

Interactive Map for Visualising Electronic Engineering Curricula

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Motivation & Introduction

- Current curriculum maps in engineering degrees are static. They usually list courses in tabular form and do not explicitly show the coherence or alignment of courses in a degree program.
- An online interactive curriculum map enables staff, students and accreditors to effectively visualize the overall organisation and mapping of a degree program [1, 2].
- The developed interactive tree map shows the interconnection between courses and can support staff and accreditors by identifying academic gaps, overlapping courses or redundancies [3, 4].

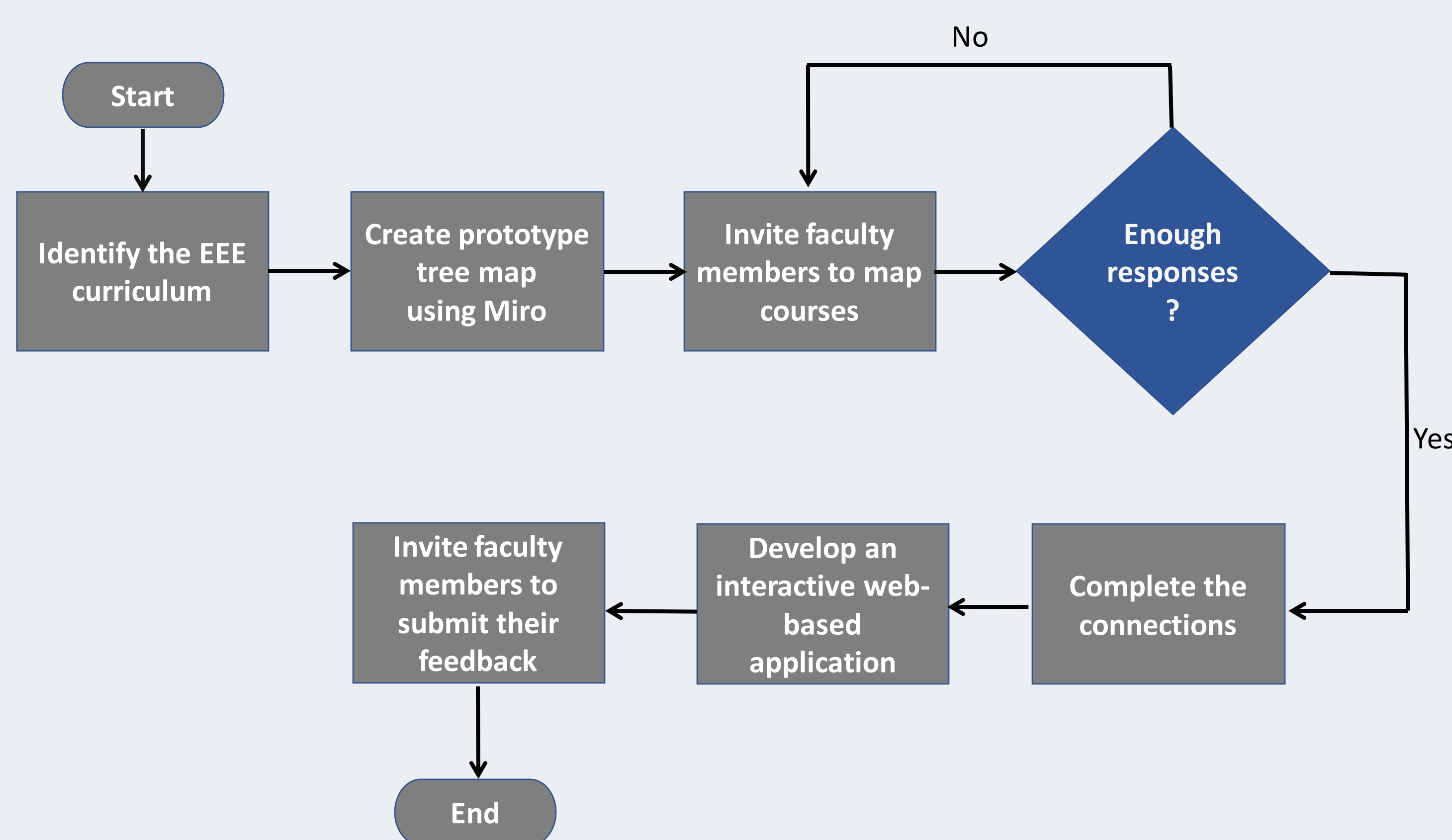
Static Thematic Structuring

Current curriculum maps in Glasgow University's School of Engineering are static and are presented in tabular form.

