Online Professional Development Program for Railway Signal & Telecommunication Engineers and Technologists

The purpose of the Professional Development Program is to provide the underlying knowledge that will facilitate the development of competent railway signal and telecommunications engineers and prepare them to undertake a broad variety of tasks and projects in the area of signalling and telecommunications. A particular focus of the Program is the management of the safety aspects in signalling, control and telecommunication projects and systems.

The professional development Program has been developed and is delivered by experienced railway signal engineers and practitioners who are members of the Institution of Railway Signal Engineers (IRSE). The content of each course of the Program is aligned with a respective set of competencies required for IRSE membership. Successful completion of the Diploma Program is considered an appropriate qualification for the purposes of corporate IRSE membership.

<table>
<thead>
<tr>
<th>Focus Areas:</th>
<th>Rail Safety</th>
<th>Signalling Principles</th>
<th>Application of Signalling Equipment</th>
<th>Integration of Systems and Equipment</th>
<th>Comm. Principles &amp; Applications</th>
<th>Professional practices in signal or telecommunication engineering</th>
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</thead>
<tbody>
<tr>
<td>Program Courses:</td>
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<tr>
<td>Certificate Diploma</td>
<td>Signalling &amp; Safe Rail Operation (CPD1)</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td></td>
<td>Signalling Principles (CPD2)</td>
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<td></td>
<td>Signalling the Layout (CPD3) – (elective 1); or Railway Telecommunications (CPD7) – (elective 2)</td>
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<td>Systems, Management &amp; Engineering (CPD5)</td>
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<td>Professional Competencies (CPD0) – (elective 1); or Signalling Research or Investigation Project (CPD6) (elective 2)</td>
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<td>✓</td>
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</table>
Study Options

After successful completion of the first three courses, learners are awarded a Post Graduate Certificate in Rail Signalling & Telecommunications. After completion of six courses, successful learners are awarded a Post-Graduate Diploma in Rail Signalling & Telecommunications. Afterwards, you may choose to further complete two research projects towards achieving a Master degree in Rail Signalling & Telecommunication. The Master degree is also available to experienced engineers via an alternative entry path who may wish to gain academic recognition for work based projects they are undertaking or intend to undertake.

There is also an option to undertake any course as a stand-alone non-award course providing the course prerequisites have been met. To complete a course you need to complete the reading required by the course, and submit assignments and projects based on case studies.

Who benefits from undertaking the Courses?

- The courses are designed to help graduates with a Bachelor Degree in Electrical Engineering who have six to twelve months of work experience in the railway industry to fast track their careers by providing them a thorough and comprehensive understanding of all major areas of railway signalling and/or telecommunications and skills to apply this knowledge to a wide range of practical situations.
- Rail technologists who have an extensive experience in the areas of rail signalling and/or telecommunications and are prepared to undertake university study.
- All courses can be undertaken as single non award course by engineers who would like to improve their understanding in a particular area.

Other Benefits from the Courses

- Development and improvement of general professional and communication skills
- Professional network building achieved through collaboration and team projects working closely with other rail professionals from different rail organisations
- Mentoring and assistance to your study by Course Tutors (senior rail signal and/or telecommunications engineers and practitioners) over the duration of the Program or a course
- Links and access to generic and rail-specific online materials, databases and IRSE technical papers

Entry Requirements

- Certificate or/and the Diploma Program: a Bachelor Degree in Electrical Engineering and minimum 6 months work experience, or other tertiary qualifications at the VET level and at least 5 years of relevant experience. Enrolment in Master degree requires completion of the Diploma Program.
- Applications for signal non award courses except CPD1 and CPD7 need to meet the perquisites for the particular course.
- All applicants must be working in the railway industry and have support from their employer to enrol in the program or an individual course.

Delivery

The course is delivered via flexible online learning and particularly suitable for engineers and other professionals working full-time and undertaking the study at a time of convenience. The course would particularly benefit rail staff working in remote locations. You will be assisted in your study by Course Tutors.
### When

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses Delivered</th>
<th>Application Deadlines</th>
<th>Start Dates for 2014</th>
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<tbody>
<tr>
<td>Term 1</td>
<td>Signalling &amp; Safe Rail Operations (CPD1)</td>
<td>14 February</td>
<td>24 February</td>
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<td>Signalling Engineering Applications (CPD4)</td>
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<td>Term 2</td>
<td>Signalling Principles (CPD2)</td>
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<td>30 June</td>
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<td>Systems, Management and Engineering (CPD5)</td>
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<td>Term 3</td>
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<td>Telecommunications (CPD7)</td>
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<td>Signalling Research/Investigation Project (CPD6) or Professional Competency (CPD0)</td>
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### Course Outline

#### Graduate Certificate in Rail Signalling & Telecommunications

**Signalling & Safe Rail Operation (CPD1)**

The purpose of this course is to provide learners with an understanding of the role and the importance of signalling and telecommunications in provision of safe rail operations. Learners are introduced to safety as the main objective of signalling and learn how this objective is achieved in practice via signalling principles, safeworking rules, and failsafe designs for signalling systems and equipment. The course topics include processes for safety assurance and risk management, safety management techniques and the role of human factors in signalling and train control systems. Students learn how to identify operational hazards and select appropriate control methods and introduce quality and safety management requirements. Upon completion, they will be able to provide for safe rail operations in case of failure of signalling control and communication systems and read and understand a broad variety of documents including system safety plans, track plans, project requirement definitions, interface specifications and many others.

