NZDE National Exams:
A Nightmare and a Limiting Barrier

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Manukau Institute of Technology
Auckland, New Zealand

https://www.pressreader.com/new-zealand/the-new-zealand-herald/20171122/281603830768812

Clarification

- This presentation is a brain storm and not a criticism
- Evidences of NZBED meetings and reports are used to backup the discussions
- Examples of NZDE Electrical strand are used to explain the concepts but some findings can be extended to other strands as well
- This presentation follows my previous presentations:
  - Momen Bahadornejad, "***A Comparison Between Moderations in NZDE & BEngTech***". In 2020 Joint NZDE/ BEngTech Forum, Hamilton, New Zealand
  - Momen Bahadornejad, "***What? Why? How? (WWH): A Simple Teaching Model for Engineering Courses***". In 2018 Joint NZDE/ BEngTech Forum, Wellington, New Zealand
  - Momen Bahadornejad, "***Is NZDE Programme Sufficient for Smart Grid Training***?" In 2017 Joint NZDE/ BEngTech Forum, Wellington, New Zealand
- The content of the national exams is not the subject of this presentation

Introduction

- The pass rate in NZDE first-year modules with national exams is lower than the other courses in the programme

13.1 MATHEMATICS

The Committee discussed the issue of Mathematics, which was raised in a number of the Annual Returns. The pass rate for Mathematics is low in comparison with the other courses and many students clearly struggle.

Bill Sole commented that there has always been debate about the appropriate content and level of mathematics in the Diploma, with a range of views expressed and little consensus.

NZBED QUALITY ASSURANCE COMMITTEE MEETING
HELD AT IPENZ, 50 - 64 Customhouse Quay, Wellington
1 May 2017, 9.00am – 2.55pm

Introduction

- The pass rate in NZDE first-year modules with national exams is lower than the other courses in the programme
- Main barrier appears to be the national exam where a minimum mark of 40% is required to pass, regardless of the student's internal coursework mark
- ITPs have tried different strategies to address the problem however it still remains as a nightmare for the students and a limiting factor for the providers

W2B	WelTec, Wintec, Ara, MIT	Penelope deBoer (Weltec), Mark Hutchinson (Ara), Ken Louie (Wintec), Mohammad Al-Rawi (MIT)	Workshop	**How can we improve the pass rate of DE4102 (Engineering Maths 1) students?** It has become apparent in recent years that the pass rate in DE4102 (Engineering Mathematics 1) is much lower than in other first-year modules, and perhaps lower than when Mathematics was taught as a year-long (two-semester) course. The main barrier appears to be the national exam where a minimum mark of 40% is required to pass, regardless of the student's internal coursework mark. In the Workshop, we hope that other tutors will join us in teasing out the reasons why students struggle in the exam. We will also outline what strategies we have been trying to address the problem and our successes (or failures) to date.

2017 Joint NZDE/BEngTech Forum – abstracts for presentations and workshops

Introduction

In this presentation:

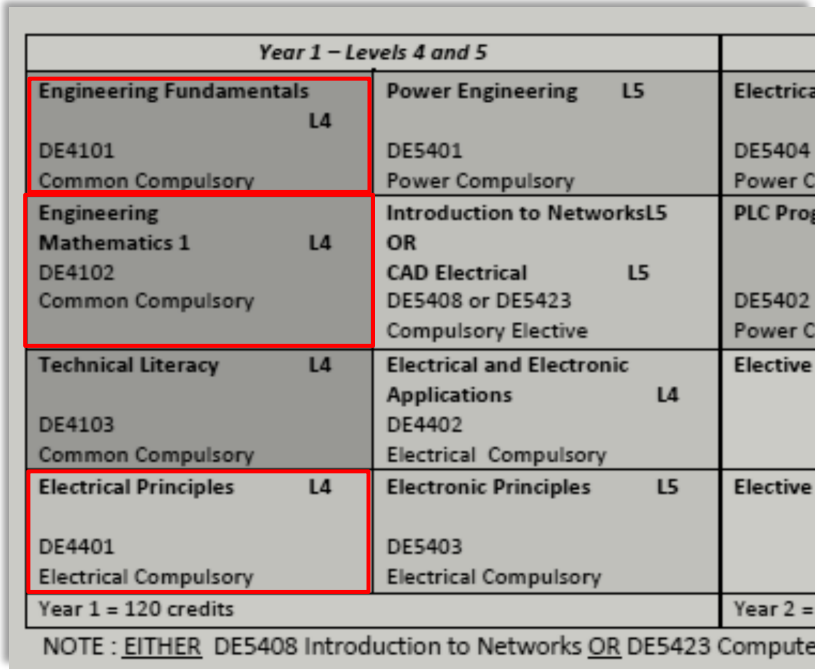
a) The reasons why students struggle in the national exams are briefly discussed

