Post-graduate courses in railway engineering: The needs of Australian engineers and rail organisations

May 2000

Author: Athol Yates
Researcher: Dmitry Lobanov
Table of Contents

Summary ........................................................................................................................................... 3
Survey Findings ................................................................................................................................. 5
Introduction ......................................................................................................................................... 5
The need for post-graduate railway engineering units or courses ..................................................... 5
Units and courses which should be offered ....................................................................................... 5
The delivery method of units and courses ......................................................................................... 6
Employer support of units and courses .............................................................................................. 7
The cost of units and courses ............................................................................................................ 7
Development of units and courses ...................................................................................................... 7
Organisations that could deliver the units and courses ..................................................................... 7
Marketing of the units and courses ..................................................................................................... 8
Attachment 1: Survey of individual rail engineers ........................................................................... 9
Attachment 2: Survey of rail organisations ......................................................................................... 16

Publication information
Yates, Athol, 1963-.

Post-graduate courses in railway engineering: The needs of Australian engineers and rail organisations
ISBN 08 5825 701 7

© Institution of Engineers, Australia, 2000
All rights reserved. Other than brief extracts, no part of this publication may be produced in any form without the written consent of the publisher. This report can be downloaded at http://www.ieaust.org.au/government

The Institution of Engineers, Australia
11 National Circuit
Barton ACT 2600
tel 02 6270 6555
fax 02 6273 2257
email Athol_Yates@eol.ieaust.org.au
www http://www.ieaust.org.au
Summary

Research into the views of Australian railway engineers and railway organisations indicates that there is a significant need for post-graduate railway engineering units and courses.

This paper reports the research findings on the demand for courses, their content and their means of delivery.

The evidence to support the view that there is a significant need for post-graduate railway engineering units includes:

- rail organisations are currently experiencing a shortages of rail engineers and consider that the shortage will increase in the future. About 34% of rail organisations surveyed as part of the report, Engineering for rail sector growth, are currently experience difficulties in recruiting professional rail engineering staff. The most acute shortages are in signalling and communications, rolling stock, and track and structures. About 47% of organisations consider that there will be a shortage within 5 years and 52% between 5 and 10 years.
- 70% of rail organisations stated that their engineering and non-engineering staff would benefit from specialist railway engineering education.
- strong demand by individual engineers across all age groups and qualifications for courses, particularly within the next two years.

This demand has been caused by:

- the reduction in training by the public rail organisations,
- the proliferation of new rail service and consulting organisations which have a limited experience and ability to train new graduates, and
- the changing nature of rail industry, such as the increase in national standardisation and regulation, which requires new skills.

Survey Findings

The most popular qualification sought by engineers is a Graduate Diploma in Railway Engineering closely followed by a Masters of Railway Engineering by course work.

Engineers wanted the units that make up the Graduate Diploma to be also available as stand-alone units that are not part of gaining a tertiary qualification.

Engineers wanted the units delivered by distance education with limited face-to-face segments, and not tied to university semester timeframes.

The units which attracted the most interest by individuals and rail organisations were:

- rail project management
- track and structures
- railway safety
- railway planning and economics
- signalling & communications
- train control & operations
- rolling stock (inc design, manufacture, operations & maintenance)

There appears to be a high level of employer support for their employees to undertake units/courses. Evidence to support this includes:
• 80% of organisations stated that they would pay partial or full fees on behalf of their employees to attend courses.
• 50% of organisations stated that they would encourage their senior staff to present guest lectures.
• 71% of individual engineers expect their employer to pay for some or all of their course payments.
• 64% of individual engineers expect their employer to give them time off for their course.

The way ahead
The units and courses need to be industry focused and meet the future skills needs of industry. This will involve:
• integrating coursework and practical industrial experience,
• ensuring industry has a primary role in course development,
• implementing schemes supported by industry to developed well-rounded engineers, such as the proposed RTSA railway engineering passport scheme, and
• selecting supportive course providers which could include universities, TAFEs, private sector education providers, and rail companies.

