative topic/area discussed and agreed with the potential academic supervisor(s);
- (3) Consult one or more academic staff with the expertise in the identified topic/area of research interest and jointly develop a topic for the research project.

Other pertinent considerations in the selection of a research project are:

- For projects requiring specialist skills, e.g. DSP, Networking Security, Programming etc., students are advised to ensure that the consultation process with the supervisor defines the scope that can be accomplished within scheduled timeframe;
- For lab-based projects or those requiring the use of specialist lab-based equipment with restricted access, students in consultation with the respective supervisor must make alternative access arrangements that will ensure that progress is not hindered in any way;
- Students should match their expected inputs to the project to that expected by the supervisor;
- The student is expected to maintain regular contact with their supervisor as the successful completion the project is the sole responsibility of the student.

The Course Coordinator will be available to direct learners to academic staff with the relevant expertise and/or research areas of interest to support any learner initiated proposals. Once the research topic is determined and supervision is agreed/allocated, the learner will be required to register these with the Course Coordinator, by submitting a *Project Outline Document* containing the following information:

- Student name and registration number;
- Proposed supervisor;
- Research project title;
- Brief summary of the research project (1000 words), clearly articulating how the proposed project meets the NMQ Level 9 Award Standards in relation to the Learning Outcomes outlined in Section 3.2 above

### 5.2 Project Supervision

Each project will be directly overseen by a named first supervisor, with a thesis committee in a supporting role. Candidates will initially be required to develop a comprehensive Project Proposal that will set out the aims and objectives of the project, provide a problem or project need statement, and describe the study methods and the project plan in enough detail to enable execution of the project, i.e., development of hardware/software, experimentation, data collection/analysis, and



reporting/dissertation. The supervisor will be responsible for monitoring the progress and safety of the project, and will provide other necessary advice and assistance as may be required from time to time. The supervisor will be available for regular meetings with the candidates. A second supervisor will also be appointed for each project. He/she will independently assess your project work, but will not necessarily take a proactive part in its direction. The course coordinator will be at hand to advice on all aspects logistics and material provisions that will be required to execute the research project.

### 5.3 Plagiarism in research projects

Plagiarism is defined as representing someone else's ideas or work as one's own without giving acknowledgement to the source of information. It is also plagiarism to alter the form and context of the work to conceal the source or to submit work which has already been submitted for credit in another module. Plagiarism will be handled as a key ethics consideration in MIOT H6023 Research Project (Part 1: Research Methods). There will be penalties related to plagiarism, and such are designed to impose sanctions on any offenders, and will reflect the seriousness of the Institute's commitment to maintaining the integrity of all its academic programmes. Penalties may include: the requirement to revise and resubmit the deliverable for assessment, receiving a zero grade for the assessment, failing the module, or at worst expulsion from the programme.

Students are also required to acknowledge the intellectual property (IP) rules covering all material and information used for the research project. Apart from acknowledging IPs belonging to others, students are required to protect the intellectual property generated throughout their project (see information covered in ITB postgraduate registration forms).

Turnitin<sup>®</sup> will be used to inspect for possible plagiarism, via all assignments submitted in electronic format. However, student should note that for purpose of the research project module at NFQ Level 9, students are also advised to view Turnitin<sup>®</sup> as a tool for informing and protecting them against plagiarism. All students registered in this programme are required to read and understand the policies covering plagiarism in the policy document 3AS08 *Institute Procedural Guidelines for Dealing with Instances of Plagiarism in Assignments and Examinations*. All policy documents are available on the Document Management System in the Intranet. The Institute's primary reason for using Turnitin<sup>®</sup> is to provide a mechanism for student to enhance their own understanding of academic writing and their understanding of plagiarism.

### 5.4 Project component submission deadlines

The deadlines for submission of each project component (i.e., the deliverable) will be as set by the research project Coordinator in consultation with the Course Board. Late submission of any components may incur a penalty as advised and implemented by the project supervisor, per Assessment Strategy and Guidelines for the School of Informatics and Engineering.

## 6 ASSESSMENT OF RESEARCH PROJECT

The assessment rubrics and learner support methods proposed for the MIOT H6023/MIOT H6022/MIOT H6024 have been adapted from University of Adelaide (2015)<sup>2</sup>.

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<sup>2</sup> University of Adelaide. 2015. Project Handbook for Masters (by Coursework). School of Mechanical Engineering, The University of Adelaide. 56 pp.

## 6.1 Components of the assessment

The Research Project will be assessed on the basis of student performance (i.e. Performance Evaluation) in the planning, execution and management of the project (i.e., learner effort), coupled with the quality of the phased project deliverables/achievement. The assessment will be conducted in both project stages, i.e., Part 1 (Research Methods) and Part 2 (Implementation). The assessment components and weighting are as specified in Table 2 below.

**Table 2. Components and indicative weighting of research project assessment**

Assessment Component	Supervisor	Internal Examiner		External Examiner*	Academic Panel	Component Sub-total			
		Examiner 1	Examiner 2						
MIOT H6023 Research Project (Part 1: Research Methods)									
Performance Evaluation	5%						5%		
Project Proposal	15%						15%		
Part 1 Sub-total	20%		N/A	N/A		20%			
MIOH H6022/H6024 Research Project (Part 2: Implementation)									
Literature/Technology Review		10%	N/A				N/A	10%	20%
Performance Evaluation	10%								10%
Final Presentation**								10%	10%
Thesis		20%	20%				20%		40%
Part 2 Sub-total	10%	30%	20%	20%	20%	80%			
Project Total	30%	30%	20%	20%	20%	100%			

\* External Examiner is prescribed ONLY for the 60 ECTS Research Project (Module MIOT H6022 + MIOT H6024), replacing Internal Examiner 2 in the final aggregate of Project Total.