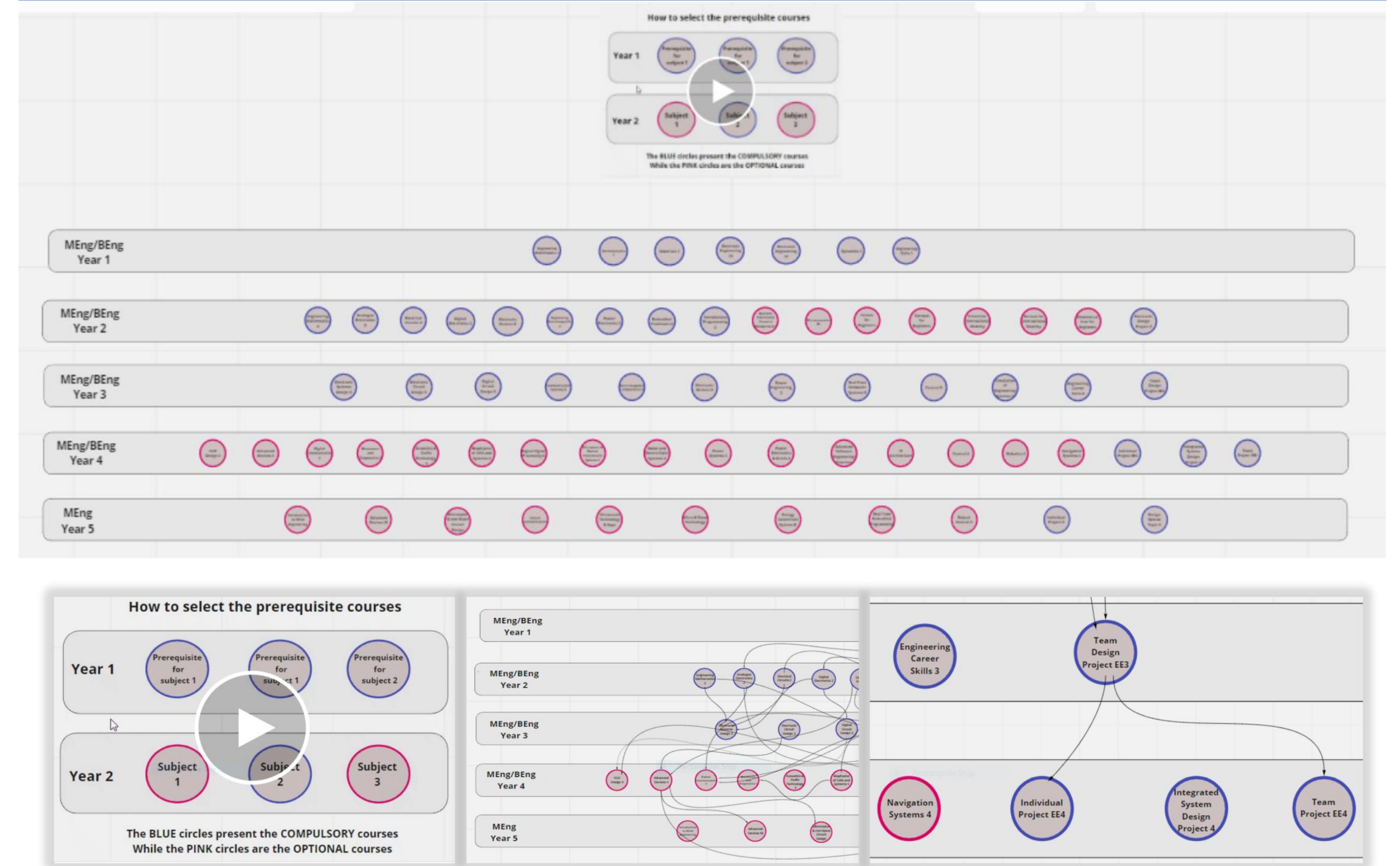
Year	Mathematics & Engineering Science	Dynamics, Control & Systems	Analogue Electronics	Digital Electronics	Electromagnetics, Communications & Optoelectronics	Nanoelectronics & Bioelectronics	Power Systems & Devices	Embedded & Computer Systems	Engineering Skills	Design	Credits
MEng/BEng Year 1	Engineering Mathematics 1 (40) Thermodynamics 1 (10)	Dynamics 1 (10)	Electronic Engineering 1X (20) Electronic Engineering 1Y (20)		Materials 1 (10)				Engineering Skills 1 (10)		Compulsory: 120
MEng/BEng Year 2	Engineering Mathematics 2 (20)		Electrical Circuits 2 (10) Analogue Electronics 2 (10)	Digital Electronics 2 (10)	Electronic Devices 2 (10) Engineering Electromagnetics 2 (10) Optical Engineering 2 (10)		Power Electronics 2 (10)	Introductory Programming 2 (10) Embedded Processors 2 (10)		Electronic Design Project 2 (10)	Compulsory: 120
MEng/BEng Year 3		Simulation of Eng Systems 3 (10) Control 3 (10)	Electronic Systems Design 3 (10) Electronic Circuit Design 3 (10)	Digital Circuit Design 3 (10)	Communication Systems 3 (10) Electromagnetic Compatibility 3 (10)	Electronic Devices 3 (10)	Power Electronics 3 (10)	Real Time Computer Systems 3 (10)	Engineering Career Skills 3 (10)	Team Design Project EES (10)	Compulsory: 120
BEng Year 4		Control 4 (20) Robotics 4 (20) Navigation Systems 4 (10)	VLSI Design 4 (20)	Advanced Devices 4 (20)	Digital Communication 4 (20) Acoustics & Audio Technology 4 (20) Digital Signal Processing 4 (20) Microwaves & Optical Trans. Systems 4 (20) Radar and Electro-Optic Systems 4 (10)	Biocensors and Diagnostics 4 (10) Biophysics of Cells and Systems 4 (10)	Power Electronics & Drives 4 (20)	Advanced Software Eng Practices (10) IT Architecture (10)	Individual Project EE4 (40)		Compulsory: 60 Optional: 60/260
MEng Year 4		Control 4 (20) Robotics 4 (20) Navigation Systems 4 (10)	VLSI Design 4 (20)	Advanced Devices 4 (20)	Digital Communication 4 (20) Acoustics & Audio Technology 4 (20) Digital Signal Processing 4 (20) Microwaves & Optical Trans. Sys 4 (20) Radar and Electro-Optic Systems 4 (10)	Biocensors and Diagnostics 4 (10) Biophysics of Cells and Systems 4 (10)	Power Electronics & Drives 4 (20)	Advanced Software Eng Practices (10) IT Architecture (10)	Integrated System Design Project 4 (20)	Team Project EE4 (20)	Compulsory: 60 Optional: 60/260
MEng Year 5	Introduction to Wind Engineering (10)	Robust Control 5 (10)		Advanced Devices M(10)	Microwaves & mm Wave Circuit Design (20) Optical Communications (20) Ultra-sound Technology & Apps		Energy Conversion Systems M(20)	Real Time Embedded Programming (20)	Individual Project 5 (60)	Design Special Topic 5 (20)	Compulsory: 60 Optional: 40/140

