Subject Description Form

Subject Code	EE533
Subject Title	Railway Power Supply Systems
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Collaboration Institute	MTR Academy
Objectives	1. To enable students to develop a comprehensive understanding of the modern railway power supply systems in metro and mainline systems. 2. To provide an appreciation of the specifications and design of the supply system configuration. 3. To enable students to understand the implications of supply system design on safety and service quality, as well as the practices and difficulties in implementation. 4. To provide students with the basic terminology and the practical processes of testing and commissioning. 5. To enable students to comprehend the connection of the railway supply system to the utility distribution network.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify the key components in a railway supply system and their functions and appreciate the relationship of the supply system to other systems in railway. b. Differentiate the requirements on power supply systems in different railway systems, metros, mainlines and light rails. c. Apply the knowledge on power supply system to comprehend the design and installation of power supply system. d. Discuss procedures of testing and commissioning of railway power system and analyse possible faults. e. Recognise the importance to engage in self-learning on latest technologies on railway systems at this advanced level of study.
Subject Synopsis/ Indicative Syllabus	1. General aspect of railway power supply system: Metro system, Light rail system, electric multiple units and locomotives, functions of traction supply system, interface requirement among power and traction supply system, contact line system, permanent way, signalling, SCADA and train. 2. Railway power supply system – requirement and specification: Types of railway power supply systems, basic structure and design of standard AC distribution and DC traction substation and control system. 3. DC and AC overhead line system and equipment: Terminology, overhead contact line types and basic characteristic; Basic design – mechanical, electrical and civil; Design for installation, testing and commissioning; failure analysis. 4. Traction earthing and DC stray current control system: Terminology, operation requirement and specification; DC current return, earthing and bonding; Design for installation, testing and commissioning; Failure analysis.

5. AC traction supply system and power quality issues: Configuration and operation of 25kV system; Power quality; Voltage dip, harmonics, imbalance, and remedial measures.
6. Traction drives, tractive effort and power calculations, overview of traction motors, VVVF control, PWM control, and regenerative braking.
7. EMC: Principles of EMC, railway-related interference problems and their solutions, booster transformer.
8. Site visit to MTR power supply systems.

Teaching/Learning Methodology

The main lecturers are from MTRC, and their experiences/knowledge are shared with students via lectures and tutorials for conveying the concept and theories. The site visit to MTR system has reinforced the pragmatic design and application in a realistic system. Problem solving skill and team work are trained via minor project and laboratory.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	✓
Tutorials		✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	✓	✓	✓	✓	
2. Test	20%	✓	✓	✓	✓	
3. Presentation/ Essay Submission	20%	✓	✓	✓	✓	✓
Total	100%					

The proposed assessment methods will be effective and adequate in gauging the extent of learning outcomes acquired by the students of this subject.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	33 Hrs.
▪ Site visit	6 Hrs.
Other student study effort:	
▪ Presentation and Report preparation	24 Hrs.
▪ Self-study	42 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. Selected papers on IEE Proceedings on Electric Power Applications
2. Selected papers on IEE Proceedings on Power Systems