Programme Name
Master of Science in Railway Engineering (Mixed Mode)

About the Programme
This program is a FULL-TIME program with a combination of Course-Work and Research Activities for a total minimum duration of 3 Semesters. Total credit hours for this program is 43 credits – 50% on Course-Work (8 courses) and 50% on Research (Dissertation 1 and 2).

The main aim of this program is to develop knowledge, improve strategies and decision making in design, operation and performance of railway engineering. Being the only one of its kind in Malaysia, this program gives not only an accredited Masters of Science degree, but also an exciting and rewarding career opportunities where the railway skills and knowledge will be highly sought after.

Programme Educational Objectives (PEO)
To produce a Masters graduate who:
1. Expert and competent in providing solutions and contribute to the advancement of knowledge in Railway Engineering field.
2. Demonstrates excellent leadership through effective communication, good social skills and practice continuous self-development.
3. Performs responsibility in professional and ethical manners for the betterment of organisation, community, society and nation.

Programme Learning Outcomes (PLO)
These are the PLOs for Master of Science in Railway Engineering (Mixed Mode):
1. Demonstrate mastery of knowledge and independence in undertaking analytical and critical evaluation, and synthesis of information, specialized concepts, theories, methods and practice in Railway Engineering. (Knowledge and Understanding, KU)
2. Apply knowledge critically and integratively to manage and resolve complex issues in Railway Engineering through investigations and research using advance techniques, tools or skills for decision making and producing innovative solutions or practice. (Cognitive Skills, C)
3. Conduct standard and specialized research methods and apply practical skills, tools or investigative techniques for new research and applications in Railway Engineering. (Practical Skills, PS)
4. Work collaboratively with different people in learning and working communities or networks. (Interpersonal Skills, IS)
5. Communicate effectively to convey the knowledge, skills, ideas, critique and conclusion using appropriate methods to peers, experts, and non-experts. (Communication Skills, CS)
6. Competently use a wide range of suitable digital technologies and appropriate software to enhance study and research in Railway Engineering. (Digital Skills, DS)
7. Apply mathematical and other quantitative and/or qualitative tools to analyze and evaluate numerical and graphical data in Railway Engineering. (Numeracy Skill, NS)
8. Demonstrate significant autonomy, independence, leadership, and interpersonal skills in planning and managing task. (Leadership, Autonomy and Responsibility, LAR)
9. Demonstrate self-advancement through continuous academic and professional development for life-long learning. (Personal Skill, PES)
10. Recognise the importance of entrepreneurship in Railway Engineering and its related discipline. (Entrepreneurial Skills, ES)

11. Performs responsibility with good ethical judgments and decisions by adhering to legal code, ethics and professional practice. (Ethics and Professionalism, EP)

Curriculum Structure

	SEMESTER 1		
	Course code	**Course name**	**Credits**
	KNT 10003	Research Methodology	3
	CNR 10103	Transportation System & Planning	3
	CNR 10203	Infrastructure and Track Systems	3
	CNR 10303	Train Control System	3
YEAR 1	CNR 10403	Rolling Stock &Traction System	3
		Total credits	*15*
	SEMESTER 2		
	Course code	**Course name**	**Credits**
	CNR 10502	Railway Management	2
	CNR 10605	Dissertation 1	5
	CNR 1***3	*Elective 1	3
	CNR 1***3	**Elective 2	3
		Total credits	*13*
YEAR 2	SEMESTER 3		
	Course code	**Course name**	**Credits**
	CNR 10715	Dissertation 2	15
		Total credits	*15*

*Elective 1: Railway Electrification System, Railway Operation and Maintenance,
Railway Track Engineering Design
**Elective 2: Signalling and Communication, Project Management,
Rolling Stocks Technologies and Maintenance

Curriculum Synopsis

KNT 10003 Research Methodology

Synopsis
This module introduces the students to the concepts and skills of research methodology. This course is to learn how research is being done, and to put that knowledge into practice. Students learn how to apply a great number of statistical techniques, draw conclusions from those, and determine what statistical technique would be suitable for a given dataset and/or research question. Besides, further exposure on the elements of the research process within quantitative, qualitative, and mixed methods approaches. Furthermore, this course exposes students to bacics of entrepreneurship concept. This module provides students with explanations and sharing experiences to develop skills required for the industry.