Below are the steps which should be undertaken to pursue the development of post-graduate rail engineering courses.
• A steering committee of industry, professions, government and other interested groups be formed to manage the developing of post-graduate rail engineering courses.
• This report should be widely distributed to rail engineers, rail organisations and potential education providers with a call for expressions of interest in pursuing this potential market.
• The steering committee consider the expressions of interest and commission one of the organisations to undertake a business plan for the provision of units and courses.
• The business plan should be widely distributed to rail engineers, rail organisations and potential education providers. Workshops should be held to collect feedback.
• The final business plan should be distributed to potential education providers and tenders for the delivery of the units and courses be called.
• The steering committee select the winning tenderer.
• Units and courses are developed, accredited and delivered.
• The steering committee monitor the outcomes of the units and courses.

The cost and time for developing post-graduate rail engineering courses should not be underestimated. The development of courses and units is a time-consuming process which is costly. It will require significant funding as doing it "on the cheap" with not result in satisfactory outcomes. It demands the attention of highly knowledgeable and experienced practitioners having access to excellent resources for purposes of reference. Necessary processes of review add to the time required for development.

This survey indicates that there is a need and market for post-graduate railway engineering courses and it is now up to the professional associations, industry and education providers to make it a reality.
Survey Findings

Introduction

This survey builds on the 1998 rails skills shortage project. This project was supported by the Railway Technical Society of Australasia, Institution of Engineers, Australia, Australasian Railway Association and the Institution of Railway Signal Engineers. The report of the project was called, *Engineering for rail sector growth*, and can be downloaded from www.ieaust.org.au/government

In 1999, two separate surveys were sent out. One was directed to rail engineers and the other to railway organisations. Below is a summary of the outcomes. Attachment 1 and Attachment 2 details the survey results for each survey group.

The aim of the survey was not to identify the market for the courses as this depends on a range of factors such as course content, delivery method and price. Instead the surveys' aim was to identify the needs of rail engineers and rail organisations. Consequently it is impossible to determine the actual number of potential students. However the fact that 45 individuals said they would start a Graduate Diploma in 2000 or 2001 if it was offered, provides some indication of the market.

The need for post-graduate railway engineering units or courses

There is a significant need for post-graduate railway engineering units or courses in Australia. The evidence to support this assessment includes:

- rail organisations are currently experiencing a shortages of rail engineers and consider that the shortage will increase in the future. About 34% of rail organisations surveyed as part of the report, *Engineering for rail sector growth*, are currently experience difficulties in recruiting professional rail engineering staff. The most acute shortages are in signalling and communications, rolling stock, and track and structures. About 47% of organisations consider that there will be a shortage within 5 years and 52% between 5 and 10 years.
- 70% of rail organisations stated that their engineering and non-engineering staff would benefit from specialist railway engineering education.
- strong demand by individual engineers across all age groups and qualifications for courses, particularly within the next two years

This demand has been caused by:

- the reduction in training by the public rail organisations,
- the proliferation of new rail service and consulting organisations which have a limited ability to train new graduates, and
- the changing nature of rail industry, such as the increase in national standardisation and regulation, which requires new skills.

Units and courses which should be offered

The surveys identified that the main reason why individuals would undertake units or a course was because of a belief in the need for Continuing Professional Development (84% of respondents). Thus the courses must provide knowledge which:

- contributes to participants' professional competence,
• keeps participants current in international and local developments,
• provides participants with knowledge that is valued by industry and clients,
• provides participants with an understanding of the rapidly changing rail business environment, and
• provides participants with an understanding of the interaction of all disciplines in rail organisations.

A secondary reason why individuals would undertake units or a course is because of a belief that study will open up new workplace challenges (58%). Thus, courses must be focussed on providing skills which will open up these challenges, such as working on state-of-the-art projects, and project managing.

The most popular qualification sought is a Graduate Diploma in Railway Engineering closely followed by a Masters of Railway Engineering by course work. (There is very little interest in Masters by research.)

Engineers wanted the units that make up the Graduate Diploma to also be available as stand-alone units that are not part of gaining a qualification.

Engineers wanted the units delivered by distance education with limited face-to-face segments, and not tied to university semester timeframes.

The units which attracted the most interest by individuals and rail organisations were:
• rail project management
• track and structures
• railway safety
• railway planning and economics
• signalling & communications
• train control & operations
• rolling stock (inc design, manufacture, operations & maintenance)

The next most popular units are:
• workshops (inc railway workshop design & operations)
• business liaison & management

Some units, such as rail safety, should be developed to appeal to both engineers non-engineering managerial staff (eg senior managers, operational managers). This is because rail organisations identified that many non-engineers would benefit from tertiary rail education as well as engineers.