b) The issues arising for the providers and the programme are highlighted

c) A new model for the national assessment is introduced to overcome the issues while the quality of the programme is assured and all parties are also satisfied

Students Are Struggling: Why?

- First Semester Courses
  - There is no other tertiary programme with first semester national exam



Year 1 – Levels 4 and 5					
Engineering Fundamentals L4 DE4101 Common Compulsory		**Power Engineering** L5 DE5401 Power Compulsory		**Electrica** DE5404 Power C	
Engineering Mathematics 1 L4 DE4102 Common Compulsory		**Introduction to Networks** L5 **OR** **CAD Electrical** L5 DE5408 or DE5423 Compulsory Elective		**PLC Prog** DE5402 Power C	
Technical Literacy L4 DE4103 Common Compulsory		**Electrical and Electronic Applications** L4 DE4402 Electrical Compulsory		**Elective**	
Electrical Principles L4 DE4401 Electrical Compulsory		**Electronic Principles** L5 DE5403 Electrical Compulsory		**Elective**	
Year 1 = 120 credits				Year 2 =	

NOTE : EITHER DE5408 Introduction to Networks OR DE5423 Compute

Students Are Struggling: Why?

- First Semester Courses
  - There is no other tertiary programme with first semester national exam
- Unsuitable Syllabus

LEARNING OUTCOMES

On successful completion of this course, the student should be able to: DE4101

1. Demonstrate an understanding of, and apply, the fundamentals of statics, dynamics and mechanical energy concepts.
2. Evaluate direct stress and strain, and derive elastic properties from tensile test results.
3. Demonstrate an understanding of the engineering properties of fluids and apply the fundamentals of hydrostatics.
4. Demonstrate an understanding of electrical voltage, current and resistance and explain the difference between AC and DC.
5. Demonstrate awareness of the New Zealand Electricity system and describe some of its safety features.
6. Demonstrate an understanding of heat energy and transfer; temperature and humidity of air.

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- Unsuitable Syllal

LEARNING OUTCOMES DE4401

On successful completion of this course, the student should be able to:

1. Explain and apply the fundamental principles of DC theory
2. Explain and apply the fundamental principles of AC theory
3. Explain and apply the fundamental principles of basic three phase theory
4. Demonstrate the use of electrical measuring equipment

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DE5401

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LEARNING OUTCOMES

On successful completion of this course, the student should be able to: DE4102

1. Manipulate and solve algebraic expressions and equations.
2. Solve, manipulate and apply mathematical functions, including application of graphs where appropriate.
3. Apply the rules and principles of trigonometry using both degree and radian measure.
4. Demonstrate knowledge of differentiation and integration techniques and apply them to solve engineering problems.
5. Demonstrate knowledge and application of one of the following:
   - 5.1 Complex numbers, logic expressions and numbers OR
   - 5.2 Basic statistical concepts and techniques.

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Bill Sole commented that there has always been debate about the appropriate content and level of mathematics in the Diploma, with a range of views expressed and little consensus.

It was agreed there are two key issues to consider:

- the mathematics needed to successfully complete all the other courses within the diploma and;
- the mathematics technicians are likely to need in their working lives.

