

Traditional and Apprentice Modes of Learning at Undergraduate Level: A Comparative Analysis.

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Abstract.

Traditionally, apprenticeships have been viewed as an alternative to traditional Higher Education (HE) pathways in Ireland. The Technological University of the Shannon (TUS) has developed an advanced apprenticeship for qualified craft technicians (electricians and electrical instrumentation), enabling their progression to degree level. This research employed a case study approach to investigate the academic and professional preparedness of these technicians as they transitioned from Quality and Qualifications Ireland (QQI) National Framework of Qualifications (NFQ) Level 6 Further Education (FE) Craft Apprenticeship through an NFQ Level 7, Consortia Led Apprenticeship (CLA) in Industrial Electrical Engineering (IEE). Data collection included interviews, surveys, and an analysis of student performance.

The study compared these apprentices to students progressing within the traditional HE pathway, from the second to third year of an undergraduate electrical engineering degree. Findings demonstrate that both pathways effectively prepare students for Level 7 study and subsequent progression to NFQ Level 8 honours degree programmes.

Furthermore, the research highlights the strong industry demand for apprenticeship graduates, with many securing supervisory positions. This underscores the value of the apprenticeship model in developing highly skilled and employable electrical engineering professionals.

The study highlights a critical need for ongoing support for apprenticeship graduates in developing foundational academic skills. To address this, this research recommends that, in parallel to the review and reassessment of the Level 6 FE craft apprenticeship as part of the migration to the single model, a comprehensive review of the Level 7 IEE CLA also be carried out. This review should explore the possibility of extending this CLA with a Level 8 honours degree add-on. This integrated approach would create a more seamless and industry-relevant educational pathway for this cohort within the HE landscape.

Keywords: Apprenticeship; Craft; Consortia-led; Electrical engineering.



All Ireland Journal of Teaching and Learning in Higher Education (AISHE-J)
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1. Introduction.

The perception of Further Education (FE) craft apprenticeships in Ireland as less prestigious than Higher Education (HE) persists, despite their significant contribution to the skilled workforce. This perception is influenced by parental preferences for HE, societal views associating apprenticeships with lower academic achievement (Cho & Apple, 1998), and a perceived inferiority of Work-based Integrated Learning (WIL) compared to traditional HE instruction (Fuller & Unwin, 1998). Historically, Irish craft apprenticeships, rooted in the trades and formalised through the Apprenticeship and Industrial Training Acts (Ireland 1959, 1967), have played a crucial role in Irish Society. These apprenticeships, initially structured around a seven-tiered model introduced in 1994, combine taught elements with a predominantly WIL framework.

Recent government initiatives, including the Department of Further and Higher Education, Research, Innovation and Science's (DFHERIS) Generation Apprenticeship, have aimed to revitalise apprenticeships. This has led to the development of new, post-2016 Consortia Led Apprenticeships (CLA), industry-led programmes managed collaboratively by industry groups and education providers (DES, 2016; DFHERIS, 2021a). A significant development was the inclusion of apprenticeships in the Central Applications Office (CAO) system in 2022, alongside the introduction of employer incentive grants (DFHERIS, 2021b). The long-term policy goal is to consolidate existing craft and CLA apprenticeships into a unified, CLA-based Single Model Apprenticeship.

This research investigates the experiences and outcomes of two distinct cohorts:

- (1) Qualified electricians and electrical instrumentation technicians entering a Quality and Qualifications Ireland (QQI) National Framework of Qualifications (NFQ) Level 7 engineering programme directly from FE ("*technicians*") (Appendix A), and
- (2) Students transitioning from the second to the third year of traditional Level 7 electrical engineering degrees within HE (Appendix B).

This comparative approach was maintained throughout the study, examining academic performance, professional development, and career outcomes. This comparison aimed to provide insights into the preparedness of each group for the modern engineering profession, including workforce integration and readiness for further HE studies.

1.1 Apprenticeship pathway.

The Technological University of the Shannon, Midlands Midwest (TUS) (*“the University”*) has pioneered a Level 7 ordinary degree CLA in Industrial Electrical Engineering (IEE) (TUS, 2021c) (Appendix C) designed specifically for qualified technicians selected by their employers. This 24-month programme mirrors the block release model of craft apprenticeships but involves a significantly accelerated learning pace. Participants, who have completed a four-year craft apprenticeship and attained an Advanced Certificate in Electrical or Electrical Instrumentation, often find the increased pressure to master new skills, particularly in areas such as Information Technology (IT), project management, and presentation skills, challenging, but manageable, compared to their previous experience. While possessing strong foundational knowledge in electrical engineering, many apprentices benefit from tailored mathematics support to address the gap since they have been away from the academic environment for some time. Initial anxieties regarding mathematical abilities and keeping pace with the programme are often alleviated by this targeted support. Notably, the 2022/23 academic year saw a 95% completion rate for stage 2 apprentices and a 93% completion rate for stage 4 apprentices in the IEE CLA programme, compared to a 68% completion rate for Level 7 of traditional electrical engineering programmes at the University (TUS, 2021a), highlighting the programme's effectiveness.

1.2 Traditional pathway.

Traditional pathway students typically complete a three-year ordinary degree after secondary education, progressing from Level 6 to Level 7. Alternative entry routes, such as access programmes, often part-time and incorporating Accumulation of Credits and Certification of Subjects (ACCS), are also available.

1.3 Level 8 honours degree.

Following the Level 7 ordinary degree, both traditional and apprenticeship pathway students can pursue a Level 8 honours degree (TUS, 2021b). Traditional students may continue directly into year four of a four-year honours programme or complete an add-on year after the ordinary degree. Apprenticeship pathway students can also pursue an add-on honours degree, either full-time or part-time via ACCS, joining the same honours programme as traditional pathway students. This integration of students with diverse learning backgrounds creates a unique dynamic within the honours degree programme. This research focuses on comparing the Level 7 experiences and outcomes of these two distinct entry routes into engineering.

1.4 The research problem and objectives.

This research investigates the preparedness of qualified technicians for direct entry into an NFQ Level 7 engineering programme, focusing on their module readiness as a key indicator. By comparing their readiness with that of students transitioning from the second to the third year of

traditional Level 7 electrical engineering degrees, the study aimed to correlate academic performance and professional development outcomes of both cohorts to assess their relative readiness for entering the workforce, progressing to higher level studies (TUS, 2021b), and their overall suitability for the demands of the modern electrical engineering profession.

The research objectives:

1. Assess the preparedness of students transitioning from NFQ Level 6 FE to Level 7 HE.
2. Critically analyse the graduate experience, at Level 7, on programme pathways delivered using different pedagogical approaches.
3. Compare postgraduate progression rates to Level 8 programmes for graduates of both programme pathways.
4. Evaluate the preparedness of graduates from both pathways to enter the workforce upon programme completion.

2. Literature Review.

Apprenticeships have a long history, dating back to antiquity (Westermann, 1914). While traditional craft apprenticeships, with their emphasis on WIL, have faced perceptions of inferiority compared to academic routes (Cho & Apple, 1998; Fuller & Unwin, 1998), recent policy initiatives in Ireland, such as the Generation Apprenticeship programme, aim to enhance their status and broaden their scope (DFHERIS, 2021b).