**The delivery method of units and courses**

The units' prime delivery method should be by distance education with some face-to-face sessions. This was by far the preferred method. (A straight campus delivered courses was by far the least popular.) Respondents identified a number of ways in which the face-to-face teaching components can be provided. Popular ways included short periods at campuses and at a local railway company.
Advantage should be taken of the 20% of rail organisations that expressed interest in hosting units/courses on their premises for other organisations' staff as well as your own.

In addition, advantage should be taken of the 50% of organisations which would encourage their senior staff to present guest lectures.

**Employer support of units and courses**

There appears to be a high level of employer support for their employees to undertake units/courses. Evidence to support this includes:

- 80% of organisations stated that they would pay partial or full fees on behalf of their employees to attend courses.
- 30% of organisations stated that they would allow time off for their employees to attend courses.
- 50% of organisations stated that they would encourage their senior staff to present guest lectures.
- 20% of organisations stated that they would be interested in having the units/courses taught on their premises.
- 20% of organisations stated that they would be interested in hosting units/courses for other organisations' staff as well as their own.
- 71% of individual engineers expect their employer to pay for some or all of their course payments.
- 64% of individual engineers expect their employer to give them time off for their course.

**The cost of units and courses**

A number of respondents indicated that course costs would be a major factor in deciding to undertake a course. However, as most employers would pay for the courses, price sensitivity may actually be less of an issue.

The pricing of the courses will need to consider if the course development costs are incorporated in the price. As the course development costs are significant, and the number of students will not be enormous, incorporating the course development costs will raise the price of the courses significantly.

Ways to reduce the course development costs may include delivering overseas developed courses.

**Development of units and courses**

Both industry and rail engineers must have considerable input into the contents of all units and courses. While the Rail Engineering Competency Profiles prepared by the IEAust would provide the basis for the content of units, considerable consultation is still required.

**Organisations that could deliver the units and courses**

The best providers of courses must be selected. Consideration should be given to all providers including universities, TAFEs, private sector education providers, and rail companies.
**Marketing of the units and courses**

To increase the appeal of courses, the courses should be

- aimed at the Australian, New Zealand and Asian markets
- be endorsed and valued by ARA and major employers
- the courses should be aimed at all age groups, with the slight distinction that engineers in the age group 36 to 50 will require more convincing of the benefits of undertaking the courses as they are marginally less emphatic about immediately undertaking a course than engineers in the 20-35 age group
Attachment 1: Survey of individual rail engineers

A survey was sent to about 800 engineers who were members of the IEAust or Railway Technical Society of Australasia, or replied to the Engineering for rail sector growth study. A total of 97 survey responses were received. This is about a 12% response rate.

**Question 1:** If there were suitable post-graduate units or courses in railway engineering on offer, would you undertake them? (only tick one box)

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage %</th>
<th>Answer option (Does not include fully-retired people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>35</td>
<td>Yes, in 2000</td>
</tr>
<tr>
<td>15</td>
<td>17</td>
<td>Yes, in 2001 and 2002</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>Yes, in 2003 or later</td>
</tr>
<tr>
<td>33</td>
<td>38</td>
<td>Maybe</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>No</td>
</tr>
</tbody>
</table>

52% of respondents who would probably undertake a railway engineering course would prefer to start the course within 2 years. As there are no responses which stated that they would not take post-graduate units, it can be inferred that only respondents who are potentially interested in undertaking units responded to the survey.

**Question 2:** Which of the following units would you be most interested in? (you may tick more than one box)

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage %</th>
<th>Answer options (Does not include fully-retired people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>55.8</td>
<td>Rail project management</td>
</tr>
<tr>
<td>42</td>
<td>48.8</td>
<td>Track and structures</td>
</tr>
<tr>
<td>39</td>
<td>45.3</td>
<td>Railway safety</td>
</tr>
<tr>
<td>36</td>
<td>41.8</td>
<td>Railway planning and economics</td>
</tr>
</tbody>
</table>

