Interactive Map for Visualising Electronic Engineering Curricula

Noor AlQallaf, Sajjad Hussain and Rami Ghannam

James Watt School of Engineering, University of Glasgow

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].

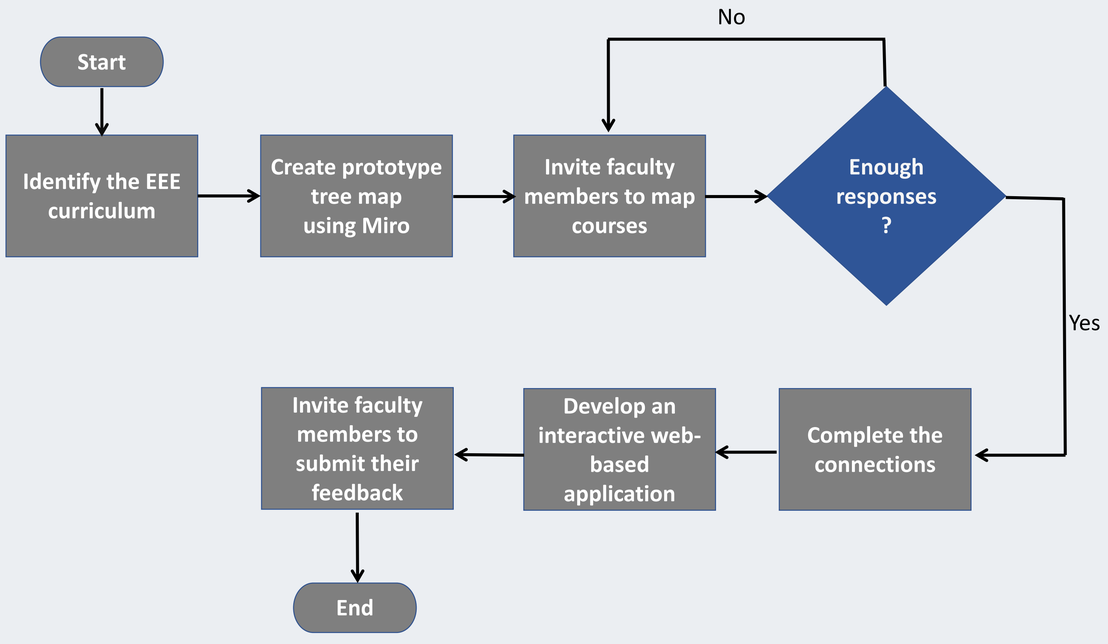
Static Thematic Structuring

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

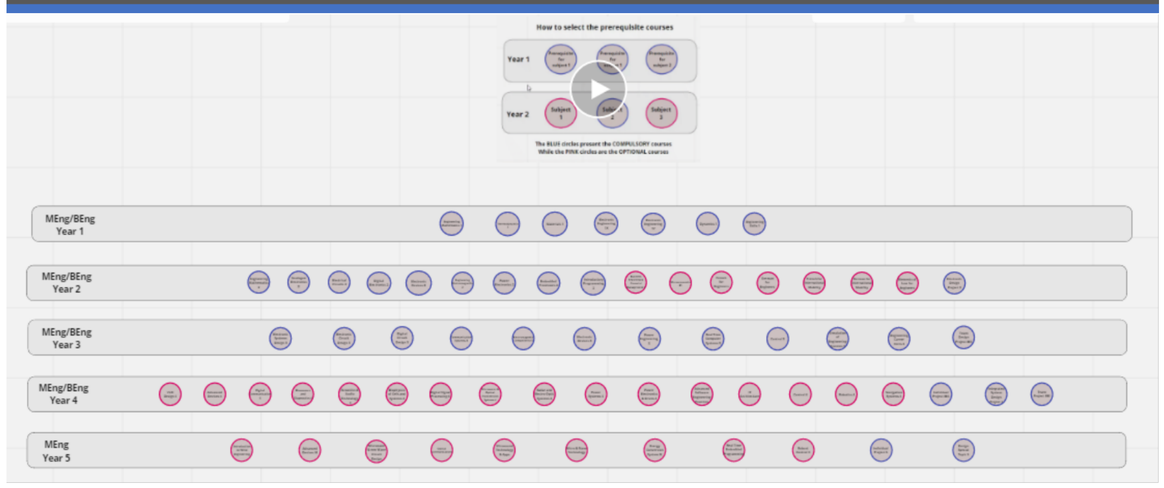
Year	Mathematics & Engineering Science	Dynamics, Control & Systems	Analogue Electronics	Digital Electronics	Electromagnetics, Communications & Optoelectronics	Nanoelectronics & Bioelectronics	Power Systems & Devices	Embedded & Computer Systems	Engineering Skills	Design	Credits
MEng/BEng Year 1	Engineering 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 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 Engineering 3 (10)	Real Time Computer Systems 3 (10)	Engineering Career Skills 3 (10)	Team Design Project EE3 (10)	Compulsory: 120
BEng Year 4		Control 4 (20) Robotics 4 (20) Navigation Systems 4 (10)	VLSI Design 4 (20)	Digital Communication 4 (20)	Advanced Devices 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)	Biosensors and Diagnostics 4 (10) Biophysics of Cells and Systems 4 (10)	Power Systems 4 (20) Power Electronics & Drives 4 (20)	Advanced Software Eng Practices (10) IT Architecture (10)	Individual Project EE4 (40)		Compulsory: 40 Optional: 80/260
MEng Year 4		Control 4 (20) Robotics 4 (20) Navigation Systems 4 (10)	VLSI Design 4 (20)	Digital Communication 4 (20)	Advanced Devices 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)	Biosensors and Diagnostics 4 (10) Biophysics of Cells and Systems 4 (10)	Power Systems 4 (20) Power Electronics & Drives 4 (20)	Advanced Software Eng Practices (10) IT Architecture (10)	Integrated System Design Project 4 (20)	Team Project EE4 (20)	Compulsory: 40 Optional: 80/260
MEng Year 5	Introduction to Wind Engineering (10)	Robust Control 5 (10)			Advanced Devices M (10) Microwave & mm Wave Circuit Design (20) Optical Communications (20) Ultrasound Technology & Apps	Micro & Nano Technology (20)	Energy Conversion Systems M (20)	Real Time Embedded Programming (20)	Individual Project 5 (60)	Design Special Topic 5 (20)	Compulsory: 80 Optional: 40/140