This research builds upon existing scholarship on apprenticeship models. In the United Kingdom (UK), where apprenticeship traditions are well-established, studies have explored the influence of industry on apprenticeship development (Hayward, 2004; Hayward & James, 2004; Gleeson & Keep, 2004) and the potential for industry dominance to limit the breadth of skills development (Elbaum, 1989).

The Irish context presents unique challenges and opportunities. While influenced by the UK model, Irish apprenticeships have evolved through a series of reforms, including the introduction of a seven-tiered model in 1994 and the establishment of statutory apprenticeship frameworks (O'Hare, 2013). The move towards CLAs, while promising, requires careful consideration to ensure that industry influence does not unduly narrow the scope of skills development and maintain a focus on broader trade competencies (Engeström, 1991; Fuller & Unwin, 1998).

This research also draws upon theories of learning. Dewey's (1938) concept of continuity of experience emphasises the importance of meaningful and relevant learning experiences. Billett's (2016) characterisation of apprenticeship as a distinct mode of learning, with its emphasis on WIL and the development of personal epistemologies, provides a valuable framework for understanding the learning process within this context.

Furthermore, this research acknowledges the importance of community within apprenticeship learning. The concept of Communities of Practice (CoP) (Lave & Wenger, 1999), where learners engage in shared activities and develop shared understandings, is relevant to both craft apprenticeships and the emerging CLA models.

By drawing upon this body of literature, this research aims to contribute to a deeper understanding of the challenges and opportunities associated with the evolving apprenticeship landscape in Ireland.

3. Methodology.

This comparative case study (Yin, 2003; Flick, 2018) investigated two parallel electrical engineering programmes: traditional and apprenticeship. A mixed-methods approach (Creswell & Creswell, 2023) was used, combining qualitative and quantitative data for a comprehensive understanding. Qualitative data was collected through in-depth interviews with a purposefully selected sample of "*participants*" who had completed Level 7 of either pathway, exploring their experiences at the transition point and their subsequent career paths (Appendix D). Purposeful sampling was used to select participants who could provide rich and informative insights into the specific experiences of interest.

Quantitative data was gathered through a survey administered to "*respondents*" who had completed Level 7 of either pathway across both electrical engineering pathways at the University (Appendix E). Qualitative data was analysed thematically using open and axial coding (Edwards & Holland, 2013; Flick, 2018), aided by QualCoder, a Free and Open-Source Software (FOSS) used for qualitative data analysis (Curtin, n.d.).

Quantitative data was analysed statistically. This two-pronged approach, interviews for rich qualitative data and a broader survey for quantitative insights, aimed for data saturation, ensuring sufficient depth and breadth to address the research questions (Dibley, 2011; Fusch & Ness, 2015).

After analysing the data separately, the qualitative and quantitative findings are combined to develop a comprehensive understanding of the research. The quantitative data helped explore patterns and trends related to the themes that emerged from the interviews. This combination enriched the interpretation of the qualitative data by providing statistical support and broader context. For example, while interviews might highlight "*practical skills development*" as a theme, survey data could then show how graduates of each programme pathway perceive their practical skills. The results are presented using this integrated approach, weaving together qualitative narratives and quantitative data for a nuanced and complete picture.

4. Materials and methods.

Figure 1: Breakdown of participants.

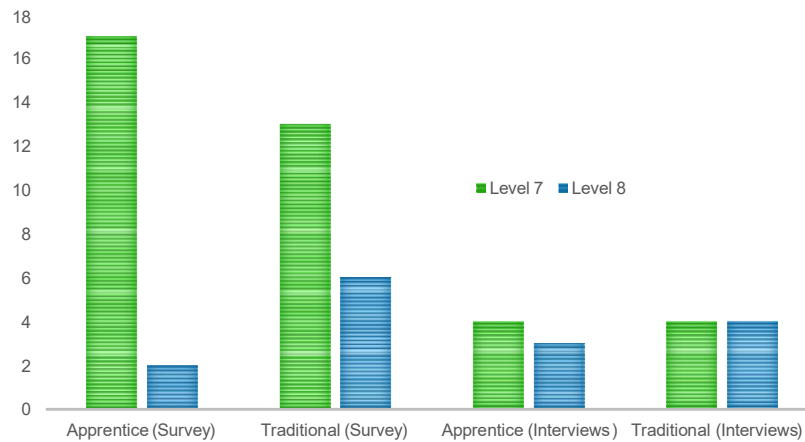


Figure 1 presents the distribution of respondents to the survey and interview participants across the apprentice and traditional electrical engineering student cohorts at the University. Interview participants were selected to ensure a balanced representation of both cohorts, with approximately half from each progressing to a Level 8 degree.

The survey data reveals that 56% of respondents pursued the Level 7 qualification through the apprenticeship pathway, while 43% followed the traditional pathway. Interestingly, a significantly higher percentage (46%) of the traditional pathway cohort have progressed to the Level 8 degree compared to apprentices (12%).

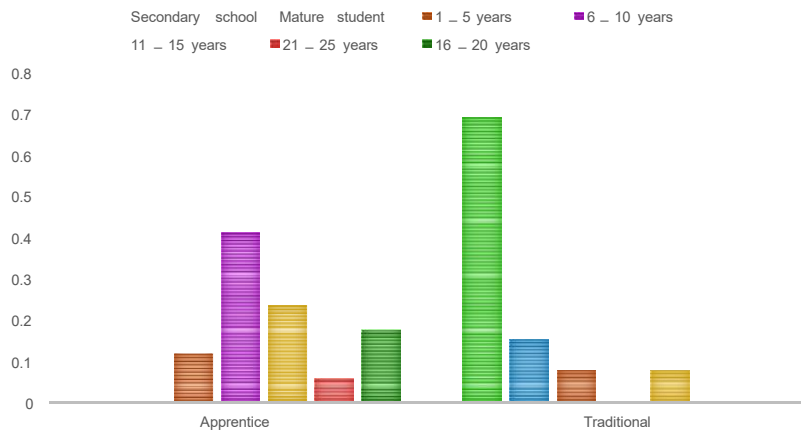
Several factors may contribute to this disparity. The apprenticeship pathway is relatively new, having been established in 2016. Additionally, the traditional Level 8 pathway is actively promoted as an ab-initio degree through the CAO, potentially influencing student choices.

5. Integrated analysis of interview and survey data.

This study investigated the experiences and outcomes of two distinct cohorts in electrical engineering programmes: qualified technicians entering a Level 7 programme directly from FE, the apprenticeship pathway, and students transitioning from the second to third year of traditional Level 7 electrical engineering degrees within HE, the traditional pathway. Both the interview and survey data were analysed to understand the preparedness of each group for the demands of modern engineering, their integration into the workforce, and their readiness for further HE study.

5.1 Pre-programme experience and pathway choices.

Figure 2: Pre-programme experience.