\*\*The final Presentation of the 60 ECTS Research Project will also include preparation of a peer-review journal publication

**Project Part 1**— This part focuses on how the candidate prepares (including attendance at project related preparation tutorials in Semester 1) and plans, manages, and executes the research process. The performance requirements will be based on the learning outcomes specified in section 3.2; but, particular focus is on the candidates' ability to apply knowledge and skills in professional practice-type projects. *Events that are part of learner preparations for the research project in Semester 1 are intended to embed learners into research culture and understanding of basic processes in scholarship or research.* Project Part 1 will account for 20% of the overall Research Project grade.

**Project Part 2**— This part focuses on the design, implementation, and analytical work (as may apply to each project) and the associated substantive reporting in both verbal and written technical report formats. Project Part 2 draws from the incremental project outcomes that will be initiated in Research Project Part 1. As the key deliverables, including the final presentation and the thesis are in this phase, it accounts for 80% of the overall Research Project grade.

## 6.2 Submission of Thesis

Thesis submission is to be accompanied by Form 4FAS06 that is duly completed by the candidate and where appropriate, countersigned by the supervisor. By duly completing Form 4FAS06, the candidate confirms that he/she, and where appropriate, the supervisor have reviewed the work and are in agreement that the work is to an acceptable standard to proceed to the assessment process. Secondly, Form 4FAS06 is a mechanism for the supervisor to consider the report and certify that it has been prepared within the thesis preparation guidelines, e.g., edited for proper use of grammar and spelling, appropriately formatted, meets the allowable page-length, checked for plagiarism, and that all data relevant to the project have been submitted.

The institute will not accept a thesis that has not been approved as ready for examination by both the candidate and the supervisor. However, in the unexpected event that the candidate disagrees with the supervisor regarding the readiness of the thesis for final examination, the dispute will be dealt with, in the first instance (please note the order of escalation): (1) with your supervisor; (2) the Course Coordinator; (3) Head of Department/School.

Subsequently, if the dispute cannot be resolved then, the matter will be referred to the Research and Postgraduate Studies Committee (RPSC) of the Academic Council by either the candidate, the designated supervisor, or the HoD. Lodging of such referral must be accompanied by detailed explanation of the basis of dispute, including the supporting documents. The RPSC will consider the submission at its next scheduled sitting.

### 6.3 Revised and Resubmitted Theses

In the event that a Fail Grade is returned for a thesis, then according to the Institute's Assessment Policy, the candidate will be offered the opportunity to revise the work for re-assessment. Under normal circumstances, when a revised thesis is submitted, it will be examined by the original examiners. However, for valid academic reasons, the Course Coordinator or Head of Department may decide that the thesis be re-assessed by different examiner(s). Such a decision will be objective and will be made on a case-by-case basis.

A revised and resubmitted thesis will be accompanied by a detailed report of *How and Where* the prescribed revisions will have been considered. The designated examiner(s) will be instructed to check whether or not the requirements for additional work, as specified in the original examiners and supervisor(s)' reports and the assessment outcome report, will have been addressed. In the re-assessment of thesis, examiners must not introduce new areas of substantive concern. The outcome of the re-examination will be a revised grade for the candidate per the institute's assessment policy (3AS06).

### 6.4 Student Performance and Achievements

Measures and guidelines for assessment of Student Performance are provided in Table 3. The performance criteria and measurable actions to be used, address specific learning outcomes for the research project module. The performance rating/weighting classifications are per ITB Policy 3AS06 Academic Programmes Assessment Policy and Procedures for the Taught Masters Degree programme, which categorises performance in the Fail, Pass, Second Class Honours, and First Class Honours categories.

Timely feedback is important in enabling candidates to focus on requirements for progress in the project and ultimately the formation of the requisite research skills. Students who are not meeting the minimum standard to pass any element of project or stage MUST be informed at the earliest point possible to give them the opportunity to address the pertinent deficit(s).

### 6.5 Project Deliverables

#### 6.5.1 The Project Proposal

It is expected that the initial Project Outline Document described in Section 5 of this handbook will be expanded to a comprehensive Project Proposal, i.e., clearly articulated in a project definition statement and a detailed project plan. The project definition statement should describe: the aims of the project; the expected outcomes; the deliverables from the project, and how the project satisfies the Learning Outcomes of Module MIOT H6023. The *Project Plan* in the proposal should clearly list/set relevant project activities against the *Project Objectives*, and also list the *Time-bound Milestones* and pertinent *Deliverables*. The Project Proposal will be assessed according to the marking rubric in Table 4.