LEARNING OUTCOMES DE4401

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- the mathematics technicians are likely to n

It was resolved that:

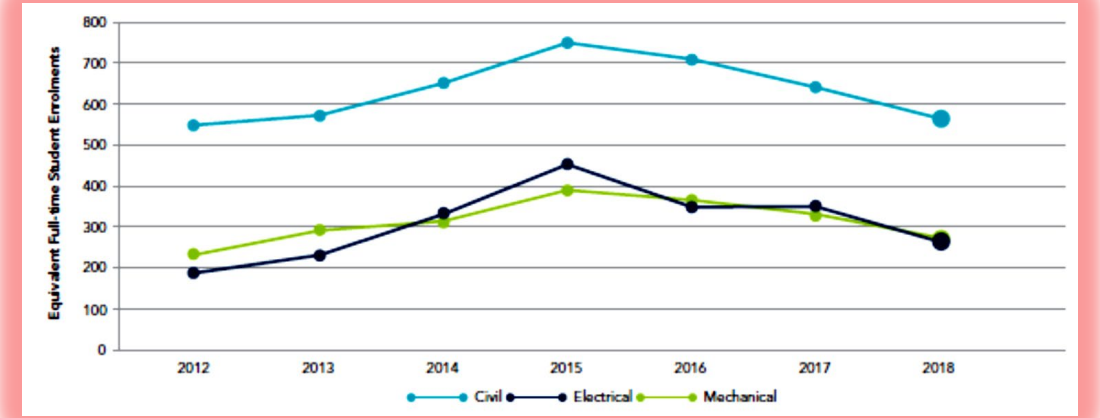
The Management Committees be asked to carry out an investigation into whether the Engineering Mathematics 1 course descriptor is still appropriate for the NZDE. In carrying out this investigation, the Management Committees should engage with graduates and employers, and consider the requirements of the other NZDE courses.

5.1 Complex numbers, logic expressions and numbers OR

5.2 Basic statistical concepts and techniques.

Impact on the providers and the programme

- Students lack of concentration on learning
- Low pass rate
- Low retention rate
- Decline in the students numbers



Impact on the providers and the programme

- Students lack of concentration on learning
- Low pass rate
- Low retention rate
- Decline in the students numbers
- Graduates employment issues

How well do graduate destinations match the intended employment pathways listed in the programme document?

Feedback from graduates

Graduate Destinations	Year Graduated		
	2018	2019	2020
Qualification match with Job Requirement	75%	46%	71%
Qualification Value (worth the investment)	41%	75%	58%

How to overcome the issues?

- Replace all National Exams with a single **Graduate Attribute** based **Capstone Assessment** at the end
- Modify and improve the National Moderation to ensure the quality
  - Like a randomly chosen paper in every strand every semester
- Revise the programme to align the first semester courses with the requirements of each strand

How to overcome the issues?

- Replace all National Exams with a single **Graduate Attribute** based **Capstone Assessment** at the end