Interpretations

All age groups indicated a high interest in undertaking a course. It is noticeable that the age group 36-50 answered 'maybe' more than other groups.
<table>
<thead>
<tr>
<th>Percentage</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>39.5</td>
<td>Signaling</td>
</tr>
<tr>
<td>30.2</td>
<td>Train control and operations</td>
</tr>
<tr>
<td>24.4</td>
<td>Business liaison and management (inc. customer liaison, traffic planning, general management)</td>
</tr>
<tr>
<td>24.4</td>
<td>Rolling stock</td>
</tr>
<tr>
<td>23.3</td>
<td>Railway regulation (inc. access arrangements/pricing, competition policy)</td>
</tr>
<tr>
<td>22.1</td>
<td>Workshops (inc. railway workshop design &amp; operations)</td>
</tr>
<tr>
<td>16.3</td>
<td>Power supply for electric traction (inc. design, manufacture, operations)</td>
</tr>
<tr>
<td>9.3</td>
<td>Other</td>
</tr>
<tr>
<td>8.1</td>
<td>Terminals</td>
</tr>
</tbody>
</table>

Respondents suggested a number of other units. These included:
- Ventilation in tunnels
- Adhesion
- Vehicle Dynamics & Wheel/Rail Interaction
- Risk management
- Overhead Wiring design & construction
- Managing/auditing
- Partnerships/risk sharing
- Management systems
- Benchmarking

**Observations**

The most popular units are
- Rail project management
- Track and structures
- Railway safety
- Railway planning and economics
- Signaling
- Train control & operations

It is interesting to note that the rail organisations believe that the most likely areas of shortage over the next decade are:
- signaling
• rolling stock
• track & structures
• business liaison & management
• train control & management

The top most list is based on the following information:
The most popular units as selected by individual engineers are
• Rail project management
• Track and structures
• Railway safety
• Railway planning and economics
• Signaling
• Train control & operations

The most popular units as selected by rail organisations are
• railway safety
• signalling & communications (inc design, manufacture, operations & maintenance)
• rolling stock (inc design, manufacture, operations & maintenance)
• track and structures (inc track design, construction, maintenance)
• train control and operations
• workshops (inc railway workshop design & operations)
• rail project management

Rail organisations in the report, *Engineering for rail sector growth*, considered that the most likely areas of shortage over the next decade
• signaling
• rolling stock
• track & structures
• business liaison & management
• train control & management

Note: project management and rail safety were not included in the original list as areas of shortages which organisations could identify.

**Question 3**: How long have you worked in the railway or related sector?

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage</th>
<th>Work length (Does not include fully-retired people)</th>
<th>Percentage of respondents in each work length category that wants to undertake a course within 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>12.8%</td>
<td>0-3 years</td>
<td>50%</td>
</tr>
<tr>
<td>11</td>
<td>12.8%</td>
<td>4-6 years</td>
<td>54%</td>
</tr>
<tr>
<td>4</td>
<td>4.7%</td>
<td>7-9 years</td>
<td>0%</td>
</tr>
<tr>
<td>15</td>
<td>17.4%</td>
<td>10-13 years</td>
<td>80%</td>
</tr>
<tr>
<td>7</td>
<td>8.1%</td>
<td>14-16 years</td>
<td>57%</td>
</tr>
<tr>
<td>38</td>
<td>44.2%</td>
<td>17+ years</td>
<td>44%</td>
</tr>
</tbody>
</table>
Observations

- The median work length of respondents was about 14 years.
- It appears that about 50% of all age groups would like to undertake a course within 2 years.
- The interest in undertaking a unit does not appear to be dependant on work length.

**Question 4:** When did you gain your most recent university/TAFE qualification?

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage %</th>
<th>Year (Does not include fully-retired people)</th>
<th>Percentage of respondents in each category that wants to undertake a course within 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.4</td>
<td>1950-1970</td>
<td>43%</td>
</tr>
<tr>
<td>21</td>
<td>25.5</td>
<td>1971-1980</td>
<td>39%</td>
</tr>
<tr>
<td>23</td>
<td>28</td>
<td>1981-1990</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>22</td>
<td>1991-1995</td>
<td>61%</td>
</tr>
<tr>
<td>18</td>
<td>22</td>
<td>1996+</td>
<td>61%</td>
</tr>
</tbody>
</table>

Observations

- The median year of graduation was about 1988.
- People who have graduated more recently have an increased likelihood of wanting to undertake a course within the next 2 years.