**Table 3. Performance Evaluation**

Evaluation Criteria <i>Measurable Actions</i>	Measure	Performance/ Achievement			
		<b>Fail</b> <i>Fails to satisfy the minimum requirements Satisfies the minimum requirements</i>	<b>Pass</b> <i>Satisfies the minimum requirements</i>	<b>Second Class Honours</b> <i>Demonstrates a high to very high standard of work with originality and insight</i>	<b>First Class Honours</b> <i>Outstanding/exceptional understanding, interpretation &amp; presentation</i>
<b>(a) Students embark on inquiry and so determine a need for knowledge/ understanding [10%]</b>	Objective stated	Unclear or inappropriate	Clear but lacks focus	Clear & focussed to clear, focussed and innovative	Clear, focussed, self-directed, innovative, & consistently inquisitive
	Context of project	Not described	Minimally described	Satisfactorily described Informative, well- researched	Comprehensive, extensively researched
<b>(b) Students find/generate needed information/ data/ ideas using appropriate approach/method [10%]</b>	Project approach informed by sources that are:	Narrow or superficial	Limited and entirely prescribed by supervisor	Extensive and mostly prescribed by supervisor to somewhat self-prescribed	Very extensive and mostly self-identified resources
	Quality of sources used in formulating project approach are:	Low quality	A few high quality sources	Several to Numerous high quality sources	Numerous high quality sources with diverse range
<b>(c) Students critically evaluate information/data / ideas, their approach and results, and react appropriately [15%]</b>	Technical approach:	Flawed or ineffective	Mostly effective but should be improved	Effective to Highly effective	Highly effective with novelty
	Critical analysis in approach:	Little or no evidence of analysis	Some evidence of analysis	Clear to Strong evidence of analysis	Strong evidence of analysis, leading to secondary insights
<b>(d) Students perform necessary processes to meet stated project objectives [25%]</b>	Overall progress:	Fails to meet expectations	Meets minimum expectations	Mostly meets to completely meets expectations	Completely meets, and exceeds expectations
	Ability to meet planned milestones:	Frequently miss milestones	Missed some milestones	Occasionally/Rarely missed milestones	No missed milestones
<b>(e) Student actively participates and 'owns' their project.[10%]</b>	Engagement with project:	Disengaged, minimal participation	Somewhat engaged, low level of participation	Generally to highly engaged, regular participation	Very highly engaged, very active participation, shows enthusiasm
<b>(f) Student communicates project objectives, achievements and the process [20%]</b>	Progress reporting at supervision meetings:	Unengaging, laboured, disjointed	Mildly engaging & needs improvements	Generally engaging but needing minor improvements to strongly engaging, & well presented	Exceptionally engaging, brilliantly presented, highly professional
	Written communication:	Poor, many errors, incomprehensible	Comprehensible, but many errors or inappropriate style	Comprehensible but occasional errors to succinct & effective, easy to follow	Succinct and eloquent; of publication standard
<b>(g) Workbook (10%)</b>	Logbook & other project documentation:	Inconsistent or incoherent entries	Occasional entries; but minimal level of details	Regular entries with adequate to high level of details	Very regular entries; meticulous details, professional level of documentation

**Table 4. Assessment Criteria for the Research Project Proposal in Research Project Part 1 (Research Methods)**

Programme Outcome <b>1,2,3,4,5 [30 ECTS]</b> <b>1,2,3,4,5 [60 ECTS]</b>	Proposal Element	Performance			
		No Evidence	Unsatisfactory <i>Below Benchmark: Incomplete or inaccurate</i>	Satisfactory <i>At Benchmark: Complete but not fully accurate, comprehensive or insightful</i>	Excellent <i>Above Benchmark: Complete, accurate, comprehensive, and insightful/ innovative</i>
<b>(a) Embark &amp; Clarify</b> Embark on research and clarify the knowledge that is needed	Executive Summary [0%]		Introduction of project vague; OR description of work confusing; OR summary of findings not adequately described.		Introduction of project clear, & description of work clear, & summary of findings described clearly and related to project aims in introduction.
	Introduction [0%]		Description of project is vague OR inadequate.	Project is described but not entirely accurate or incomplete.	Project is described clearly, accurately, and succinct.
	Project Definition Statement adheres to SMART scheme (see description provided under Guidelines for Preparation of the Project Proposal, Section 6.5.1) [10%]	Does not adhere to SMART scheme.	Partial attempt to address elements to SMART scheme OR are vague OR incomplete.	A thorough attempt has been made to address all elements to SMART scheme.	All elements adhere to SMART scheme.
	Aims and Objectives [10%]		Significance of the research project is stated, but not based on leads from, or gaps in, the literature.	Significance of the research project is stated explicitly and is based on leads from, or gaps in, a limited number of references.	Significance of the research project is stated explicitly, and is based on leads from, or gaps in multiple sources.
	Justification project meets NFQ/EI Engineering Level 9 Award Standard [20%]		Claims not comparable to NFQ/EI Level 9 requirements.	Claims comparable to NFQ/EI Level 9 requirements, but further clarification is necessary	Claims are precisely comparable to NFQ/EI Level 9 requirements, with strong justification.
<b>(b) Find &amp; Generate</b> Find and generate needed information/data using appropriate methods.	Identified Literature Resources [5%]		Limited number of journal & conference papers, text books. References lack relevance to the topic.	Search strategy uses several different sources types, e.g. journals and books References usually relevant to the focus of the project.	Extensive number of sources. Information drawn on/data generated is highly relevant to the focus of the project.
<b>(c) Evaluate &amp; Reflect</b>	Literature Review [15%]		References listed are barely compared, or put into context of project.	References are compared, critiqued and put into context with the project.	References are compared, critiqued, put into context with project, and insightful suggestions of future work for