Methodology

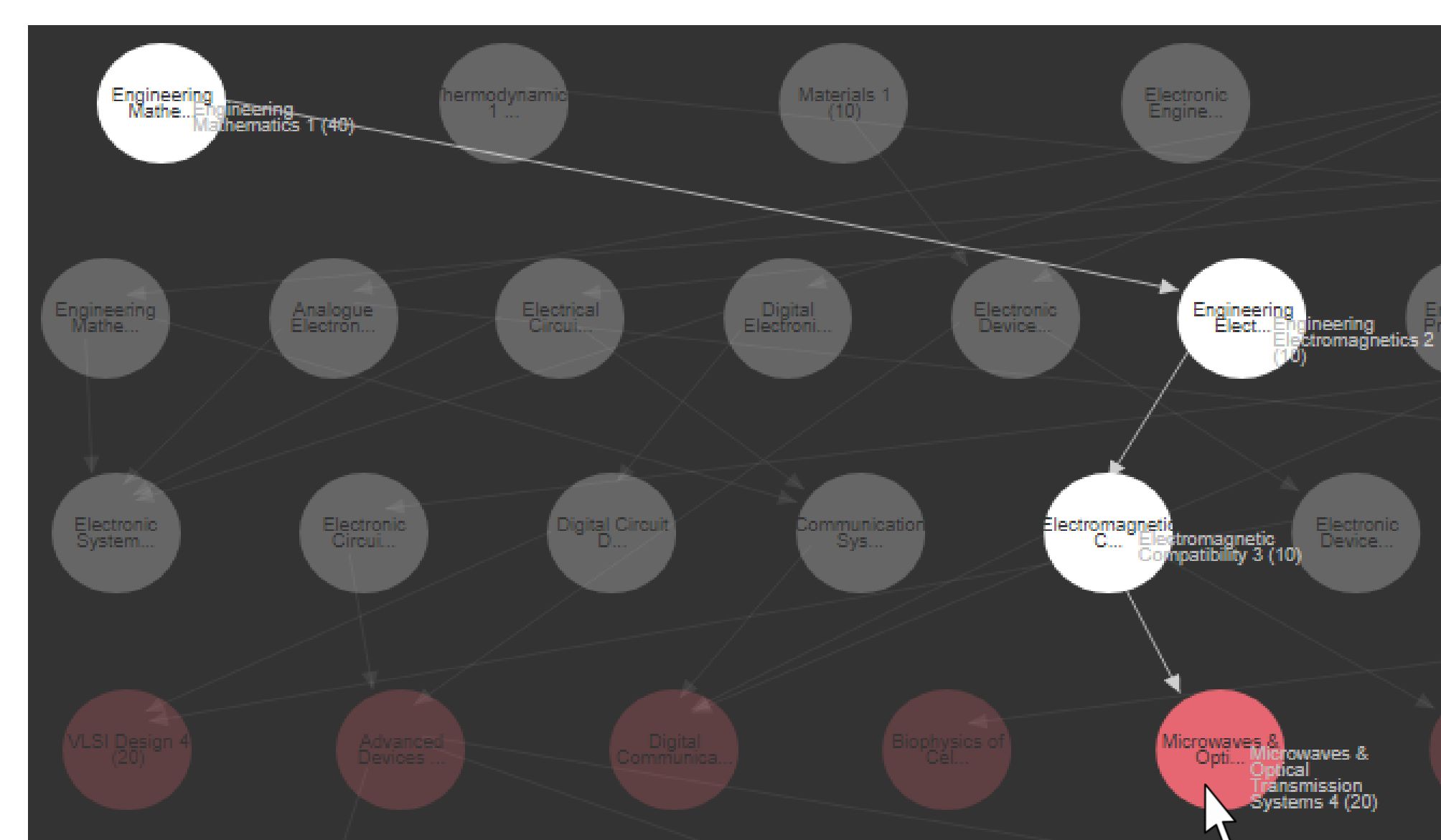
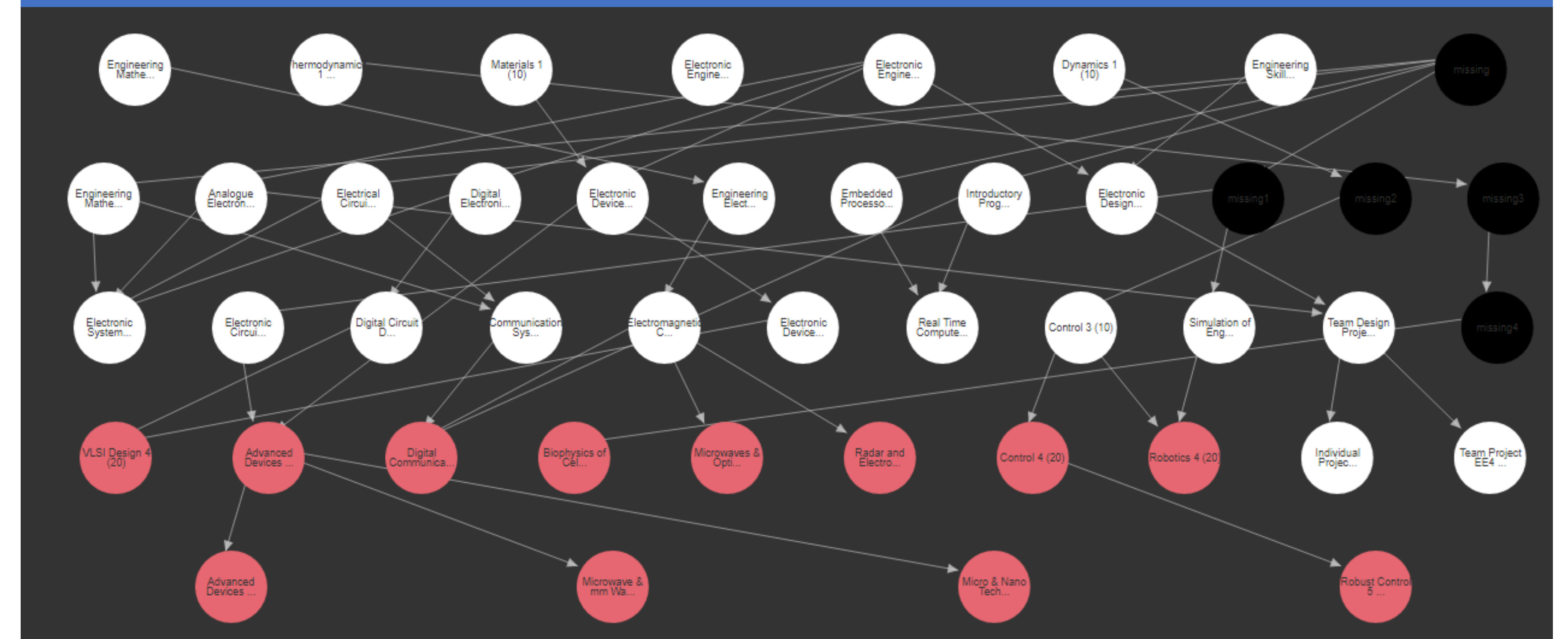
An interactive curriculum map for Glasgow University's Electronic and Electrical Engineering (EEE) program was developed, which was based on MIT's tree mapping approach [5, 6].