**Question 5:** Would you be most interested in undertaking the units/courses as (you may tick more than one box)

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage %</th>
<th>Answer options (Does not include fully-retired people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>37.2</td>
<td>Graduate Diploma in Railway Engineering</td>
</tr>
<tr>
<td>30</td>
<td>34.9</td>
<td>Master of Railway Engineering by course work</td>
</tr>
<tr>
<td>21</td>
<td>24.4</td>
<td>Units for a business course, e.g. MBA, Master of Business Technology</td>
</tr>
<tr>
<td>14</td>
<td>16.3</td>
<td>Units for another engineering course, e.g. B.Eng., GradDip</td>
</tr>
<tr>
<td>11</td>
<td>12.8</td>
<td>Master of Railway Engineering by thesis</td>
</tr>
</tbody>
</table>

Additional comments by respondents included:

- MSC (Eng) in Rail systems Engineering
- Stand alone units which had the option to aggregate into a higher degree

Observations

- The most popular course option is a Graduate Diploma in Railway Engineering closely followed by a Masters of Railway Engineering by course work.
• There is substantial interest in the courses being offered as stand along units which can be aggregated into a qualification.
• The least popular course is a Master of Railway Engineering by thesis

**Question 6**: Order your preferences as to the preferred method of units/course delivery (Score 1=best to 4=worst)

<table>
<thead>
<tr>
<th>Weighted method order</th>
<th>Answer options (Does not include fully-retired people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>By distance education with supplementary campus component</td>
</tr>
<tr>
<td>2</td>
<td>By distance education</td>
</tr>
<tr>
<td>3</td>
<td>In your workplace</td>
</tr>
<tr>
<td>4</td>
<td>On a campus</td>
</tr>
</tbody>
</table>

**Observations**
The most popular delivery method by a weighting system is
1 By distance education with supplementary campus component
2 By distance education

The most popular delivery method by first preference is
1 By distance education
2 In your workplace

The least popular by both methods is
4 On a campus

**Question 7**: What level of support would you expect from your employer to undertake units/course? (you may tick more than one box)

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage</th>
<th>Answer options (Does not include fully-retired people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>11.6</td>
<td>None</td>
</tr>
<tr>
<td>61</td>
<td>70.9</td>
<td>Partial or full fee payment</td>
</tr>
<tr>
<td>55</td>
<td>64</td>
<td>Time off</td>
</tr>
<tr>
<td>5</td>
<td>5.8</td>
<td>other</td>
</tr>
</tbody>
</table>

The comments written in the 'other' choice were:
• tax deductions
• self employed consultant - time as available
• self employed - would expect employer to agree
• not sure
• because I'm working as a contractor

**Observations**
71% of respondents expected their employer to pay for some or all of their course payments.
64% of respondents expected their employer to give them time off for their course
Only 12% of respondents would get no support.

Considering that there about 13% of rail engineers are self-employed consultants, and 12% of respondents would get no support, it appears that nearly all employed engineers would probably get some employer support.

**Question 8**: What is your highest qualification? (only tick one box)

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage</th>
<th>Percentage of respondents who would undertake a course within 2 years</th>
<th>Answer options (Does not include fully-retired people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>8.1</td>
<td>43%</td>
<td>Skilled vocational qualification</td>
</tr>
<tr>
<td>13</td>
<td>15.1</td>
<td>46%</td>
<td>Associate Diploma, Diploma or</td>
</tr>
</tbody>
</table>
Advanced Diploma
4 4.7 100% Bachelor of Technology
39 45.3 53% Bachelor of Engineering
9 10.5 66% Post-graduate Diploma
13 15.1 50% Ph.D. or Masters degree

Observations
It appears that respondents with qualifications of a Bachelor degree or higher are slightly more likely to undertake a rail engineering course.

Question 9: Why would you undertake a unit/course? (you may tick more than one box)

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage</th>
<th>Answer options (Does not include fully-retired people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>83.7</td>
<td>to facilitate Continuing Professional Development</td>
</tr>
<tr>
<td>50</td>
<td>58.1</td>
<td>to open up new workplace challenges</td>
</tr>
<tr>
<td>42</td>
<td>48.8</td>
<td>for personal interest</td>
</tr>
<tr>
<td>20</td>
<td>23.3</td>
<td>to work in a new area of railway</td>
</tr>
<tr>
<td>18</td>
<td>20.9</td>
<td>to gain promotion</td>
</tr>
<tr>
<td>18</td>
<td>20.9</td>
<td>to gain increased salary</td>
</tr>
<tr>
<td>8</td>
<td>9.3</td>
<td>other</td>
</tr>
<tr>
<td>5</td>
<td>5.8</td>
<td>to get into railway engineering</td>
</tr>
</tbody>
</table>

Respondents provided a range of other reasons for undertaking a unit/course and these were:
- to transfer knowledge
- to update lecture notes to schools/societies
- to keep up to date with the latest technology in railways
- to improve my understanding of the interaction of all the disciplines
- to gain a better understanding of the rail business environment
- to allow rail in Australia to reach its potential
- to add to my knowledge
- provide basis for the type of work I do, when working for the rail industry

Observations
By far the most popular reason for undertaking a unit/course is to facilitate Continuing Professional Development (84%).
The next two most popular reasons were to open up new workplace challenges (58%) and for personal interest (49%).