Evaluate information/data and reflect on the research processes used.					referenced authors. Distinguishes between the quality of different evidence.
	Technical Approach [10%]	Resubmission required.	Flawed or ineffective.	Effective.	Highly effective with novelty.
<b>(d) Organise &amp; Manage</b> Organise information collected/ generated and manage research processes.	Proposed Project Execution Plan [20%]	Missing component, e.g., Gantt chart, task breakdown, risk assessment etc.	Plan is difficult to follow / inappropriate. Token effort made on Gantt chart, and project management tasks.	Plan is present / appropriate, yet only partially coherent. Gantt chart has some detail. Reasonable attempt at project management tasks.	Plan is present / appropriate, and has a high level of coherence. Detailed Gantt chart, task breakdown, risks and contingencies are detailed.
<b>(e) Analyse &amp; Synthesise</b> Analyse information/data and synthesise new knowledge to produce coherent individual & understandings.	Outcome Not Applicable to this stage of assessment	Outcome Not Applicable to this stage of assessment	Outcome Not Applicable to this stage of assessment	Outcome Not Applicable to this stage of assessment	Outcome Not Applicable to this stage of assessment
<b>(f) Effective Communication</b> Production of high quality engineering research report.	Referencing [2%]		Some referencing, but does not follow the appropriate conventions.	Appropriate referencing style is specified & applied, but with some errors.	Appropriate referencing style is specified & applied consistently.
	Adheres to Formatting Requirements [2%]		Does not follow.	Generally adheres and suitable for distribution.	Adheres to all requirements and suitable for distribution.
	Cross Referencing of Figures and Tables [2%]		Unsatisfactory cross-referencing.	Usually done correctly.	Consistently done correctly.
	Quality of Figures, Tables, Drawings [4%]	Unacceptable.	Often vague or confusing.	Usually clear, appropriate and effective.	Elegant & precise, strongly appropriate for discipline.

### *Guidelines for Preparation of the Project Proposal*

At the first project meeting after submission of the Project Outline Document, your prospective project supervisor will assist in further definition of the project and also outline the possible scope of work. Development of the project proposal is an opportunity for you to research and clearly articulate the scientific/technical background to the project and take ownership of the work.

*A good proposal should clearly state the aims and objectives, and also outline the project requirements in form of a work plan Gantt Chart, that clearly outlines the expected outcomes, and deliverables.*

The workplan should be a detailed description of related activities that will be geared to achieving the outcomes stated in the proposal. It should also relate such activities to milestones, with corresponding dates/timelines. Proposal development will require a close consultation with your prospective supervisor.

After the submission of your project proposal, your supervisor will provide feedback and may suggest changes before the project proceeds further. The project plan will need to be updated to accommodate any agreed changes. During the course of the research project there may be need to make major changes to the project plan (consider this to be normal). Such needs should be justified via consultation with the supervisor before proceeding. Managing changes in an orderly manner is a key part of project management.

Some important consideration for development of the Project Proposal are:

- (1) Literature Review— This must be a critical review of any published work relevant to your project. It should not be confined to statement of what others have done, but content should be directly related to the project topic and identify any perceived knowledge gaps that will be addressed by the project. Students must learn to express own opinions regarding the published work, especially if they are incomplete, or if they challenge existing knowledge and disagree with other published work. Critical opinions that are founded on available evidence is a hallmark of good Literature Review.
- (2) Project Objectives— These must define what is to be achieved and the method of measuring the extent of the achievement. It is helpful that description of the project objective must adhere to the SMART criteria, i.e.:
  - Specific (target a specific area for improvement);
  - Measurable (quantify or at least suggest an indicator of progress);
  - Assignable (specify who will do it), Realistic (what results can realistically be achieved, given available resources), and;
  - Time-bound, with specification of when the result(s) can be achieved.

The Course Coordinator will direct students to other relevant resources that could be used to develop a comprehensive Research Proposal.

### **6.5.2 Mid-term Report**

The Mid-term Research Project Report is intended to enable candidates to report on their progress, and specifically, how they have achieved or are in progress to achieve the project objectives. Performance will be assessed against the milestones and deliverables that were agreed upon in the Project Proposal.

Key elements require the student to:

- (1) Provide a comprehensive literature and/or technology review;
- (2) To report on the project progress to date, specifically, the milestones achieved and also any, previously unforeseen challenges that may have been encountered, including how such (if any) will have been resolved or the pertinent intentions to resolve them.
- (3) To discuss the planned further work (i.e., in the Stage 2 of the project), and to report any changes from the original plan and justification for such changes.

The Mid-term Research Project Report will be assessed against the marking rubric in Table 5.