The Miro Platform



The Interactive Curriculum Map



Hovering the mouse cursor over a course results in highlighted the relations

Preliminary Results

- Important for students to visualize their curricula.
- Interactive map provided staff a better understanding of how their courses fit in the overall degree program.
- Helped staff identify content gaps/overlaps between courses.
- Helped staff improve their teaching delivery.

References:

- [1] S. Udelhofen, Keys to curriculum mapping: Strategies and tools to make it work. Corwin Press, 2005.
- [2] C. E. Bell, R. H. Ellaway, and S. M. Rhind, "Getting started with curriculum mapping in a veterinary degree program," *Journal of veterinary medical education*, vol. 36, no. 1, pp. 100–106, 2009.
- [3] H. S. Joyner, "Curriculum mapping: A before-and-after look at faculty perceptions of their courses and the mapping process," *Journal of Food Science Education*, vol. 15, no. 2, pp. 63–69, 2016.
- [4] K. A. Kelley, J. W. McAuley, L. J. Wallace, and S. G. Frank, "Curricular mapping: process and product," *American Journal of Pharmaceutical Education*, vol. 72, no. 5, 2008.
- [5] K. E. Willcox and L. Huang, "Network models for mapping educational data," *Design Science*, vol. 3, 2017.
- [6] R. Ghannam and I. S. Ansari, "Interactive Tree Map For Visualising Transnational Engineering Curricula," *2020 Transnational Engineering Education using Technology (TREET)*, 2020, pp. 1–4, doi: 10.1109/TREET50959.2020.9189750.



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