



TUS

**Technological University of the Shannon:
Midlands Midwest**

Ollscoil Teicneolaíochta na Sionainne:
Lár Tíre Iarthar Láir

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**Dámh an Innealtóireacht agus an Timpeallacht Thógtha
Faculty of Engineering and the Built Environment**

**Department of Mechanical and Automobile Engineering
Report of External Validation Panel**

External Validation Visit, 9th February 2024

for the

Masters of Engineering in Autonomous Vehicles

Embedded Awards

Post Graduate Diploma in Autonomous Vehicles

Special Purpose Award in Autonomous Vehicle Embedded Systems

Special Purpose Award in Vehicle Communication for Intelligent Transport Systems

Special Purpose Award in Hardware and Software Architecture for Autonomous Systems

**Special Purpose Award in Modelling and Simulation for Hazard Identification and Risk
Analyses**

Special Purpose Award in Automotive Sensing Technology, Systems and Architecture

Special Purpose Award in Regulations, Standards and Safety for Autonomous Vehicles

1.0 INTRODUCTION

This report outlines in summary form, the proceedings and findings of the External Validation Panel visit for the proposed:

Masters of Engineering in Autonomous Vehicles

And Embedded Awards:

Post Graduate Diploma in Autonomous Vehicles

Special Purpose Award in Autonomous Vehicle Embedded Systems

Special Purpose Award in Vehicle Communication for Intelligent Transport Systems

Special Purpose Award in Hardware and Software Architecture for Autonomous Systems

Special Purpose Award in Modelling and Simulation for Hazard Identification and Risk Analyses

Special Purpose Award in Automotive Sensing Technology, Systems and Architecture

Special Purpose Award in Regulations, Standards and Safety for Autonomous Vehicles

held on the 9th February 2024. The external validation visit was undertaken in accordance with TUS Academic Regulations for the development of taught programmes. An external validation panel makes an independent impartial judgement on a programme proposal.

2.0 GENERAL INFORMATION

2.1 Higher Education Provider

Provider	Technological University of the Shannon: Midlands Midwest
Faculty	Faculty of Engineering and the Built Environment
Department	Mechanical and Automobile Engineering
Date of Visit	9 th February 2024

2.2 Programmes Evaluated

Programme Title	Masters of Engineering in Autonomous Vehicles
Award Title	Masters of Engineering in Autonomous Vehicles
NFQ Level	Level 9
ECTS Credits	90 ECTS

Award Class	Master of Engineering (Honours)
Delivery Mode	Full Time / Part Time
Duration	1.5 years / 2 years
Proposed Starting Date	September 2024
Contact	Dr. Philip Ryan / Ailbe Burke

Programme Title	Post Graduate Diploma in Autonomous Vehicles
Award Title	Post Graduate Diploma in Autonomous Vehicles
NFQ Level	Level 9
ECTS Credits	60 ECTS
Award Class	Post Graduate Diploma
Delivery Mode	Full Time / Part Time
Duration	1 year / 1.5 years
Proposed Starting Date	September 2024
Contact	Dr. Philip Ryan/Ailbe Burke

Programme Title	Special Purpose Award in Autonomous Vehicle Embedded Systems
Award Title	Special Purpose Award in Autonomous Vehicle Embedded Systems
NFQ Level	9
ECTS Credits	10
Award Class	Special Purpose Award
Delivery Mode	Full Time
Proposed Starting Date	September 2024
Contact	Dr. Philip Ryan/ Ailbe Burke

Programme Title	Special Purpose Award in Vehicle Communication for Intelligent Transport Systems
Award Title	Special Purpose Award in Vehicle Communication for Intelligent Transport Systems
NFQ Level	9
ECTS Credits	10
Award Class	Special Purpose Award
Delivery Mode	Full Time
Proposed Starting Date	September 2024
Contact	Dr. Philip Ryan/ Ailbe Burke

Programme Title	Special Purpose Award in Hardware and Software Architecture for Autonomous Systems
Award Title	Special Purpose Award in Hardware and Software Architecture for Autonomous Systems
NFQ Level	9
ECTS Credits	10
Award Class	Special Purpose Award
Delivery Mode	Full Time
Proposed Starting Date	September 2024
Contact	Dr. Philip Ryan/Ailbe Burke