**Table 5. Assessment Criteria for the Mid-term Research Progress Report (Part 2: Implementation)**

Programme Outcome <b>1,2,3,4,5 [30 ECTS]</b> <b>1,2,3,4,5,6 [60 ECTS]</b>	Mid-term Report Element	Performance			
		No Evidence	<b>Unsatisfactory</b> <i>Below Benchmark: Incomplete or inaccurate</i>	<b>Satisfactory</b> <i>At Benchmark: Complete but not fully accurate, comprehensive or insightful</i>	<b>Excellent</b> <i>Above Benchmark: Complete, accurate, comprehensive, and insightful/ innovative</i>
<b>(a) Embark &amp; Clarify</b> Embark on research and clarify the knowledge that is needed	Executive Summary [0%]		Introduction of project vague, OR description of work confusing, OR summary of findings not adequately described.		Introduction of project clear, & description of work clear, & summary of findings described clearly and related to project aims in introduction.
	Introduction [0%]		Description of project is vague OR inadequate.	Project is described but not entirely accurate or incomplete.	Project is described clearly, accurately, and succinct.
	Aims and Objectives adhere to SMART scheme [5%]	Does not adhere to SMART scheme.	Partial attempt to address elements to SMART scheme OR are vague OR incomplete.	A thorough attempt has been made to address all elements to SMART scheme.	All elements adhere to SMART scheme.
	Aims and Objectives [5%]		Significance of the research project is stated, but not based on leads from, or gaps in, the literature	Significance of the research project is stated explicitly and is based on leads from, or gaps in, a limited number of references.	Significance of the research project is stated explicitly, and is based on leads from, or gaps in multiple sources.
<b>(b) Find &amp; Generate</b> Find and generate needed information/data using appropriate methods.	Identified Literature Resources [5%]		Limited number of journal & conference papers, text books. References lack relevance to the topic.	Search strategy uses several different sources types, e.g. journals and books References usually relevant to the focus of the project.	Extensive number of sources, approaching the standard of a PhD thesis. Information drawn on/data generated is highly relevant to the focus of the project.
<b>(c) Evaluate &amp; Reflect</b> Evaluate information/data and reflect on the research processes used.	Literature Review [20%]		References listed are barely compared, or put into context of project.	References are compared, critiqued and put into context with the project.	References are compared, critiqued, put into context with project, and insightful suggestions of future work for referenced authors. Distinguishes between the qualities of different evidence.



<b>(d) Organise &amp; Manage</b> Organise information collected/ generated and manage research processes.	Proposed Project Execution Plan [20%]	Missing component, e.g., Gantt, task breakdown, risk assessment	Plan is difficult to follow / inappropriate. Token effort made on Gantt chart, and project management tasks.	Plan is present / appropriate, yet only partially coherent. Gantt chart has some detail. Reasonable attempt at project management tasks.	Plan is present / appropriate, and has a high level of coherence. Detailed Gantt chart, task breakdown, risks and contingencies.
<b>(e) Analyse &amp; Synthesise</b> Analyse information/data and synthesise new knowledge to produce coherent individual & understandings.	Description of Work Completed to Date [35%]		Tasks (designs, experiments, software, etc.) barely commenced or inadequate progress, unlikely to meet objectives.	Good progress made on tasks (designs, experiments, software, etc.), adequate progress made, very likely to meet objectives.	Excellent progress made on tasks (designs, experiments, software, etc.), nearly completed all project objectives.
<b>(f) Effective Communication</b> Production of high quality engineering research report.	Referencing [2%]		Some referencing, but does not follow the appropriate conventions.	Appropriate referencing style is specified & applied, but with some errors.	Appropriate referencing style is specified & applied consistently.
	Adheres to Formatting Requirements [2%]		Does not follow.	Generally adheres and suitable for distribution.	Adheres to all requirements and suitable for distribution.
	Cross Referencing of Figures and Tables [2%]		Unsatisfactory cross-referencing.	Usually done correctly.	Always done correctly.
	Quality of Figures, Tables, Drawings [4%]	Unacceptable.	Often vague or confusing.	Usually clear, appropriate and effective.	Elegant & precise, strongly appropriate for discipline.

### 6.5.3 Final Project Seminar and Presentation

The *Final Project Seminar and Presentation* will consist of 20 minute project presentation by the candidates and 10 minutes of Questions and Answers. This is a formal assessment exercise with the presentation as the deliverable (see Table 1 and Table 2).

Candidates will make a presentation of their project to a panel of academic staff and peers. Presentations must cover the full aspects of the project, including, the pertinent research background, literature review and findings/results of the project. They will also describe the research methods and the management of the project. This exercise will allow the examiners to observe and assess the technical presentation skills of each presenter. There will be a question and answer session at the end of each presentation; which will accord candidates with the opportunity to clarify any details or matters arising from their project presentation.

The final presentation will be assessed by a panel of academic staff, with the supervisor providing the verbal and/or written feedback. The Course Coordinator will provide guidelines for preparation for the seminar and presentation. The Seminar will be assessed according to the marking rubric in Table 6.