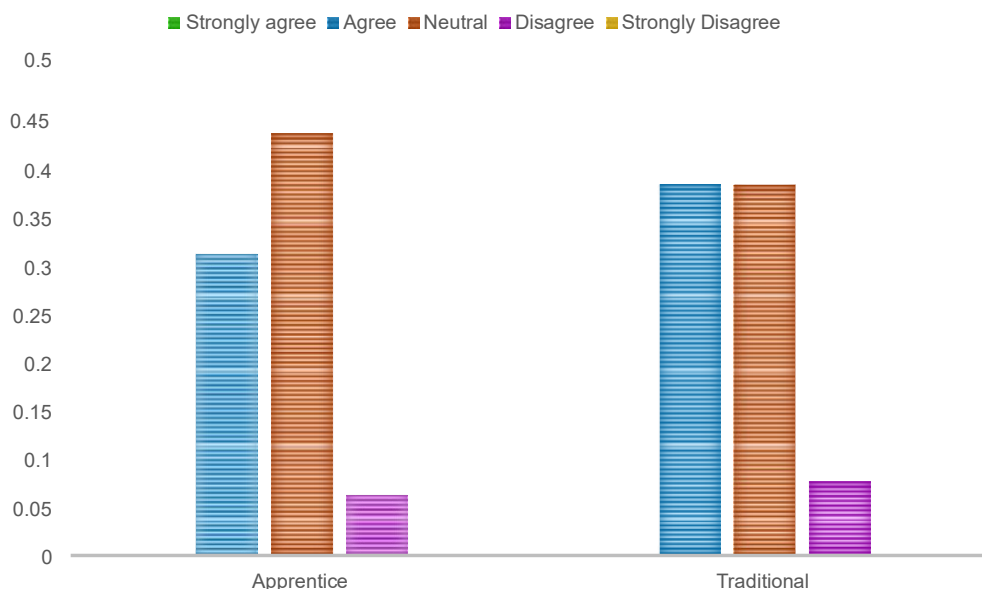
Survey data (Figure 2) confirmed that 70% of traditional pathway students entered directly from secondary school, aligning with typical HE progression. Conversely, apprenticeship pathway participants brought substantial practical experience, often accumulated over several years as craft technicians. Interviews revealed that family background significantly influenced pathway choices. Students from trade families often favoured apprenticeships, mirroring their family experiences, while others leaned towards traditional university routes. One interviewee explained,

"I wanted to be an electrician...like my father...but due to the fallout of the recession I defaulted, if I can't be an electrician I will be an electrical engineer" (Interviewee 1).

While university visits could play a role, they often reinforced existing preferences

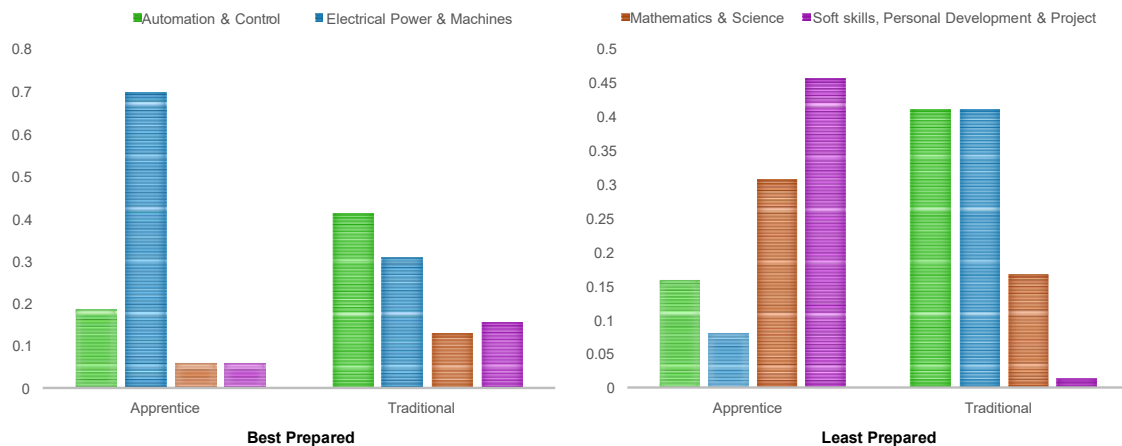
5.2 Preparedness for Level 7.

Figure 3: Level 6 as preparation for Level 7.



Survey results (Figure 3) indicated that both cohorts felt their respective Level 6 programmes adequately prepared them for Level 7. However, interviewees from the traditional pathway generally reported a smoother transition to Level 7 compared to apprentices returning to HE after a craft apprenticeship. This suggests potential challenges for apprentices readapting to the academic environment.

Figure 4: Preparedness for Level 7.



Survey data (Figure 4) revealed that apprentices perceived their strength in Electrical Power & Machines, likely due to their practical experience. Traditional pathway students, while also identifying strengths in Automation & Control, showed more varied preparedness, with a significant portion (41%) identifying it as a weakness. Apprentices, on the other hand, felt less prepared in Soft Skills & Personal Development and Mathematics & Science, areas less emphasised in craft apprenticeships. Interviews corroborated this, with apprentices noting the challenge of the accelerated learning pace and the need to develop skills in IT, project management, and presentation skills. They also highlighted the initial anxiety around mathematics, which was allayed by tailored support.

"The lecturer...for Maths, was excellent. He didn't just lecture Maths, he actually taught it...His attitude towards it, I'm going to try and make you understand..." (Interviewee 2).

5.3 Pedagogy and support.

Interviews highlighted the distinct pedagogical approaches of the two pathways. Apprenticeships emphasise practical skills and WIL, while traditional programmes focus on theoretical knowledge. While the Level 7 IEE CLA aimed for continuity from the Level 6 craft apprenticeship, the transition to the more traditional Level 8 programme posed a challenge. Both pathways recognised the importance of skills-based learning. Lecturers with industry experience were highly valued by both cohorts for their practical insights. Interviews revealed

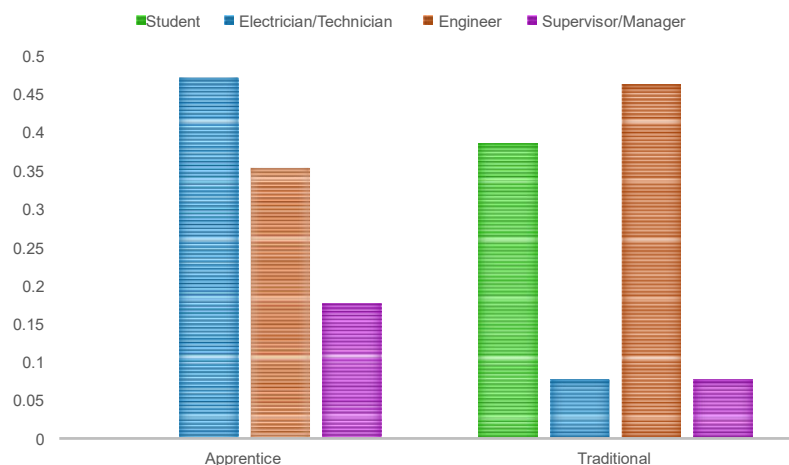
that lecturers often leveraged the diverse experiences within the classroom, fostering peer-to-peer learning.

"I would personally say that the CAO students benefited from this...They used people like me for information" (Interviewee 3)

The programme proactively addressed the needs of returning students, including apprentices, with additional tutorials, dedicated mathematics and communications skills support, thus reducing the need for formal support services.

