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DEVELOPMENT OF EDUCATION MODULES FOR SAFETY CRITICAL RAILWAY OPERATION SYSTEMS

DEM-SaCROS
2023



**DEVELOPMENT OF EDUCATION MODULES
FOR RAIL SYSTEM ELECTRICS ELECTRONICS**



**EDUCATION MODULES
FOR RAIL SYSTEM ELECTRIC
ELECTRONICS**

**DEM-SaCROS
2023**





**DEVELOPMENT OF EDUCATION MODULES
FOR RAIL SYSTEM ELECTRICS ELECTRONICS**



COURSE CONTENTS

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LEARNING OUTCOMES





DEVELOPMENT OF EDUCATION MODULES FOR RAIL SYSTEM ELECTRICS ELECTRONICS



PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM CONSTRUCTION
COURSE SEMESTER	RAIL SYSTEM ELECTRIC ELECTRONICS
WEEKLY COURSE PERIOD	
COURSE DURATION	MATHEMATICS I

AIMS

1. To be able to do mathematical operations concerning accounting number, natural numbers, integers, rational numbers and irrational numbers.
2. To be able to express the basic identities to solve an equation.
3. To be able to explain the function
4. To be able to explain logarithm
5. To be able to understand and explain trigonometry
6. To be able to calculate the area and volume of different geometries

SPECIAL DEFINITIONS

In order to increase the student's, mathematical skills which would be necessary to improve the analytical and geometrical understanding of them, basic mathematical operations, identities and equations would be introduced. Besides, the further information regarding the geometry and trigonometry will improve the rational thinking skills of the students.

EVAULATION TABLE

The percentages of the studies conducted related to topic and teaching style are given according to their weights in the table below. While final exam questions preparing, this percentage shall be considered.

<i>TOPICS</i>	<i>Ratios of Topics (%)</i>
A. Mathematical operations concerning accounting number, natural numbers, integers, rational numbers and irrational numbers.	20
B. The basic identities to solve an equation	15
C. Function	20
D. Logarithm	15
E. Trigonometry	15
F. Area and Volume	15

TOPICS





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A. Workplace Management & Administration Mathematical operations concerning accounting number, natural numbers, integers, rational numbers and irrational numbers.

AIM: To be able to do mathematical operations concerning accounting number, natural numbers, integers, rational numbers and irrational numbers.

LEARNING OUTCOMES

1. Do arithmetic operations concerned rational and irrational numbers .
2. Recognize exponentiation numbers that come out and practice operations.
3. Recognize arithmetic operations with radical numbers
4. Recognize absolute value.

B. The basic identities to solve an equation

AIM: To be able to express the basic identities to solve an equation.

LEARNING OUTCOMES

1. factorize quadratic equation.
2. Solve rational statement.
3. Solve equation
4. Recognize absolute value.

C. Function

AIM: To be able to explain function

LEARNING OUTCOMES

1. Define function concept.
2. Find out domain.
3. Find out inverse of function.
4. Plot function.

D. Logarithm

AIM: To be able to explain logarithm

LEARNING OUTCOMES

1. Define exponential functions and graph.
2. Define logarithm function.
3. Define natural logarithm.
4. express features of logarithm.

E. Trigonometry

AIM: To be able to understand and explain trigonometry

LEARNING OUTCOMES

1. Recognize an angle measure unity.





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2. Set ratios of sine, cosine and tangent for acute angle.
3. Know inverse trigonometric ratios.
4. Graph trigonometry function.

F. Area and Volume

AIM: To be able to calculate the area and volume of different geometries

LEARNING OUTCOMES

1. calculate area and volume of geometric figure.
2. Apply euclidean and Pythagorous' theorems.
3. Calculate areas of irregular geometric figures.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM CONSTRUCTION
COURSE SEMESTER	RAIL SYSTEM ELECTRIC ELECTRONICS
WEEKLY COURSE PERIOD	
COURSE DURATION	MATHEMATICS II

AIMS

1. To be able to do matrices and determinants
2. To be able to do solutions of linear systems of equations
3. To be able to explain the integral
4. To be able to explain definition of derivative
5. To be able to understand and explain exponential and logarithmic functions
6. To be able to understand solutions of linear systems of equations

SPECIAL DEFINITIONS

In order to increase the student's, mathematical skills which would be necessary to improve the analytical and geometrical understanding of them matrices and determinants, solutions of linear systems of equations, the integral, definition of derivative, exponential and logarithmic functions and linear systems of equations.

EVAULATION TABLE

The percentages of the studies conducted related to topic and teaching style are given according to their weights in the table below. While final exam questions preparing, this percentage shall be considered.