This information supports evidence obtained from the report, *Engineering for rail sector growth*. For example, the main reason why engineers intend to leave the rail sector or move into management is because they are seeking new challenges. Also the least important reason why engineers intend to leave the rail sector or move into management is because of seeking higher salary.

Question 10: Any other comments?
- The time and locations of classes as well as course lengths are the biggest considerations. If the course is costly then a high level of performance again would need to be achieved (promotion/pay) to justify the outlay.
- The rail industry must have courses/education that is specific to the transportation industry and to business management.
- The opportunity to carry out research to answer problems not adequately explained by existing codes.
- The course should be as flexible as far as time and the number of units/subjects to be completed in an allotted amount of time.
- Start running the courses now!
- Need to do courses at own pace due to family commitments.
- Short sharp & focussed. I am too old for long courses and I travel a lot.
- Must have relevance, by accessible and appropriately costed.
• Providing a challenging course at reasonable venue; preferably at a recognized university for eg. Melbourne or Monash university.
• My main interest is for seeking options for the development of training program & structured career path for subordinates.
• If the state railways or equivalent organisations formally recognize the course.
• If short courses in specific topics are offered at easy access venues for reasonable rates and by well respected railway engineers.
• Flexible learning packages not limited to the traditional university semester timeframes.
• Face to face teaching/lectures.
• Depends on my future job situation (or will close down after the 2000 Olympics).
• Course location close to work & out of work hours, course is recognised by IEAust, other universities
• Course conducted has self paced learning packages
• COST - don't be greedy (I will have to convince my wife it is worth it) QUALITY - course overview should look relevant and be well constructed by well respected railway engineers, RECOGNITION - seek a letter of recognition form railways, manufacturers, regulating authorities are accepting the course as highly desirable for railway engineers.
• Any course must be internationally recognised, all rail technology world wide and take advantage of the global rail industry.
• Accessibility, Cost, Relevance to my personal situation (working with an IT consultant)
• It would need to have a highly international flavour including mass transit railways and update of major international projects.
• With railways being sold off, privatised, railway engineering skills are being lost! I feel strongly that "railways related courses” should be part of a civil, mechanical and electrical B.Eng. syllabus, similar to some universities in Europe.
• Undertook a railway elective at an Australian university in 1998. The course was extremely vague with little real information provided. During my final year doing the thesis I conducted research into methods of rail adjustments. Very little was offered by the university in terms of support or knowledge. I was extremely disappointed to see such little support for a major industry.
Attachment 2: Survey of rail organisations

A survey was sent to 220 rail organisations. A total of only 10 responses were received. This is a response rate of 5%.

<table>
<thead>
<tr>
<th>Number</th>
<th>Percentage</th>
<th>Would your engineering and non-engineering staff benefit from specialist railway engineering education?</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>70%</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>30%</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>10%</td>
<td>Maybe (comment)</td>
</tr>
</tbody>
</table>

Observations
70% of respondents considered their staff would benefit from railway engineering education.