**Signalling Principles (CPD2)**

The purpose of this course is to provide students with a thorough knowledge of signalling principles and ensure that students will be able to apply this knowledge in a safe and cost effective manner. The course content includes principles of multiple-aspect signalling, as well as signalling principles used in interlocking, level crossing, single and double lines control, and train detection and automatic protection systems. The course explains principles used in radio based signalling systems including ERTMS and introduces students to protection measures for safeguarding signalling and train control systems against human errors. Upon completion of the unit learners will be able to prepare interlocking and control tables for a given layout and design a simple panel layout and indications. They also will be able to interpret control tables, aspect sequence charts, signal circuit diagrams and application logic equations and apply signalling principles to specific applications.

**Signalling the Layout (CPD3)**

The purpose of this course is to ensure that learners are capable of signalling the layout for a variety of different traffic patterns and equipment systems in a professional and cost effective manner taking into account constraints of the layout and safety requirements. The course explains relationship between intensity of traffic, track geometry and rolling stock parameters, and spacing of signals. Students understand the impact of network operational factors on operational requirements for interlockings and terminals. Other topics covered by this course include risk assessment for level crossings, junctions and terminals as well as principles for investigating incidents involving signalling equipment. Upon completion of the course learners will be able to interpret user’s requirements and, for a particular track plan, demonstrate signalling layout required for safe train movements. They will also be able to identify potential hazards in a layout and explain measures for reducing or avoiding risks and demonstrate how safe configuration of signalling and telecommunications is achieved via safety management processes.

#### Graduate Diploma in Rail Signalling & Telecommunications

**Signalling Applications Engineering (CPD4)**

The purpose of this course is to provide users with a broad knowledge of individual signalling equipment and units at the sub-system level. Learners are introduced to a wide range of equipment used in signalling, control and telecommunications. The
The course considers impact of electromagnetic compatibility and environmental factors on functioning of different types of equipment. Special topics of the course are dedicated to installation, testing and commissioning of equipment. Upon completion of this unit students will be able to select appropriate equipment for specific signalling applications to achieve safety of operation and cost efficiency. They will also be able to prepare a functional specification and a maintenance plan, develop fault trees for a given subsystem and equipment and provide for their continuing and safe operation at all stages of the lifecycle.

System Management and Engineering (CPD5)
The purpose of this course is to equip learners with the knowledge and skills required for integrating diverse signalling, control and telecommunication equipment and multiple subsystems into a system in a safe and professional manner. Students are introduced to standards, management and control procedures, quality assurance system and documentation required at the stages of design and development of signalling systems. They are introduced to safety assurance, technology risk and competency management processes and will be able to assess the impact of operational, environmental and whole-of-life cost factors on a system. Upon completion of the course students will be able to prepare a specification and configure a signalling system to achieve safety, reliability and efficiency in operations. They also will be able to analyse maintainability of a system, provide for its continuing and safe operation, compile a safety plan, and manage competence of staff.

Signalling Research/Investigation Project (CPD6)
The purpose of this course is to enhance knowledge and skills of students as system engineers. Students undertake a project in the area of signalling and/or telecommunication and contribute to the body of professional know-how. On successful completion of this course students will produce a research or investigation project that is suitable for presentation to the Institution of Railway Signal Engineers and/or in other professional forums and meetings. The course introduces learners to research and investigation methodologies and intellectual property protection and ownership issues. Upon completion of the course students will be qualified to undertake a range of professional tasks including:
- Develop a railway signalling/control or telecommunication system to meet client’s needs;
- Review and critically assess current art of professional practices in signalling and telecommunication engineering;
- Investigate and compare signalling, control or telecommunication practices used by different rail organisations;
- Investigate and suggest options for improving effectiveness of a current practice or system.

Railway Telecommunications (CPD7)
The purpose of this course is to provide broad, systematic knowledge of telecommunications technology and its application in the railway environment. Students will learn how optical fibre, copper and radio systems are designed and will examine some of the mobile radio communication technologies. Immunisation of communication systems for use in electrified railways is studied, along with broader issues of electromagnetic compatibility. System safety, embracing the whole communication system from user to user, is a recurrent theme throughout the module. Students will develop a professional understanding of the factors to be considered in applying telecommunications systems and equipment in a railway environment in a safe, fit for purpose and cost effective manner.

Professional Competency (CPD0)
This course builds upon the skills and knowledge gained during the Railway Signalling program, and provides an opportunity for students to apply these skills and knowledge to practical situations. It allows students to demonstrate their competence in planning and undertaking tasks in railway signalling in the work environment. Students can elect to take one of the following competency streams:
- Design;
- Installation;
- Test and Commissioning;
- Maintenance.

On successful completion of this course, students are expected to have demonstrated their competence in the required elements of the selected stream.

For Enrolment and Further Information
Please contact Vicky Kreiser via email: v.kreiser@cqu.edu.au or by phone +61 7 4923 2277, or Phone 13CQUni 13 27 86 or go to http://www.cqu.edu.au/study