DE4101 (Electrical)
Electrical Engineering Fundamentals

- Revise the programme to align requirements of each strand

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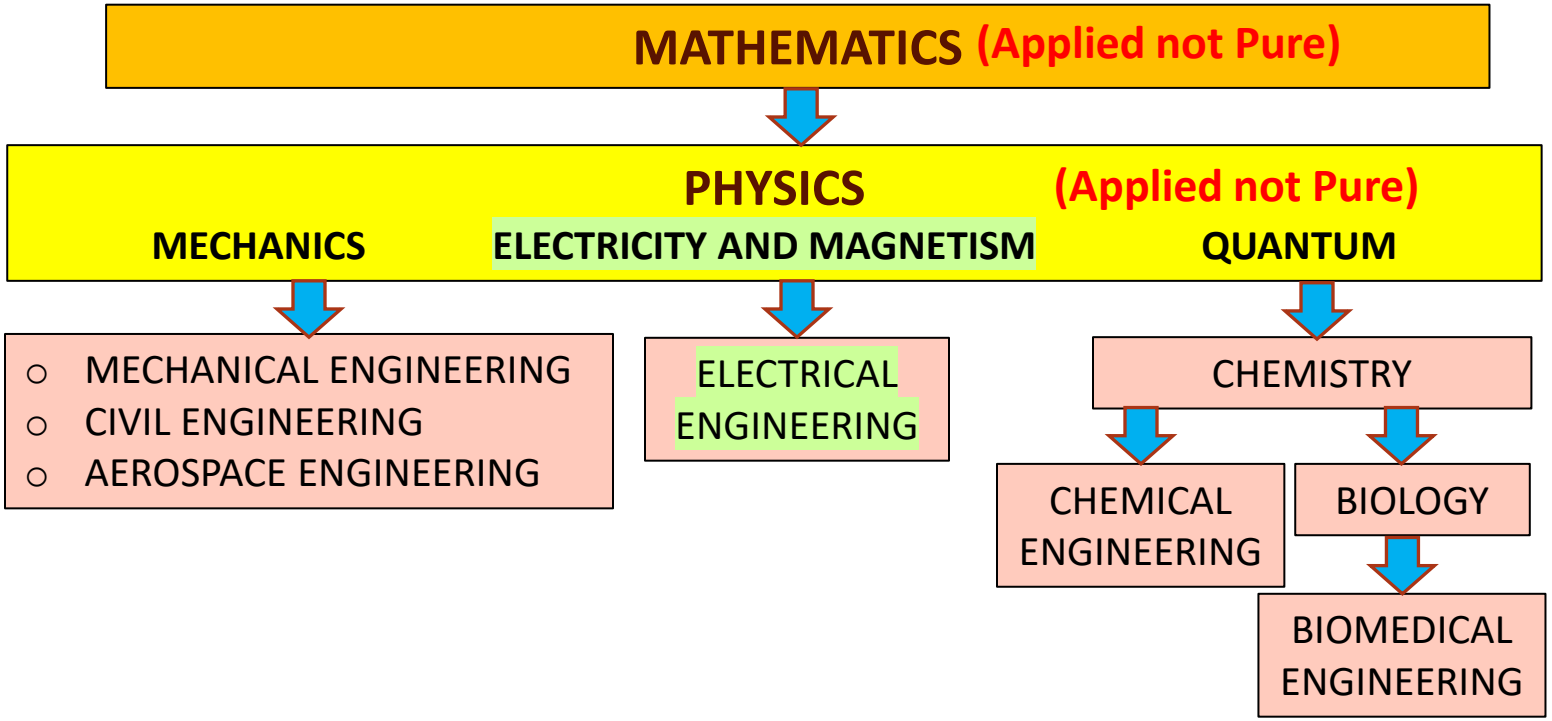
Year 1 = 120 credits			Year 2 =

NOTE : EITHER DE5408 Introduction to Networks OR DE5423 Compute

- Engineering is the application of Physics & Mathematics



How to overcome the issues?

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DE4101 (Electrical)
Electrical Engineering Fundamentals

- Revise the pro
requirements o

DE4102
Revise the syllabus

DE4401
Move to semester 2

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Conclusions and Suggestions

- Students are struggling with the national exams
- The course content is not suitable for the relevant strand
- The timing mismatch in the courses is creating problems
- The future of NZDE in the current format is not promising and certain changes are required
- Suggestions:
  - Different first-semester papers to be introduced for different strands
  - Relocating the papers and putting them in a rational order
  - The national moderation programme to be modified to ensure the quality
  - National exams to be replaced with a single graduate attribute based capstone assessment

Acknowledgement

- NZBED and METRO Group for arranging the Forum
- MIT for hosting the event
- Unitec for providing the opportunity to attend the Forum

Questions?

NZBED
NEW ZEALAND BOARD FOR ENGINEERING DIPLOMAS

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Manukau Institute of Technology
Otago Polytechnic
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