5.4 Workforce transition and career outcomes.

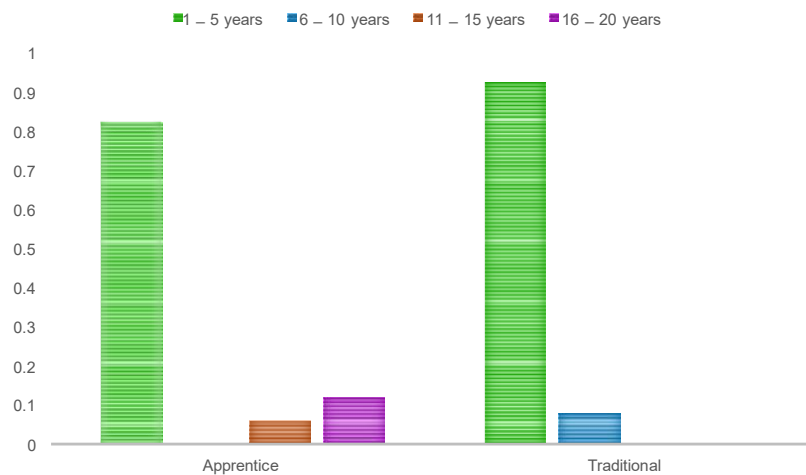
Figure 5: Current role.



Survey data (Figure 5) showed a higher percentage of traditional pathway graduates progressing to engineering and supervisory roles compared to apprenticeship pathway graduates. Interviews, however, revealed that while most apprentices returned to their previous employers, their responsibilities significantly increased, often including technical leadership or project management.

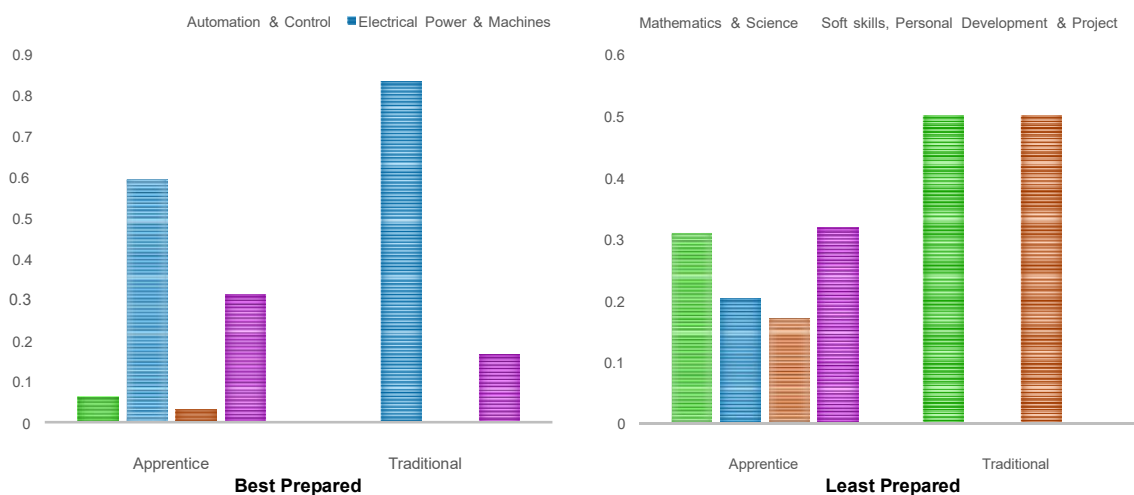
"After the Level 7, I went back into supervisory role, but with more responsibility"
(Interviewee 4)

Figure 6: Experience since qualification.

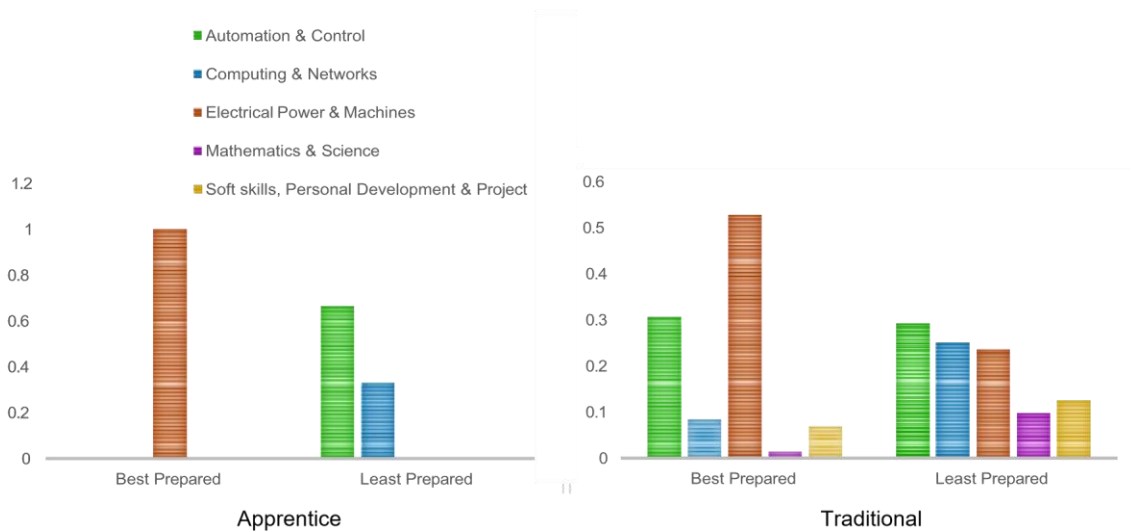


Survey data (Figure 6) indicated that some apprentices had more than five years of industry experience, likely reflecting their total experience as craft technicians. Interviews highlighted the importance of Communication & IT Skills for career success, skills often less emphasised in the Level 6 FE framework. Survey data (Figure 7) also showed both cohorts felt well-prepared for roles in Electrical Power & Machines. Interestingly, apprentices perceived Soft Skills, Personal Development & Project as a strength upon completion, despite initially identifying it as a weakness, suggesting the programme's effectiveness in this area.

Figure 7: Preparedness for starting in the workforce.



5.5 Progression to Level 8.

Figure 8: Preparedness for Level 8 electrical engineering programme.

Survey data (Figure 8) showed that a significantly higher proportion of traditional pathway students progressed to Level 8. These students generally expressed strong preparedness, particularly in Electrical Power & Machines. Apprentices who progressed to Level 8 also identified Electrical Power & Machines as a strong area but noted Automation & Control and Computing & Networks as areas needing further development. Interviews revealed that the transition to Level 8 was perceived differently. Traditional pathway students found the learning mode similar, while apprentices found it significantly different, although they adapted well.

However, it is important to note individual experiences that demonstrate the adaptability of apprenticeship graduates, and the vital role of employer support. For example, one apprenticeship graduate, who returned to the University to complete the Level 8 programme, received crucial support from their employer.

“Thankfully, [Employer] actually turned around, they said, we’ll let you off the year. They actually paid me a subsidy every week to keep me on the books...”
(Interviewee 5)

6. Discussion.

Using a mixed-methods approach, this study successfully achieved all four research objectives, demonstrating the effectiveness of the Level 7 IEE CLA and its alignment with blended learning theories, integrating academic learning with real-world experience. The programme provides a supportive learning environment and valuable industry connection. Both apprenticeship and traditional entry pathways effectively prepared graduates for successful careers, with both approaches borrowing effective pedagogical methods from each other.

6.1 Transition to Level 7 from Level 6.

The study examined two distinct Level 7 electrical engineering programmes with unique pedagogical approaches. For the traditional pathway, with integrated Levels 6 and 7, assessing preparedness was straightforward, as the Level 6 curriculum prepares students for the advanced Level 7 studies. The apprenticeship pathway presents different challenges, as the Level 6 FE craft apprenticeship, which focuses on developing skilled craft technicians, may not fully prepare apprentices for university-level engineering.