**Table 6. Assessment of the Part 2 Research Project Seminar & Final Presentation**

Description of Element Assessed	Performance				Score
	1	2	3	5	
<b>Organisation of presentation</b>	Poor sequence of information therefore audience cannot understand presentation	Difficulty in following presentation due to poor sequencing.	Information presented in logical sequence which audience can follow.	Information presented in logical, interesting sequence which audience can follow.	5
<b>Knowledge of project subject matter</b>	Poor grasp of information. Many of the concepts presented are incorrect.	Uncomfortable with information. Some understanding of topic shown. Some links and connections made between ideas. Information relevant but points developed with minimal detail.	Good understanding of topic shown. Links and connections between ideas made clear. Information relevant and expressed in own words. Points were developed with sufficient and appropriate details	Very good understanding of the topic. Links and connections between ideas made clear. Information relevant and well expressed in own words. Points well-organised and developed with sufficient and appropriate details.	5
<b>Use of graphics/illustrations</b>	Superfluous graphics or no graphics	Occasionally use of graphics that rarely support text and presentation.	Graphics relate to text and presentation.	Graphics explain and reinforce screen text and presentation.	5
<b>Quality of Presentation material</b>	Presentation has four or more spelling errors or grammatical errors.	Presentation has three misspellings and/or grammatical errors.	Presentation has no more than two misspellings and/or grammatical errors.	Presentation has no misspellings or grammatical errors.	5
<b>Body language, e.g. eye contact</b>	Presents by reading entire report devoid of any eye contact.	Occasional eye contact, but still reads most of report.	Maintains eye contact most of the time but frequently returns to notes.	Maintains eye contact with audience, seldom returning to notes.	5
<b>Coherence</b>	Mumbling, incorrect pronunciations, & generally incoherent.	Low voice. Incorrect pronunciations & general difficulty in hearing by audience.	Clear voice. Pronounces most words correctly. Most of the audience can hear presentation.	Uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation.	5
<b>Handling Q&amp;A Session</b>	Student cannot answer questions about subject or is evasive.	Student is able to answer only rudimentary questions.	Student is at ease with expected answers to all questions, but fails to elaborate.	Student demonstrates full knowledge by answering all class questions with explanations and elaboration.	5
				<b>Aggregate</b> [To be Weighted at 10%]	<b>/35</b>

#### 6.5.4 MEng Thesis

The MEng Thesis is to be submitted as the culmination of the Research Project modules, and ultimately, the Masters programme. The thesis is intended to be presented as a stand-alone report on the entire *Research Project*. Therefore, it is expected to interweave elements of the stage deliverables and milestones such as the project proposal, mid-term report, and the final seminar presentation.

Overall, the final thesis will include: a comprehensive literature/technology review; description of the aims and the scope of the project; detailed description of the research methodology applied, including elements of project management; detailed reporting of the findings or the outcomes of the project, lessons learned during the project, and; tangible conclusions and recommendations for future work, if any. The specific details are outlined in the Guidelines for Preparation of the MEng Thesis below.

An electronic copy of the MEng Thesis in PDF format must be submitted via the link provided in Moodle VLE. Each student will also be required to submit a USB memory stick containing the electronic copies of all project reports, any design/test data and documents, final seminar presentation materials, and copies of any project software and any other documentation pertaining to the research project.

The MEng Thesis will be assessed in accordance with the marking rubric in Table 7.

##### 6.5.4.1 Guidelines for the preparation of the MEng Thesis

*Note that writing a good thesis requires time, and may involve up to three or more Draft Iterations before achieving an acceptable Final Thesis.*

*Students are therefore encouraged to start the preparations for the final write-up at the onset of the research project, by adopting an outline or skeletal structure (e.g., from your Project Proposal) that will be expanded and modified as the project evolves. Students will also need to collate the necessary reference material and other supporting documentation that will, if necessary, be included as appendices to the MEng Thesis.*

Students are encouraged to produce a complete and typed first draft of thesis well before the specified thesis submission deadline. Also, the thesis drafts must have been submitted to the supervisor(s) for consideration, either in complete drafts or in parts, before the final thesis is produced and bound for submission.

The supervisor is expected to guide the students during the drafting stages of the thesis, but the student should not regard the supervisor as a proof-reader. Salient Programme Outcome of this Level 9 Award requires the student: *to be able to write technical papers and reports, and synthesise their own work and that of others in abstracts and executive summaries*. Therefore, it is the responsibility of the student to ensure that the thesis is written in clear and concise format, and devoid of any excessive grammatical and typographical errors. Diagrams should be clear and well presented; all tables, figures and diagrams should be sequentially numbered and must individually retain appropriate captions. Where applicable, the source of any data and/or diagram must be appropriately referenced (see guidelines regarding referencing below).

**Table 7. Assessment of the MEng Thesis**

Learning Outcome <b>1,2,3,4,5 [30 ECTS]</b> <b>1,2,3,4,5,6 [60 ECTS]</b>	Thesis Element	Performance			
		No Evidence	Unsatisfactory <i>Below Benchmark: Incomplete or inaccurate</i>	Satisfactory <i>At Benchmark: Complete but not fully accurate, comprehensive or insightful</i>	Excellent <i>Above Benchmark: Complete, accurate, comprehensive, and insightful/ innovative</i>
<b>(a) Embark &amp; Clarify</b> Embark on research and clarify the knowledge that is needed	Executive Summary [0%]		Introduction of project vague, OR description of work confusing, OR summary of findings not adequately described.		Introduction of project clear, & description of work clear, & summary of findings described clearly and related to project aims in introduction.
	Introduction [5%]		Description of project is vague OR inadequate.	Project is described but not entirely accurate or incomplete.	Project is described clearly, accurately, and succinct.
	Aims and Objectives adhere to SMART scheme [5%]	Does not adhere to SMART scheme.	Partial attempt to address elements to SMART scheme OR are vague OR incomplete.	A thorough attempt has been made to address all elements to SMART scheme.	All elements adhere to SMART scheme.
	Aims and Objectives [5%]		Significance of the research project is stated, but not based on leads from, or gaps in, the literature.	Significance of the research project is stated explicitly and is based on leads from, or gaps in, a limited number of references.	Significance of the research project is stated explicitly, and is based on leads from, or gaps in multiple sources.
<b>(b) Find &amp; Generate</b> Find and generate needed information/data using appropriate methods.	Identified Literature Resources [5%]		Limited number of journal & conference papers, text books. References lack relevance to the topic.	Search strategy uses several different sources types, e.g. journals and books References usually relevant to the focus of the project.	Extensive number of sources, at the standard of a PhD thesis. Information drawn on/data generated is highly relevant to the focus of the project.
<b>(c) Evaluate &amp; Reflect</b> Evaluate information/data and reflect on the research processes used.	Literature Review [10%]		References listed are barely compared, or put into context of project.	References are compared, critiqued and put into context with the project.	References are compared, critiqued, put into context with project, and insightful suggestions of future work for referenced authors.
<b>(d) Organise &amp; Manage</b> Organise information collected/ generated and manage research processes.	Project Management [5%]	Missing component	Plan is difficult to follow / inappropriate. Token effort made on Gantt chart, and project management tasks.	Plan is present / appropriate, yet only partially coherent. Gantt chart has some detail. Reasonable attempt at project management tasks.	Plan is present / appropriate, and has a high level of coherence. Detailed Gantt chart, task breakdown, risks