<table>
<thead>
<tr>
<th>Number</th>
<th>Percentage</th>
<th>Assuming your organisation considered the courses relevant, which of the following units would be most relevant to the needs of your staff? (you may tick more than one box)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>60%</td>
<td>railway safety</td>
</tr>
<tr>
<td>6</td>
<td>60%</td>
<td>signalling &amp; communications (inc design, manufacture, operations &amp; maintenance)</td>
</tr>
<tr>
<td>4</td>
<td>40%</td>
<td>rolling stock (inc design, manufacture, operations &amp; maintenance)</td>
</tr>
<tr>
<td>4</td>
<td>40%</td>
<td>track and structures (inc track design, construction, maintenance)</td>
</tr>
<tr>
<td>4</td>
<td>40%</td>
<td>train control and operations</td>
</tr>
<tr>
<td>4</td>
<td>40%</td>
<td>workshops (inc railway workshop design &amp; operations)</td>
</tr>
<tr>
<td>4</td>
<td>40%</td>
<td>rail project management</td>
</tr>
<tr>
<td>3</td>
<td>30%</td>
<td>railway planning and economics</td>
</tr>
<tr>
<td>2</td>
<td>20%</td>
<td>business liaison and management (inc customer liaison, traffic planning, general management)</td>
</tr>
<tr>
<td>2</td>
<td>20%</td>
<td>railway regulation (inc access arrangements/pricing, competition policy)</td>
</tr>
<tr>
<td>2</td>
<td>20%</td>
<td>power supply for electric traction (inc design, manufacture, operations &amp; maintenance)</td>
</tr>
<tr>
<td>2</td>
<td>20%</td>
<td>terminals (inc freight &amp; passenger terminal)</td>
</tr>
</tbody>
</table>

Observations
The most popular units are
- railway safety
- signalling & communications (inc design, manufacture, operations & maintenance)
- rolling stock (inc design, manufacture, operations & maintenance)
- track and structures (inc track design, construction, maintenance)
- train control and operations
- workshops (inc railway workshop design & operations)
- rail project management

It is interesting to note that the rail organisations in the report, *Engineering for rail sector growth*, believe that the most likely areas of shortage over the next decade are (It must be remembered that project management and rail safety were not included as areas of shortages which organisations could identify.)
- signaling
- rolling stock
- track & structures
- business liaison & management
- train control & management
**Number of individuals** | What is the approximate number of individuals in the 2 categories below who might undertake one or more of the above units over the next 5 years?
---|---
86 | professional engineers and engineering technologists
34 | non-engineering managerial staff (eg senior managers, operational managers)

**Observations**
Both engineers and non-engineers appear to be potential candidates for some units of rail engineering courses/units.

<table>
<thead>
<tr>
<th>Number</th>
<th>Percentage</th>
<th>Assuming your organisation considered the courses relevant, what would be the level of support from your organisation to your staff so they could undertake units/course? (you may tick more than one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0%</td>
<td>none</td>
</tr>
<tr>
<td>8</td>
<td>80%</td>
<td>partial or full fees</td>
</tr>
<tr>
<td>3</td>
<td>30%</td>
<td>time off</td>
</tr>
</tbody>
</table>

**Observations**
80% of organisations would pay partial or full fees on behalf of their employees to attend courses.
30% of organisations would allow time off for their employees to attend courses.

<table>
<thead>
<tr>
<th>Number</th>
<th>Percentage</th>
<th>Would your organisation be interested in having the units/courses taught on your premises?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>20%</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>50%</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>20%</td>
<td>Maybe</td>
</tr>
</tbody>
</table>

**Comments**
- if economical for a small group and of short duration
- would consider

**Observations**
20% of organisations would be interested in having the units/courses taught on their premises.

<table>
<thead>
<tr>
<th>Number</th>
<th>Percentage</th>
<th>Would your organisation be interested in hosting units/courses for other organisations’ staff as well as your own?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>20%</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>50%</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>20%</td>
<td>Maybe</td>
</tr>
</tbody>
</table>

**Observations**
20% of organisations would be interested in hosting units/courses for other organisations’ staff as well as your own.

<table>
<thead>
<tr>
<th>Number</th>
<th>Percentage</th>
<th>Would your organisation encourage your senior staff to present guest lectures?</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>50%</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>20%</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>10%</td>
<td>Maybe</td>
</tr>
</tbody>
</table>

**Observations**
50% of organisations would encourage their senior staff to present guest lectures.

**Other comments**
- Our field of involvement is limited to rolling bearings in rail vehicles. This includes design, manufacture, application engineering, maintenance and overhaul of bearings in traction motors, gear drives, TR-motor suspension and journal roller bearings and other auxiliary rotating equipment. There exists a vested interest in the track/wheel interface, vehicle design and ride quality, traction motor and drive developments.
- We would seek input to course content & structure to suit our needs. A structure leading to a post-graduate qualification would be favoured.
• No course will be attractive if it isn't sensibly priced and based on current offerings, I see this as the single biggest hurdle for making any scheme successful. Also distance education is preferred.
• I do believe that there is becoming an extreme need for such a formal training scheme because of the proliferation of small operators and contract service organisations who do not have much specific railway training, particularly in braking and safety.