- Apprenticeship Strengths: Significant practical experience in Electrical Power & Machines, and Automation & Control (particularly for those with instrumentation backgrounds).
- Apprenticeship Challenges: Time away from academic study, particularly in Mathematics, Science, and Soft-skills, Personal Development & Project.

Dedicated support mechanisms, such as specialised Mathematics and IT Skills classes, effectively addressed these challenges. Apprenticeship graduates who progressed to Level 8 demonstrated a strong ability to adapt to a traditional academic environment, indicating the Level 7 apprenticeship programme's effectiveness.

6.2 Level 7 graduate experience.

As would be expected, the transition to Level 7 was seamless for traditional pathway students. The apprenticeship pathway programme was designed to build upon craft technicians' existing knowledge and skills. Dedicated support in Soft-skills, Personal Development & Project as well as Mathematics & Science was provided, while leveraging their technical and practical strengths. Apprenticeship graduates, who initially identified these areas as potential weaknesses, ultimately perceived Soft-skills, Personal Development & Project as a significant strength. Minimal additional academic support was in-fact needed beyond that delivered as part of the Level 7 IEE CLA.

A point potentially overlooked by apprentices is the impact of the apprenticeship pathway's structure on Grade Point Average (GPA) calculation. The apprenticeship's two 15-week university blocks (Stages 2 and 4) roughly correspond to a traditional programme's pair of third-year semesters. However, the apprenticeship GPA excludes Stage 2 grades, unlike on traditional programmes.

6.3 Workforce readiness.

Apprenticeships inherently ensure continuous workforce engagement. Graduates are already employed; the focus is on career advancement, for example to electrical engineer or supervisor

roles. Interview data revealed rapid promotions for many apprenticeship graduates, highlighting the value of their enhanced skills, especially in Soft-skills, Personal Development & Project.

Traditional pathway graduates often pursue further academic studies (Level 8), limiting immediate workforce experience. While academically strong, some desired more practical experience, suggesting that internships or co-op placements would enhance job readiness.

6.4 Progression to Level 8

Due to programme design, traditional pathway students experienced a seamless progression to the BEng (Hons) in Electrical Engineering. Apprenticeship graduates transitioning to Level 8 faced a shift from a WIL model to a traditional academic setting. However, evidence shows that their strong work ethic and social skills, gained while on the job over many years, enabled them to excel and integrate with traditional pathway peers. Innovative pedagogical approaches at Level 8 leveraged the diverse experiences of both cohorts, fostering a collaborative learning environment. Lecturers with industry connections facilitated this integration.

7. Conclusions.

The study successfully demonstrated the value of providing flexible and inclusive pathways for individuals with diverse educational and professional backgrounds to access HE opportunities within the engineering field.

The traditional pathway, characterised by a seamless progression through the curriculum, provided a strong foundation for academic success. However, the apprenticeship pathway, despite the initial challenges associated with re-entering an academic environment, demonstrated a remarkable capacity for student success. Each of the four objectives of the study were achieved.

7.1 Transition to Level 7 from Level 6.

While traditional pathway students transitioned smoothly, Level 6 FE craft graduates faced challenges due to the time gap since their apprenticeship and differing FE/HE pedagogical approaches. However, their work experience and practical skills, along with support in Soft-skills, Personal Development & Project as well as Mathematics & Science, facilitated successful transitions. Their hands-on experience provided them with a unique perspective and a deeper understanding of real-world applications, enabling them to excel and contribute meaningfully to class discussions.

7.2 Level 7 graduate experience.

Both pathways developed strong critical thinking and problem-solving skills. Traditional pathway graduates had a stronger theoretical foundation, while apprenticeship graduates demonstrated enhanced practical skills and real-world understanding. This suggests that the Level 7 IEE CLA, building upon the practical foundation of the Level 6 FE craft apprenticeship, effectively equips graduates with a unique blend of theoretical and practical expertise, preparing them for successful careers in the industry.

7.3 Workforce readiness.

Graduates of the Level 7 IEE CLA, through their continuous engagement with the workforce throughout their studies, were highly prepared for continued employment and demonstrated rapid career progression within their respective technical roles.

Traditional pathway graduates, while potentially requiring an acclimatisation period to fully integrate into workplace settings, demonstrated strong academic foundations and were more likely to progress to supervisory and senior engineering roles, leveraging their strong theoretical knowledge and analytical skills.

7.4 Level 8 progression.

A significant proportion of traditional pathway students pursued further academic studies at the Level 8 honours degree level, reflecting a strong academic foundation. While a smaller number of graduates from the Level 7 IEE CLA pathway continued to the Level 8 programme, several factors may contribute to this lower progression rate, including:

- The Level 7 IEE CLA is designed to equip graduates with industry-ready skills, preparing them for immediate career opportunities within their sponsoring organisation.
- Graduates from the Level 7 IEE CLA may pursue alternative pathways for professional development based on their role within their sponsoring company. Many of these companies have large operations both in Ireland and abroad and have their own specialist schools that deliver professional industry-recognised training such as High Voltage, Station Commissioning, and Project Management certifications.
- Many Level 7 IEE CLA graduates are sponsored by their employers, who prioritise their immediate contributions to the workplace upon programme completion.

Despite the lower progression rate, those who did transition from the Level 7 IEE CLA to Level 8 programmes demonstrated strong academic performance, highlighting their potential for success at higher levels of study.

7.5 Additional conclusions.

7.5.1 Cross-pollination.

The research observed a valuable exchange of pedagogical approaches between both pathways. The traditional programme benefited from incorporating elements of apprentice style WIL, internships and industry projects, enhancing student engagement and practical application of theoretical knowledge.

Concurrently, the apprenticeship programme effectively integrates academic rigour into its curriculum by ensuring a strong foundation in theoretical concepts alongside practical skills development.

7.5.2 Industry collaboration.

Strong industry collaborative participation in the apprenticeship consortium is key to the programme's success. This collaboration facilitates a seamless transition for apprentices between the academic and work environment. Industry mentors provided invaluable guidance by supporting apprentices to applying their theoretical knowledge to practical challenges.

Additionally, the industry-led nature of CLAs ensure that the curriculum remains relevant and aligned with the evolving needs. This underscores the critical importance of fostering strong industry collaborations and the lesson is just as relevant for traditional pathways where the industry link is not so direct.

8. Recommendations.

To build on this research's positive conclusions and to strengthen the Universities electrical programmes, the following recommendations are proposed to enhance graduate outcomes across both traditional and apprenticeship pathways.

8.1 Enhancing transition and foundational support.

8.1.1 Targeted bridging programme.

While the evidence shows the apprenticeship pathway students are given tailored supports in Soft-skills, Personal Development, Mathematics and Science that work effectively, it would be a good idea to pre-emptively address potential academic gaps and ease the transition to HE via a pre-Level 7 bridging programme that would supplement existing Level 7 IEE CLA supports by reinforcing foundational skills and introducing some HE pedagogical approaches they will encounter during the programme.