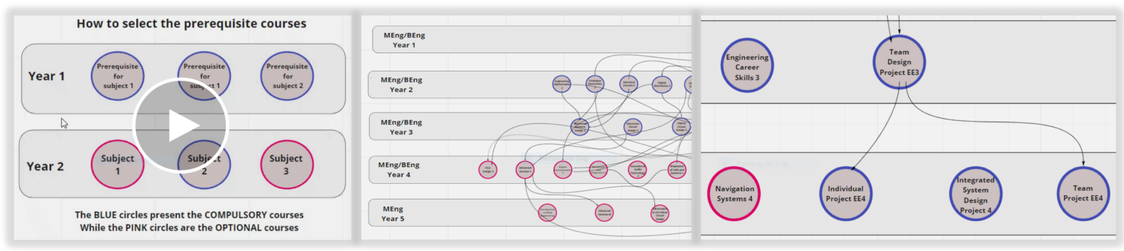
Methodology

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] .

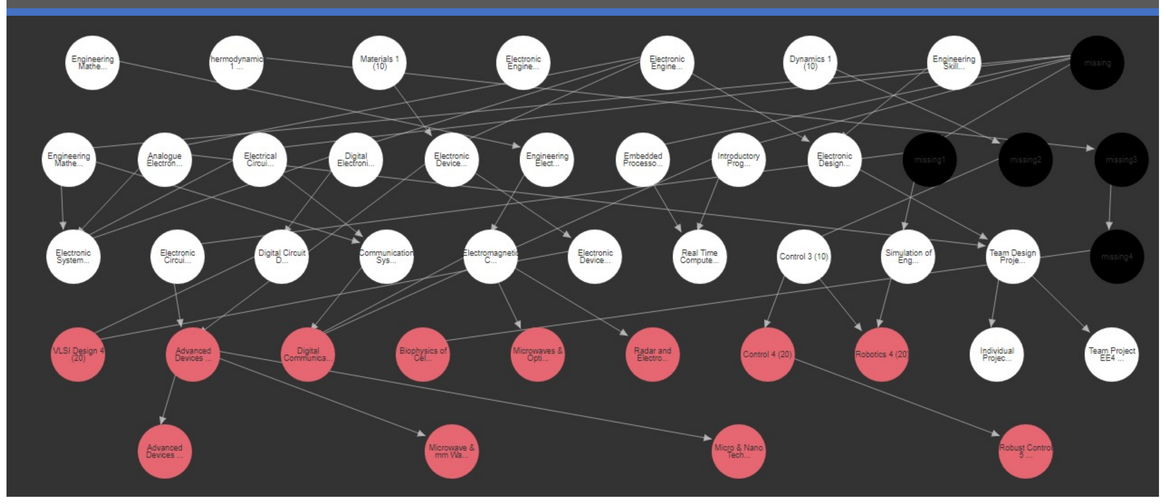


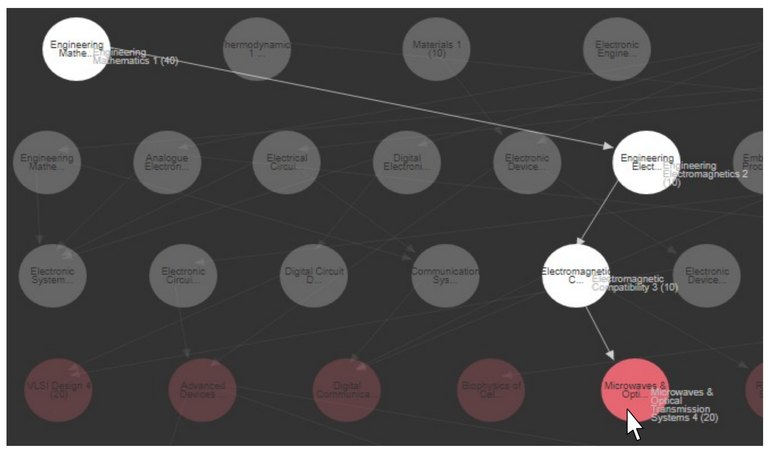
The Miro Platform





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.

University of Glasgow

2492835a@student.gla.ac.uk, sajjad.hussain@glasgow.ac.uk, rami.ghannam@glasgow.ac.uk

References:

[1] S. Udelhofen, Keys to curriculum mapping: Strategies and tools to make itwork. Corwin Press, 2005.

[2] C. E. Bell, R. H. Ellaway, and S. M. Rhind, "Getting started with cur-riculum mapping in a veterinary degree program," Journal of veterinarymedical 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.