Programme Title	Special Purpose Award in Modelling and Simulation for Hazard Identification and Risk Analyses
Award Title	Special Purpose Award in Modelling and Simulation for Hazard Identification and Risk Analyses
NFQ Level	9
ECTS Credits	10
Award Class	Special Purpose Award
Delivery Mode	Full Time
Proposed Starting Date	September 2024

Contact	Dr. Philip Ryan/Ailbe Burke
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Programme Title	Special Purpose Award in Automotive Sensing Technology, Systems and Architecture
Award Title	Special Purpose Award in Automotive Sensing Technology, Systems and Architecture
NFQ Level	9
ECTS Credits	10
Award Class	Special Purpose Award
Delivery Mode	Full Time
Proposed Starting Date	September 2024
Contact	Dr. Philip Ryan/Ailbe Burke

Programme Title	Special Purpose Award in Regulations, Standards and Safety for Autonomous Vehicles
Award Title	Special Purpose Award in Regulations, Standards and Safety for Autonomous Vehicles
NFQ Level	9
ECTS Credits	10
Award Class	Special Purpose Award
Delivery Mode	Full Time
Proposed Starting Date	September 2024
Contact	Dr. Philip Ryan/Ailbe Burke

2.3 External Validation Panel of Expert Assessors

Name	Affiliation
Mr. John Vickery	Formerly IT Tallaght (Chairperson)
Dr. Ciaran Eising	UL
Dr. Alan Ryan	UL
Mr. James O'Keefe,	General Motors
Ms. Olivia Wynne	Jaguar Landrover
Mr James Ryan	Student Representative

Secretary to Panel: Dr. Michael Francis Ryan

2.4 TU STAFF

Name	Affiliation
Dr. Terry Twomey	VP Academic Affairs and Registrar
Dr. Maria Kyne	Dean of Faculty of Engineering and the Built Environment
Dr. Philip Ryan	Head of Department of Mechanical and Automobile Engineering
Seamus Hoyne	Dean of Flexible Learning
Dr Órlaith Borthwick	Head of Flexible Learning
Ailbe Burke	Programme Coordinator
<ul style="list-style-type: none">Programme Team: Jonathan Blackmore; Darragh Donnelly; Dr. Wassim Derguech; Guilherme Gomes; James McPhillips; Yuhang Ye; Roger Young.	

3.0 FINDINGS AND RECOMMENDATIONS OF EXTERNAL VALIDATION PANEL

3.1 Main Findings

The External Validation Panel of Assessors recommends approval of the proposed programmes and associated embedded awards:

Master of Engineering in Autonomous Vehicles

And Embedded Awards:

Post Graduate Diploma in Autonomous Vehicles

Special Purpose Award in Autonomous Vehicle Embedded Systems

Special Purpose Award in Vehicle Communication for Intelligent Transport Systems

Special Purpose Award in Hardware and Software Architecture for Autonomous Systems

Special Purpose Award in Modelling and Simulation for Hazard Identification and Risk Analyses

Special Purpose Award in Automotive Sensing Technology, Systems and Architecture

Special Purpose Award in Regulations, Standards and Safety for Autonomous Vehicles

3.2 Conditions

- 1) Develop Programme Learning Outcomes for the Postgraduate Diploma offering and ensure they are linked to the relevant award standard;
- 2) Increase overall programme content on AI. Introduce practical AI in the context of Autonomous Vehicles, including: the AI process, practice-based applications, with students to gain insights from applying AI to driving simulations;

3.3 Recommendations

- 1) Consider the introduction of a new module on AI;
- 2) Review the Programme learning outcomes to clearly identify the specific outcomes achieved on programme completion (currently the LOs seem quite generic). What specific KSA will a graduate of the programme have? Need for greater linkage between module LOs and Programme Learning Outcomes;
- 3) Develop further the description of 'Graduate Attributes' to make explicit the graduate profile arising from this specific programme;