8.1.2 Curriculum alignment.

Conduct a thorough review of the FE Level 6 craft apprenticeship and the HE Level 7 IEE CLA curricula to ensure seamless alignment and minimise pedagogical discrepancies. This could be executed in parallel to a review of the Electrical and Electrical Instrumentation craft apprenticeships, which will most likely take place prior to migration to the single model apprenticeship model.

8.2 Optimising the Level 7 graduate experience.

8.2.1 Standardised GPA Calculation.

Implement a standardised GPA calculation across both pathways, incorporating results from both stages 2 and 4 of the Level 7 IEE CLA to ensure equitable assessment.

8.3 Strengthening workforce readiness.

8.3.1 Mandatory industry placements.

Integrate mandatory, structured internships or co-op placements into the traditional pathway curriculum, preferably during the summer semesters of second and third year.

8.3.2 Industry partnership expansion.

Expand on the industry partnerships that are an integral part of the CLA model to provide increased opportunities for internships, and graduate placements of students on the traditional pathways.

8.4 Fostering Level 8 progression and advanced skill development.

8.4.1 Flexible Level 8 pathways.

Develop flexible Level 8 pathways, based on part-time ACCS and blended learning options, to accommodate the needs of apprenticeship graduates and working professionals.

8.4.2 Employer incentive programme.

Implement programmes to incentivise employers to support employee progression to Level 8, potentially through financial assistance or flexible work arrangements.

8.4.3 Tertiary certificate integration.

As the FE Advanced and HE Higher Certificates are replaced via a transition to a new common Tertiary Certificate at Level 6 and as the craft apprenticeship model transitions to the single model apprenticeship, ensure a seamless progression at Level 6, to the Level 7 and Level 8 degree programmes (QQI, 2025).

8.4.4 Advanced technical certifications.

Facilitate access to industry-recognised advanced technical certifications such as High Voltage, Station Commissioning, and Project Management certifications, for both traditional and apprenticeship pathway graduates.

8.5 Enhancing programme evaluation and continuous improvement.

8.5.1 Longitudinal graduate tracking.

Implement a robust system for tracking graduate career progression and gathering feedback on programme effectiveness.

8.5.2 Cross-pathway knowledge sharing.

Facilitate cross-pathway knowledge sharing through workshops, seminars, and collaborative projects to promote best practices and innovation.

These recommendations will further underpin the University as a leader in Electrical Engineering education, delivering industry-ready graduates at Level 7 and Level 8, regardless of their educational background or pathway.

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Appendix –**A Level 6 Craft Electrical Apprenticeship**

The overall duration of this apprenticeship is a minimum of 4 years provided all phases are successfully completed. Graduates are awarded a FE Level 6 AC Electrical.

Phase 1: With Employer

- Induction Training
- Introduction to Health & Safety
- Introduction to Tools & Equipment
- Introduction to Basic Skills

Phase 2: Delivered in ETB Training Centre (22 weeks)

- Electrical Science
- Installation Techniques 1
- Installation Techniques 2
- Panel Wiring and Motor Control
- Fundamentals of Alternative Electrical Energy Sources
- Communications & Team Leadership

Phase 7: With Employer

Appendix –

▪ Work Based Training and Assessments
Phase 3: With Employer
▪ Work Based Training and Assessments

Phase 4: Delivered in University (11 weeks)
<ul style="list-style-type: none"> ▪ Electricity 2 ▪ Power Distribution 1 ▪ Electronics 1 ▪ Alternative Electrical Energy Sources ▪ Communications & Team Leadership

Phase 5: With Employer
▪ Work Based Training and Assessments

Phase 6: Delivered in University (11 weeks)
<ul style="list-style-type: none"> ▪ Automation and Control ▪ Intruder and Fire Alarm Systems ▪ Electricity 3 ▪ Power Distribution 2 ▪ Electronics 2 ▪ Alternative Electrical Energy Sources ▪ Communications & Team Leadership

B Electrical Engineering Modules

This table lists the modules in the BEng in Electrical Engineering programme by year and NFQ Level. The transition point between year 2 and year 3 is considered the transition from Level 6 to Level 7 and is considered the equivalent to the starting point for the Level 7 IEE CLA. Year 3 on this degree can be compared to the Level 7 IEE CLA in Appendix C.

NFQ Level	Modules
Year 1	

Appendix –

6	<ul style="list-style-type: none"> ▪ Electrical Installation 1 ▪ Electrical Technology 1 ▪ Electrical Theory for Installation ▪ Engineering Science ▪ Engineering Mathematics 1 ▪ Introduction to Electronics 1 ▪ Introduction to Energy Systems ▪ Project 1
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Year 2	
6	<ul style="list-style-type: none"> ▪ Cisco IP Networking and Scripting ▪ Electrical & Instrumentation Drawing ▪ Electrical Installation 2 ▪ Electrical Principles 2 ▪ Engineering Mathematics 2 ▪ Equipment Control Systems ▪ Project 2

Year 3	
7	<ul style="list-style-type: none"> ▪ Advanced PLCs, HMI & SCADA ▪ Electrical Machines & Power Distribution ▪ Electrical Planning, Layout & Testing ▪ Industrial Maintenance and Energy Efficiency ▪ Mathematics for Electrical Engineers ▪ Process Instrumentation & Calibration ▪ Work Placement

C Industrial Electrical Engineer Apprenticeship Stages

Stage 5 of the Level 7 IEE CLA involves a significant time on-the-job (35 weeks) implementing the knowledge and skills gained. This stage includes a substantial work-based project, supported by a module in project management along with both academic and industrial mentoring.

<p>Stage 1 – On the Job, September (21 Weeks)</p> <ul style="list-style-type: none"> ▪ Work Based Learning Portfolio ▪ Industrial Communication & Personal Development

Appendix –

Stage 2 – University Block, January (15 Weeks) ▪
 Engineering Mathematics
 ▪ Advanced Electrical Control Systems Workshop
 ▪ Electrical Drawing & BIM
 ▪ Engineering Communications & Collaborative Working
 ▪ Electrical Planning & Layout
 ▪ Electrical Machines

Stage 3 – On the Job, May (18 Weeks)
 ▪ Work Based Learning Project

Stage 4 – University Block, September (15 Weeks)
 ▪ Engineering Maths 2
 ▪ Automation System Design
 ▪ Electrical Testing & Fault finding
 ▪ Distributed Electrical Systems
 ▪ HMI & SCADA

Electives (Select 2):
 ▪ Process Instrumentation & Calibration
 ▪ HV/MV Network Operations
 ▪ Industrial Electrical Maintenance Systems

Stage 5 – On the Job, January (35 Weeks)
 ▪ Industrial Project
 ▪ Project Management & Industrial Work Based Learning

D Interview Questions

#	Time	Objective	Question
	1 – 2	Introduction	
1	3	Ease in, Personal question	What sparked your interest in pursuing a career in Electrical Engineering?
2	2	Third level education to date	Please outline your academic achievements to date?
3	3	Work experience	Please tell me about your work experience whether it be in the electrical field or not?
4	2	Pre-entry	Having completed [the first 2 years of the EE programme IEE], I would be interested in your thoughts as to how prepared you felt you were to undertake [Level 7 of the EE programme IEE]?