CNR 10103 Transportation System and Planning

Synopsis

This course will discuss on the components of the transportation system, transportation planning process, zoning and network construction. The fundamental stages on travel demand forecasting will be discussed in details; trips matrix building, trip production and distribution methods, modal split and trip. Further discussions will be covered relate to transportation planning process; development of transport strategies and plans, transportation system analysis, multimodal traffic management, environmental impact of transportation., terminals characteristics, integration of multimodal transportation modes and transport economics and project evaluation.

CNR 10203 Infrastructure and Track Systems

Synopsis

Infrastructure and track system are the branch of study applied to the railway infrastructure and engineering. The emphasis is mostly on topics related to civil engineering discipline. The course includes lectures, case studies and field visits, that ensure students leave the program with a broad and practical view of the modern railway system. The course will require students to use creative thinking and teamwork for solving problems. The course will cover a wide variety of topics within railway field, including introduction to railway infrastructure and track system, tunnel system, railway bridge, station infrastructure and high-speed rail.

CNR 10303 Train Control System

Synopsis

Train control system is one of the most important parts of the many which make up a railway system. Train movement safety depends on it and the control and management of trains depends on them. Over the years, many train control systems have been evolved so that today a highly technical and complex industry has developed. In this course, in simple terms, how train control system was developed and the importance of it has been given in detail.

CNR 10403 Rolling Stock & Traction System

Synopsis

This course will cover introduction to rolling stock engineering, design fundamentals of railway vehicles, material specifications, railway vehicle dynamics and traction system of rolling stocks.

CNR 10502 Railway Management

Synopsis

This course covers management principles which are crucial to the railway industry. Areas covered include strategic management, planning and formulation, economics, finance, business and managing industries stakeholders. Economics is covered at a basic level and includes the issues of supply and demand, macro and micro-economics and marginal costing as well as some elements of balance sheet analysis and project financing. KPIs and benchmarking are also covered in this part of the module. Both economics and technology strategy are taught by means of lectures and case studies.

CNR 11103 Railway Electrification System

Synopsis
This course teaches the method of supplying electricity to electric trains. Topics will be taught in this course include Railway Electrification Systems, DC Electric Railway System, AC Electric Railway System, HV AC Electrical System for High Speed Railways, Signal Compatibility With AC Railway Electrification, Electrification Economic Studies and Electrification System Selection.

CNR 10803 Railway Operation and Maintenance

Synopsis
This course covers the range of railway operations and maintenance activities derived from railway planning of the special characteristics of the rail mode. Areas addressed include railway technology, operation and maintenance planning, railway infrastructure and services, planning, transportation model, queuing & sequencing and most importantly, safety in railway. Normally, the module also includes a short seminar on a topic of current importance for the industry. The course is supported by the industry with speakers and includes a visit to track system plants.

CNR 11003 Railway Track Engineering Design

Synopsis
This course covers the introduction to railway track engineering design, components of track, railway track design standards and specifications, fundamental considerations in railway track design, basic design of track components, geometric design of railway track and design of points and crossings (turnout).

CNR 11203 Signalling and Communication

Synopsis
Over the years, many signalling and communications systems have been evolved so that today a highly technical and complex system has been developed. This course will cover the principles and concepts of signalling and communications in modern railway systems. The topics cover are safety in railway operation, principles in signalling, layout of signalling, applications in railway engineering, signalling systems, management and engineering and railway telecommunications.

CNR 10903 Project Management

Synopsis
This course covers the introduction to project management, project organisation, project life cycle, project planning and scheduling, cost planning, and project communication and documentation.

CNR 11303 Rolling Stocks Technologies and Maintenance

This course covers the introduction to rolling stocks technologies and maintenance, systems and components, systems and car body structure, under carriage, bogies, amenities, braking system, safety standards, planning for maintenance, maintenance monitoring system and maintenance of major components of rolling stocks

CNR 10605 Dissertation 1

Synopsis
This course covers a systematic approach to students in conducting research. Students will be supervised by graduate staff specialized in the particular area and conduct research under supervision. The nature of the project involves in-depth investigation of a relevant topic, related works and development of significant and functional component of related engineering system and/or application. Students are encouraged to carry out the project in industry with joint industry-academic supervision. The students are expected to produce problem statements, literature review and expected findings.

CNR 10715 Dissertation 2

Synopsis
This course covers a systematic approach to students in conducting research. Students will be supervised by graduate staff specialized in the particular area and conduct research under supervision. The nature of the project involves in-depth investigation of a relevant topic, related works and development of significant and functional component of related engineering system and/or application. Students are encouraged to carry out the project in industry with joint industry-academic supervision. The students are expected to produce problem statements, literature review, methodology, results and discussions and conclusions.