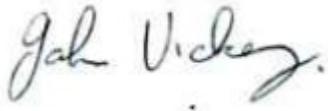
- 4) Review the documentation to highlight the unique nature of the programme - particularly: the facilities and potential of the collaboration with FMCI (Future Mobility Campus Ireland) & other industries working in this space; the blended and part-time delivery; and access to industry workshops and practical applications;
- 5) Clarify in the documentation (particularly at modular level), the specific approach to teaching, learning and assessment (focus on continuous assessment) and include reference to: teamwork, FMCI, workshops, industry collaboration, problem-based learning and flipped classroom (where appropriate);
- 6) Review the language associated with some modular learning outcomes for level 9. (Replace 'Understand' with Apply, Analyse, Evaluate...);
- 7) Clarify and communicate clearly if there is continuation of modules or dependency between modules;
- 8) Consider moving to a sequential (rather than parallel) delivery of the modules to accommodate industry participants (their commitments) and the timing of continuous assessments;
- 9) Communicate the level of independent learning hours required, it is important to communicate both time expectation and commitment required;
- 10) Consider a Recognition of Prior Learning (RPL) template, indicating how decisions are made regarding candidates - ensuring alignment with TUS transfer and progression policy;
- 11) Ensure entry, transfer and progression requirements for all arrangements are clearly stated in the documentation; e.g. who the programme is aimed at (including clarification regarding: transfer of postgraduate students to the Masters programme) on completion of the 60 credit component;
- 12) In light of the proposed weekly contact and independent study hours, consider the provision of further pre-recorded online sessions to ensure more flexibility of access for industry participants;
- 13) Review the current documentation and provision for timetabling regarding potential full-time delivery. (Ensure it is timetabled over 3 days minimum in compliance with regulations for international students);
- 14) The programme should be further benchmarked against other similar programmes;
- 15) Consider using the term 'autonomous systems' as a generic term across the document where appropriate;

Module Specific Recommendations

- a) Review the amount of overlap across modules (e.g. module codes: 9005, 9007 & 9010 all appear to have a focus on safety; there is also content overlap between *'Autonomous Vehicle Embedded Systems'* & *'Vehicle Communications for Intelligent Transport Systems'* (Possibly exclude listing of protocols, historical context, given the speed of change in the sector);
- b) Incorporate more AI into the *Hardware and Software Architecture for Autonomous Systems'* & reduce current indicative content that overlaps with other modules;
- c) *Automotive Sensing Technology, Systems and Architecture*: need to include some content on: the pros and cons of different sensors and how you can switch sensors or provide back up where faults arise, how to manage a crisis...degradation/fusion issues for sensors);
- d) *Modelling and Simulation for Hazard Identification and Risk Analyses*; provide some input on contingency planning in the event of unforeseen factors arising in a given scenario (fail safe strategies -including ethical domain). Consider acquisition of licences (relevant simulation platforms) for student access during the programme. Reconsider the assessment weighting (with more weighting towards practice element). Consider possibilities for teamwork;
- e) *Regulations, Standards and Safety for Autonomous Vehicles*;
Enhance the potential for 'fun learning' experience in this module and consider the option of a 'micro accreditation award' for industry participants. Review LOs 3 & 5. Consider additional focus in indicative syllabus on ethical domain for autonomous vehicles (human impact/decision making, GDPR compliance);
- f) *Thesis & Work Based Learning* - Consider in more detail issues associated with the proposed offering of both Thesis and Work based project. Consider the nature of the work-based project, the possibilities it offers to industry participants and the consistency of the assessment process. Currently the proposed work-based project (professional development module) is assessed as pass - fail in the documentation (unlike the thesis which has a fully graded system);
Thesis Requirement - clarify in the documentation the key components of the thesis (proposal, literature review, methodology, discussion of findings, conclusions & recommendations) & format for presentation of findings: e.g. oral exam/poster/video or equivalent.

3.4 Commendations and Observations

- 1) The panel appreciated the detailed discussions and clarifications provided by the programme team;
- 2) The panel commend aspects of the documentation provided and associated indicative syllabus for modular content;
- 3) The panel commends the collaboration with industry, particularly FMCI (Future Mobility Campus Ireland) and also the development of a dedicated space for workshop practice at both Coonagh & FMCI campus;
- 4) The panel commended the quality of the CVs of listed personnel associated with the programme;
- 5) The panel would like to commend the team for their active and enthusiastic engagement with the panel.

A handwritten signature in black ink, appearing to read "John Vickey". The signature is written in a cursive style with a small dot at the end.

Signature of Chairperson

Date: 22/02/2024