Appendix –

5	5	Level 6 subjects	What subjects from the [Level 7 of the EE programme IEE] were you best prepared for by the Level 6 programme? What subjects from the [Level 7 of the EE programme IEE] were you least prepared for by the Level 6 programme?
6	2	Additional Supports	Were you aware of, and if so, did you avail of any additional academic supports while you studied at TUS Moylish campus?
7	1 – 2	Workforce / Level 8 Decide on Option A or B	On completion of your Level 7 programme did you [join return] to the workforce or continue to a Level 8 academic programme?

Option A

11	8	Day one	On your first day [back] on the job where you ready for work as an Electrical Engineer or did you require mentoring? Who long was the period of mentoring? What role were you assigned?
12	5	Level 7 subjects	What Level 7 subjects best prepared you for the workforce? What Level 7 subjects least prepared you for the workforce?
	1 – 2	Conclude interview	Thanks, and summarise the interview for and ask if the interviewee has any questions.

Option B

21	3	Academic Progression	So, you continued to a Level 8 programme, please tell me about that?
22	1	Preparation	Did you feel that your experience from the [Level 7 of the EE programme IEE] prepared you well for Level 8 of the EE programme?
23	2	Mode of Learning	Did you notice much difference in the mode of learning you encountered at Level 7 and that you encountered at Level 8? What specific issues did you encounter
24	5	Level 7 subjects	What Level 7 subjects best prepared you for the Level 8 EE programme? What Level 7 subjects least prepared you for the Level 8 EE programme?
	1 – 2	Conclude interview	Thanks, and summarise the interview for and ask if the interviewee has any questions.

E Survey Questions

Appendix –

Instructions

There are 4 sections to the survey and in each a number of options are presented. Questions are either type:

(1) Multiple choice, pick **only one answer** from a range of options by placing a mark on the preferred option

(2) Multiple select, pick **all that apply** from a range of options by placing a mark on the preferred option(s)

(3) Yes | No questions select **one preferred option** and if it is either **Yes** then feel free to Give more detail on why you made that choice in the box provided.

(4) Vote for **three** of the given options **in order of priority**, 1, 2 and 3. 3 1 2

Section 1: Education and Job function

The purpose of this section is to discover the education level attained by you to date and if you completed either of the two level 7 Electrical Engineering programmes at TUS, Moylish Campus.

Education Level - Select the education level that most appropriately matches your tertiary education **completed** to date.

Doctorate (Level 10) Masters (Level 9) Honours Degree (Level 8) Degree (Level 7) Certificate (Level 6) Apprenticeship (Level 6) Other

Current job role - Select the job role that most appropriately matches your current employment.

Electrician Technician Engineer Lecturer Engineering Manager Other

TUS Programme - Select the Electrical programme (level 7) that you are on now or have completed.

BEng in Electrical Engineering (LC271) BEng in Industrial Electrical Engineering (Apprenticeship) Neither

Pre-programme experience - How many years **work experience in the Electrical field**, in industry, had you before attempting the TUS programme identified in the previous question?

Nil, I joined programme from secondary school Nil, I joined programme as a mature student

1 – 5 years 6 – 10 years 11 – 15 years 16 – 20 years 21 – 25 years Greater than 25

Experience - How many years have you worked, in the Electrical industry, since completing the TUS programme?

Student level 7 Student level 8 Student level 9

1 – 5 years 6 – 10 years 11 – 15 years 16 – 20 years 21 – 25 years Greater than 25

<p>Section 2: Preparation for level 7</p> <p>What are your thoughts on how prepared you were to attempt the programme at level 7?</p>
<p>Pre-entry - Select the qualifying, level 6, pre-entry qualifications you had prior to starting your TUS programme.</p> <p><input type="checkbox"/> Higher Certificate in Electrical Engineering <input type="checkbox"/> Advanced Craft Certificate - Electrical (SOLAS)</p> <p><input type="checkbox"/> Other qualifying programme <input type="checkbox"/> Recognition of Prior Learning</p>
<p>Pre-entry - If you selected an option from the bottom row of the previous question please elaborate further.</p> <p>_____</p>
<p>My pre-programme qualifications for level 7 had me well prepared for the level 7 experience - Select one</p> <p><input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree</p>

Section 2: Preparation for level 7 - continued

What are your thoughts on how prepared you were to attempt the programme at level 7?

I felt best prepared for the following three subjects when I undertook the level 7 programme

Vote in order **1** **2** **3**

- | | |
|---|--|
| <input type="checkbox"/> Work Based Learning Portfolio | <input type="checkbox"/> Process Instrumentation & Calibration |
| <input type="checkbox"/> Industrial Comms & Personal Development | <input type="checkbox"/> HV/MV Network Operations |
| <input type="checkbox"/> Engineering Mathematics | <input type="checkbox"/> HMI & SCADA |
| <input type="checkbox"/> Advanced Electrical Control Systems Workshop | <input type="checkbox"/> Project Management & WBL Portfolio Industrial Project |
| <input type="checkbox"/> Electrical Drawing & BIM | <input type="checkbox"/> Project |
| <input type="checkbox"/> Engineering Comms & Collaborative Working | <input type="checkbox"/> Advanced PLCs, HMI & SCADA (LC271) |
| <input type="checkbox"/> Electrical Planning and Layout | <input type="checkbox"/> Electrical Planning, Layout & Testing (LC271) |
| <input type="checkbox"/> Electrical Machines | <input type="checkbox"/> Electrical Machines & Power Distribution (LC271) |
| <input type="checkbox"/> Work Based Learning Project | <input type="checkbox"/> Mathematics for Electrical Engineers (LC271) |
| <input type="checkbox"/> Automation System Design | <input type="checkbox"/> Industrial Maintenance & Energy Efficiency (LC271) |
| <input type="checkbox"/> Electrical Testing and Fault finding | <input type="checkbox"/> Process Instrumentation & Calibration (LC271) |
| | <input type="checkbox"/> Work Placement (LC271) |

HV / MV Electrical Systems

I felt the least prepared for the following three subjects when I undertook

Vote in order **1** **2** **3**

- | | |
|---|--|
| <input type="checkbox"/> Plant Maintenance Systems (only 1 of each) | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| the level 7 programme | <input type="checkbox"/> Process Instrumentation & Calibration |
| <input type="checkbox"/> Work Based Learning Portfolio | <input type="checkbox"/> HV/MV Network Operations |
| <input type="checkbox"/> Industrial Comms & Personal Development | <input type="checkbox"/> HMI & SCADA |
| <input type="checkbox"/> Engineering Mathematics | <input type="checkbox"/> Project Management & WBL Portfolio Industrial Project |
| <input type="checkbox"/> Advanced Electrical Control Systems Workshop | <input type="checkbox"/> Project |
| <input type="checkbox"/> Electrical Drawing & BIM | <input type="checkbox"/> |
| <input type="checkbox"/> Engineering Comms & Collaborative Working | <input type="checkbox"/> Advanced PLCs, HMI & SCADA (LC271) |
| <input type="checkbox"/> Electrical Planning and Layout | <input type="checkbox"/> Electrical Planning, Layout & Testing (LC271) |
| <input type="checkbox"/> Electrical Machines | <input type="checkbox"/> Electrical Machines & Power Distribution (LC271) |
| <input type="checkbox"/> Work Based Learning Project | <input type="checkbox"/> Mathematics for Electrical Engineers (LC271) |
| | <input type="checkbox"/> Industrial Maintenance & Energy Efficiency (LC271) |
| | <input type="checkbox"/> Process Instrumentation & Calibration (LC271) |

Automation System Design

Electrical Testing and Fault finding

Work Placement (LC271)

HV / MV Electrical Systems

Plant Maintenance Systems

(only 1 of each)

I availed of the following additional academic supports at TUS Moylish campus - Select all that apply

- Mathematics Academic writing Other _____

I successfully/ unsuccessfully completed the programme at level 7 and - Select one option

Joined the workforce for the first time Rejoined the workforce

Continued my academic journey to the BEng (hons) in Electrical Engineering (level 8)

Transferred to a different level 8 programme, please specify

Other, please specify _____

This section is only filled if **Joined the workforce for the first time** or **Rejoined the workforce** options were selected for the final question in the **Section 2: Preparation for level 7** section.