TOPICS	Ratios of Topics (%)
A. Matrices and Determinants	20
B. Solutions of Linear Systems of Equations	15
C. Integral	20
D. Derivative, Definition of derivative	15
E. Exponential and Logarithmic Functions	15
F. Solutions of Linear Systems of Equations	15

TOPICS

A. Mathematical operations concerning matrices and determinants.

AIM: To be able to do mathematical operations concerning matrices and determinants.

LEARNING OUTCOMES

1. Do arithmetic operations concerning matrices.
2. Do arithmetic operations concerning determinants.





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B. Solutions of Linear Systems of Equations

AIM: To be able to do the solutions of linear systems of equations.

LEARNING OUTCOMES

1. Solve equations.

C. Integral

AIM: To be able to understand integral

LEARNING OUTCOMES

1. Define integral.
2. Find out definite integral.
3. Find out indefinite integral.
4. Understand properties of integral.

D. Derivative

AIM: To be able to explain definition of derivative

LEARNING OUTCOMES

1. Define tangent line, properties of the derivative.
2. Define chain rule.
3. Define derivatives of polynomial, rational, exponential and logarithmic functions.

E. Exponential and Logarithmic Functions

AIM: To be able to understand and explain exponential and logarithmic functions

LEARNING OUTCOMES

1. Find out exponential and logarithmic functions.

F. Solutions of Linear Systems of Equations

AIM: To be able to understand solutions of linear systems of equations.

LEARNING OUTCOMES

1. Find out linear systems of equations.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM CONSTRUCTION
COURSE SEMESTER	RAIL SYSTEM ELECTRIC ELECTRONICS
WEEKLY COURSE PERIOD	
COURSE DURATION	RAILWAY SYSTEM TRAFFIC

AIMS

1. To introduce students to the basics of railway traffic management. This includes topics such as train signaling, train dispatching, and railway safety.
2. To help students develop the skills needed to analyze and solve railway traffic problems. This includes the ability to identify and assess risks, develop and implement safety procedures, and manage train traffic in a safe and efficient manner.
3. To encourage students to consider careers in the railway industry. The railway industry is a growing sector with a wide range of career opportunities. By learning about railway traffic management, students can gain the skills and knowledge needed to pursue a rewarding career in this field.

SPECIAL DEFINITION

Train signaling: This includes the different types of train signals, how they work, and how they are used to control train movements. Train dispatching: This includes the process of planning and coordinating train movements, as well as the role of the train dispatcher. Railway safety: This includes topics such as railway signaling, train dispatching, and railway operations. Problem-solving: This includes the ability to identify and assess risks, develop and implement safety procedures, and manage train traffic in a safe and efficient manner.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Information about trains and other railway vehicles, signs and signals in railways	30
B. Regulations and crisis management in breakdowns and disorders	30
C. Classification of railway vehicles, preparation of trains for departures and regulations for railway traffic	40





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TOPICS

A. Understands information about trains and other railway vehicles, signs and signals in railways

AIM: To understand information about trains and other railway vehicles, signs and signals in railways

LEARNING OUTCOMES

1. To be able to understand information about trains and other railway vehicles.
2. To know about signs and signals in railways.

B. Regulations and crisis management in breakdowns and disorders

AIM: To know regulations and crisis management in breakdowns and disorders

LEARNING OUTCOMES

1. Understand and know regulations and crisis management in breakdowns and disorders

C. Classification of railway vehicles, preparation of trains for departures and regulations for railway traffic

AIM: To recognize classification of railway vehicles, preparation of trains for departures and regulations for railway traffic

LEARNING OUTCOMES

1. Understands the classification of railway vehicles, preparation of trains for departures and regulations for railway traffic





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PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	CIRCUIT ANALYSIS
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To develop an understanding of computer-aided circuit analysis tools and their applications.
2. To gain practical skills in using circuit simulation software for analyzing electronic circuits.
3. To learn various types of circuit analyses and their relevance in electronic design.

SPECIAL DEFINITION

Demonstrate proficiency in using ISIS software for schematic drawing and circuit simulation. Understand the general concepts of ISIS, including graphics, reporting, and print outputs. Perform various types of circuit analyses, such as analog, digital, frequency, noise, audio, interactive, and digital conformance analyses.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Introduction to circuit theory	30
B. Electrical power and energy	30
C. Amplitude, frequency, and phase in ac circuits	40

TOPICS

A. Introduction to circuit theory

AIM: To get know basics of circuit theory

LEARNING OUTCOMES

1. Apply Ohm's Law and understand the relationship between current, voltage, and resistance.
2. Calculate power and energy in electrical circuits.
3. Analyze and solve complex circuits using different circuit analysis methods, including Kirchhoff's Laws, the Mesh Current Method, and the Node Voltage Method.





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B. Electrical power and energy

AIM: To get know electrical power and energy

LEARNING OUTCOMES

1. Determine the equivalent resistance of series and parallel combinations of resistors.
2. Analyze circuits with dependent and independent voltage and current sources.
3. Apply source transformations to simplify circuit analysis.