					and contingencies are detailed.
<b>(e) Analyse &amp; Synthesise</b> Analyse information/data and synthesise new knowledge to produce coherent individual & understandings.	Quality of Work Completed [40%]		Tasks completed are not demonstrated to a professionally competent standard, or at the standard of an honours project.	Tasks completed are at a standard of masters (higher than honours) and is professionally competent. Has met most of the project objectives.	Tasks completed to a very high professional standard, and comparable to a PhD project. All project objectives have been met.
	Findings, Conclusions and Future Work [10%]	Missing component	Findings and conclusions of project not described clearly / inaccurate. Inadequate comparison of work completed to stated project objectives and tasks.	Findings and conclusions of project described clearly. Work completed has been clearly compared to stated project objectives and tasks. Proposed future work is included and reasonable.	Findings and conclusions of project described clearly. Work completed has been clearly compared to stated project objectives and tasks. Proposed future work is reasonable and highly innovative.
<b>(f) Effective Communication</b> Production of high quality engineering research report.	Quality of writing, figures, tables, drawings. Referencing Cross referencing of figures and Tables [10%]	Resubmission required.	Often vague or confusing. Some referencing, but does not follow the appropriate conventions.  Unsatisfactory.	Usually clear, appropriate and effective. Well organised, but needs refinement for publication. Appropriate referencing style is specified & applied, but with some errors.  Usually done correctly.	Elegant & precise, strongly appropriate for discipline. Professional quality, suitable for publication. Appropriate referencing style is specified & applied consistently.  Consistently done correctly.
	Adheres to Formatting Requirements [5%]	Resubmission required.	Poor quality, not suitable for submission.	Adheres to almost all requirements.	Adheres to all requirements.

#### 6.5.4.2 Thesis Structure

Structure of a good thesis should generally include:

- Title Page (Prepared per Institute Format)
- Acknowledgment & Candidate Thesis Declaration
- List of Symbols, Acronyms & Abbreviations, List of Tables, & List of Figures.
- Abstract (Approximately 500 words, covering what was done, how it was done, what was found, and implications of the findings)
- Table of Contents (well-structured for clear demarcation of sections, subsections, etc.)
- Introduction (to include a Problem Statement and Project Aims & Objectives)
- Literature review (supporting all the key aspect of the research inquiry but focused on elements of the study objectives)
- Research Methods (covering Experimental Design, Hardware/Software/Modelling, Data Collection/Processing & Analysis, Analyses of Experimental Errors, etc.)
- Results from the research (Presentation of data in tables and/or graphical formats with concurrent discussion)
- Discussion (how results from this research answer your research questions)
- Conclusions (brief summary of your findings specific to research objectives, and evidenced by your results and analyses)
- Future Work/Perspectives (if any)
- References
- Appendices (As appropriate, but confined to additional information supporting what is covered in the main body, but not required for the basic understanding of the thesis itself, e.g., hardware/software development and code, additional features of experimental data and any secondary data tables, sections of relevant standards, extended statistical analyses/procedures, etc.)

#### Sectioning

Sections and subsections are used to organise the document, but meaningful headings should be used.

Avoid section subdivisions beyond 3rd levels, e.g. 3.1.1.2 may be too much. Below is an example

#### 1 Chapter 1

##### 1.1 Section 1 of Chapter 1

##### 1.1.1 Sub-Section 1 of Section 1

A Division A of Sub-section 1

i.) Sub-Division i.) of Division A

ii.) Sub-Division ii.) of Division A

B Division B of Sub-Section 1

##### 1.1.2 Sub-section 2 of Section 1

##### 1.2 Section 2 of Chapter 1

#### 2 Chapter 2

#### Tables and figures

These should each be sequentially (and separately) numbered throughout the document. They should also be centred and labelled with identification number and title. If necessary to fit the contents of a table on one page, 10-point font size may be used; alternatively the page may be printed in landscape mode.

#### Appendices

These should be sequentially numbered starting with Appendix A, and pagination continued from the main body of the thesis.

#### Language Styling and Grammar

Avoid

- colloquial words and phrases (e.g. *lab* results, *stats*),

- Asking rhetorical questions or using exclamation marks
- Contractions (e.g. didn't, can't, it's etc.)