Section 3: The Workforce

What are your thoughts on how prepared you were to enter or re-enter the workforce after completing the BEng level 7 programme?

On day one back in the workforce, I was - Select one option

Ready to be assigned work as an Electrical Engineer

I returned to work as an Electrician or Network Technician (ESB) but was given more responsibilities I required a period of mentoring before taking up an Electrical Engineering role:

Short (1-5 days) Medium (6-30 days) Long (> 1 month), please specify _____ days

Took up a non Electrical Engineering role, please specify _____

The following three subjects best served me when I took up my new role in the workforce Vote in order 1 2 3

(only 1 of each)

<input type="checkbox"/> Work Based Learning Portfolio <input type="checkbox"/> Industrial Comms & Personal Development <input type="checkbox"/> Engineering Mathematics <input type="checkbox"/> Advanced Electrical Control Systems Workshop <input type="checkbox"/> Electrical Drawing & BIM <input type="checkbox"/> Engineering Comms & Collaborative Working <input type="checkbox"/> Electrical Planning and Layout <input type="checkbox"/> Electrical Machines <input type="checkbox"/> Work Based Learning Project <input type="checkbox"/> Automation System Design <input type="checkbox"/> Electrical Testing and Fault finding <input type="checkbox"/> HV / MV Electrical Systems <input type="checkbox"/> Plant Maintenance Systems	<input type="checkbox"/> Process Instrumentation & Calibration <input type="checkbox"/> HV/MV Network Operations <input type="checkbox"/> HMI & SCADA <input type="checkbox"/> Project Management & WBL Portfolio <input type="checkbox"/> Industrial Project <input type="checkbox"/> Advanced PLCs, HMI & SCADA (LC271) <input type="checkbox"/> Electrical Planning, Layout & Testing (LC271) <input type="checkbox"/> Electrical Machines & Power Distribution (LC271) <input type="checkbox"/> Mathematics for Electrical Engineers (LC271) <input type="checkbox"/> Industrial Maintenance & Energy Efficiency (LC271) <input type="checkbox"/> Process Instrumentation & Calibration (LC271) <input type="checkbox"/> Work Placement (LC271)
--	--

The following three subjects served me the least when I took up my new role in the workforce Vote in order 1 2 3

(only 1 of each)

<input type="checkbox"/> Work Based Learning Portfolio <input type="checkbox"/> Industrial Comms & Personal Development <input type="checkbox"/> Engineering Mathematics <input type="checkbox"/> Advanced Electrical Control Systems Workshop <input type="checkbox"/> Electrical Drawing & BIM <input type="checkbox"/> Engineering Comms & Collaborative Working <input type="checkbox"/> Electrical Planning and Layout <input type="checkbox"/> Electrical Machines <input type="checkbox"/> Work Based Learning Project <input type="checkbox"/> Automation System Design	<input type="checkbox"/> Electrical Testing and Fault finding <input type="checkbox"/> HV / MV Electrical Systems Plant <input type="checkbox"/> Maintenance Systems Process <input type="checkbox"/> Instrumentation & Calibration <input type="checkbox"/> HV/MV Network Operations <input type="checkbox"/> HMI & SCADA <input type="checkbox"/> Project Management & WBL Portfolio <input type="checkbox"/> Industrial Project <input type="checkbox"/> Advanced PLCs, HMI & SCADA (LC271) <input type="checkbox"/> Electrical Planning, Layout & Testing (LC271)
--	--

Electrical Machines & Power Distribution (LC271)

Industrial Maintenance & Energy Efficiency (LC271)

Mathematics for Electrical Engineers (LC271)

Process Instrumentation & Calibration (LC271)

Work Placement (LC271)

This section is only filled if the **Continued to BEng (hons) in Electrical Engineering (level 8)** option was selected for the final question in the **Section 3: Preparation for level 7** section.

Section 4: Further academic progression

What are your thoughts on how prepared you were to progress to the BEng level 8 programme?

I continued to the BEng (hons) in Electrical Engineering (level 8) at - Select one option

- Directly after completing the BEng at level 7
- I returned to workforce for a period, (____years) and then continued to the BEng (hons) programme

I undertook the BEng (hons) in Electrical Engineering (level 8) in:

- TUS Moylish Campus TUS Athlone Campus University of Limerick
- Other Higher Education Institution, please specify _____

My previous level 7 experience had me very prepared for the level 8 programme - Select your opinion.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The mode of learning (schedule and way subjects were taught) was very different on the level 8 programme from the level 7 and previous 3rd level academic experiences I had to that point – Select one

- True
- False

If you selected True to the last question, did the new mode of learning present any particular issues to your learning experience at level 8 – Select one

- No it didn't
- Yes it did, please specify _____

I felt best prepared for the following three subjects when I undertook the level 8 programme

Vote in order (only 1 of each)

- | | |
|---|---|
| <input type="checkbox"/> Advanced Automation Design | <input type="checkbox"/> Electrical Power Quality & Storage |
| <input type="checkbox"/> Advanced SCADA and Industrial Networks | <input type="checkbox"/> Electrical Power Systems |
| <input type="checkbox"/> Applied Statistical Analysis | <input type="checkbox"/> Electrical Protection Systems |
| <input type="checkbox"/> Batch, Historian & SQL | <input type="checkbox"/> Energy Management Systems & Efficiency |
| <input type="checkbox"/> Building Information Modelling | <input type="checkbox"/> Final Year Project |
| <input type="checkbox"/> Cisco Networking | <input type="checkbox"/> Power Conversion Systems Modelling |
| | <input type="checkbox"/> Statistical Process Control |

Computer System Validation

I felt the least prepared for the following three subjects when I undertook the level 8 programme

Vote in order (only 1 of each)

- | | |
|---|---|
| <input type="checkbox"/> Advanced Automation Design | <input type="checkbox"/> Electrical Power Quality & Storage |
| <input type="checkbox"/> Advanced SCADA and Industrial Networks | <input type="checkbox"/> Electrical Power Systems |
| <input type="checkbox"/> Applied Statistical Analysis | <input type="checkbox"/> Electrical Protection Systems |
| <input type="checkbox"/> Batch, Historian & SQL | <input type="checkbox"/> Energy Management Systems & Efficiency |
| <input type="checkbox"/> Building Information Modelling | <input type="checkbox"/> Final Year Project |
| <input type="checkbox"/> Cisco Networking | <input type="checkbox"/> Power Conversion Systems Modelling |
| <input type="checkbox"/> Computer System Validation | <input type="checkbox"/> Statistical Process Control |