The thesis should be written in the third person. Do not use personal pronouns (i.e. I, we, our, you, us)

### *Use of Apostrophes*

One of the most common mistakes in student writing is incorrect use of the apostrophe ('), as in PC's to mean a number of PCs. Sole use of apostrophes is to form contractions such as didn't (did not), can't (cannot) and it's (it is). Such should be avoided.

The apostrophe is also used to denote possessive case, as in *the dog's bone* or *the student's assignment*.

- The rule here is that of the intended noun is singular (one dog) the apostrophe is placed before the s. The examples above refer to a single dog and a single student respectively.
- If the intended noun is plural, the apostrophe is placed before the s as in *dogs'* (of the dogs).

However if the noun has an irregular plural, e.g. child – children, the apostrophe is placed before the s as in *children's*.

### *Use of Acronyms*

Computing/engineering are fields in which acronyms are heavily used to avoid repetition of long technical terms, e.g. RAM, PC etc. When using an acronym for the first time, always precede it with the expanded version e.g. Random Access Memory (RAM)

### *Grammar & Jargon*

Do be careful to write in full sentences and to proof read the document to ensure not only that the text is grammatically sound, but also that it means exactly what was intended. Try to strike a good balance between use of jargon and appropriate use of technical terms.

### *Spelling*

There should be no excuse for spelling mistakes in a word processed document. Spelling errors create a bad impression. Note, however, that spelling checkers cannot detect cases where the wrong word happens to be a real word e.g. *from* – *form*. So a careful proof read is necessary or many of.

### *Referencing Introduction*

The best way to avoid plagiarism is to acknowledge the resources upon which you have based your ideas. There are three variants on the British Standard 1629:1989 referencing system. The variant recommended is often referred to as the "**name and date**" or **Harvard System**. The Harvard System involves two tasks:

- **In Text Citations:** How you refer to other authors in the body of your text.
- **Compilation of a Reference List:** How you compile a list of reference sources at the end of your text.

### *In Text Citations*

**Citing one work by one author** - use only the name of the author, followed by the year of publication:

Nebel (1987) first proved the relationship between x and y.

OR

The confirmation of a relationship between x and y (Nebel 1987)...

**Citing a work with two or three authors** - the names of all authors should be included:



Farrier, Lyster and Pearson (1993) have shown...

OR

It has been shown (Farrier, Lyster & Pearson 1993)...

**Citing a work with more than three authors** - use only the surname of the first-listed author, followed by the expression 'et al.' (or 'and others'):

Larsen et al. (1997) have found...

OR

It was found (Larsen et al. 1997)...

**Authors with the same last name** - include the authors' initials to avoid any confusion:

In one study D Smith (1994) has shown ... but A Smith (1992) has suggested...

OR

It has been shown (Smith, D 1998) that ... but this theory has recently been opposed (Smith, A 1992).

**The Internet** - when you are citing a Web page in your text, give the address of the site. When citing a document from the Web, you must use the author/date format. In both cases, you must include your source in the list of references.

The National Research Center for Statistics and the Environment (4 May 2000) revealed...

### Compilation of a Reference List

A reference list only includes books, articles etc that are cited in the text. The reference list is arranged alphabetically by author. Where an item has no author it is cited by its title, and ordered in the reference list or bibliography alphabetically by the first significant word of the title.

**A book with one or more authors** - include the name of every author responsible for the text:

Farrier, D, Lyster, R & Pearson, L 1993, *The Environmental Law Handbook: planning and land use in New South Wales*, 3<sup>rd</sup> edn, Redfern Legal Centre Publishing, Redfern.

**Journal articles** - include volume, issue, and page numbers (as appropriate):

Author/s	Year	Article title	Journal title	Volume	Issue	Page/s
Thomas, Peter A	2000	'A tree's old age'	<i>Natural History</i>	vol. 109	no. 4	p. 96.

**Conference papers** - use the following format:

Saunders, DA, Hopkins, AJM & How, RA (eds.) 1990, *Australian ecosystems: 200 years of utilization, degradation and reconstruction: proceedings of the Ecological Society of Australia*, Surrey Beatty & Sons, Chipping Norton.

**Internet & websites** - use the following format: Author/editor Site date, *Homepage Title*, Name and place of the sponsor of the source, viewed: access date, URL.

Example of Information on Thesis Title page

# **INSTITUTE OF TECHNOLOGY BLANCHARDSTOWN**

**Department of Engineering & Trades**

**School of Informatics & Engineering**

[Title of your Thesis in appropriate Fonts]

By

[Your full name & academic qualifications]

A thesis submitted in partial fulfilment of the requirements for  
the degree of Master of Science in Applied Cyber Security

Supervisor(s):

[Title & name of your supervisor]

Date of submission:

---

**Example of Candidate Thesis Declaration of Originality Page**

## Candidate Declaration

I declare that this thesis, which I submit to the Institute of Technology Blanchardstown (ITB) for examination in partial fulfilment of the Award of *MEng in Internet of Things Technologies* is my original work. Where any of the content presented is the result of input or data from a related collaborative research programme or other people's works are duly acknowledged in the text, such that it is possible to ascertain how much of the work is my own. This work has not been presented in ITB or any other institution for any other award. Furthermore, I took reasonable care to ensure that the work is original, and, to the best of my knowledge, does not breach copyright law, and has not been taken from other sources except where such work has been cited and acknowledged within the text.

Signed \_\_\_\_\_

Student Number \_\_\_\_\_

Date \_\_\_\_\_