C. Amplitude, frequency, and phase in ac circuits

AIM: To get know amplitude, frequency, and phase in ac circuits

LEARNING OUTCOMES

1. Understand the concept of alternating current (AC) and analyze AC circuits.
2. Calculate power and determine phase relationships in AC circuits.
3. Analyze RL, RC, and RLC circuits in AC.
4. Interpret phase diagrams and understand reactance and impedance.
5. Understand the principles and applications of transformers in electrical circuits.





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PROGRAM TITLE COURSE CODE AND TITLE COURSE SEMESTER WEEKLY COURSE PERIOD COURSE DURATION	RAIL SYSTEM ELECTRIC ELECTRONICS MEASUREMENT TECHNIQUE
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AIMS

1. Explain the fundamental principles and concepts of measurement techniques.
2. Identify and analyze various sources of measurement errors and propose strategies to mitigate them.
3. Select and operate appropriate analog and digital measurement equipment for specific measurement tasks.
4. Perform accurate measurements of current, voltage, power, and frequency using suitable techniques.
5. Apply mechanical, pneumatic, and hydraulic measurement methods in practical scenarios.
6. Measure speed, velocity, heat, and gravity accurately using appropriate instruments.
7. Apply quantitative measurement techniques in transmission systems to identify and troubleshoot failures.
8. Comply with safety regulations and guidelines while conducting electrical measurements.

SPECIAL DEFINITION

Develop a comprehensive understanding of measurement techniques used in various industries and vocational settings. Acquire the necessary skills to perform accurate measurements and interpret measurement data effectively. Familiarize students with the principles, tools, and instruments commonly used in measurement processes.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Introduction to measurement techniques, standards and units	30
B. Data acquisition and analysis	30
C. Measurement in specific industries	40





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TOPICS

A. Introduction to measurement techniques, standards and units

AIM: To get know introduction to measurement techniques, standards and units

LEARNING OUTCOMES

1. Demonstrate a sound understanding of measurement principles and techniques.
2. Select appropriate measurement instruments and devices for specific tasks.
3. Perform accurate measurements using standard procedures.

B. Data acquisition and analysis

AIM: To get know data acquisition and analysis

LEARNING OUTCOMES

1. Apply calibration methods to ensure measurement accuracy and traceability.
2. Analyze and interpret measurement data, including error analysis and uncertainty estimation.
3. Utilize statistical techniques to analyze and present measurement results.

C. Measurement in specific industries

AIM: To get know measurement in specific industries

LEARNING OUTCOMES

1. Apply relevant measurement techniques in various industrial contexts.
2. Understand the importance of metrology and quality control in industrial settings.
3. Demonstrate awareness of safety procedures and ethical considerations in measurement practices.
4. Solve problems related to measurement techniques and make informed decisions based on measurement data.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE SEMESTER	RAIL SYSTEM CONSTRUCTION
WEEKLY COURSE PERIOD	
COURSE DURATION	TECHNICAL DRAWING

AIMS

1. Teach students the basic principles of technical drawing, such as line types, lettering, and dimensioning.
2. Help students develop their skills in sketching and drafting.
3. Enable students to communicate their ideas clearly and concisely through technical drawings.
4. Prepare students for careers in engineering and other fields where technical drawing is a necessary skill.

SPECIAL DEFINITION

Problem-solving: Technical drawing requires the ability to solve problems and think critically. Students will learn how to use their technical drawing skills to solve problems and come up with creative solutions. **Communication:** Technical drawings are a form of communication. Students will learn how to use their technical drawing skills to communicate their ideas clearly and concisely to others. **Teamwork:** Technical drawings are often created by teams of people. Students will learn how to work effectively as part of a team to create technical drawings.

EVALUATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Engineering Drawing and Tools	30
B. Geometric Projection and Drawing Views	30
C. Scaling and Measuring	40

TOPICS

A. Engineering Drawing and Tools

AIM: Students know details of engineering drawing and tools.

LEARNING OUTCOMES

1. Knows papers used at drawing and other tools.
2. Know measurements of paper standards.





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B. Geometric Projection and Drawing Views

AIM: Knows scaling and measuring, cross section views, perspective, roughness of surfaces and surface processing signs, tolerance and exercises.

LEARNING OUTCOMES

1. Students can draw cross section views, perspective and tolerance.
2. Students can define roughness of surfaces and surface processing signs.

C. Scaling and Measuring

AIM: To know scaling and measuring of parts.

LEARNING OUTCOMES

1. Students can understand and draw scaling and measuring tools.





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PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	ENERGY PLANTS
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To understand the energy production, transmission and distribution process.
2. To recognize the types of energy sources used in rail systems, their working principles and maintenance processes.
3. To raise awareness about energy efficiency, environment and energy recycling.

SPECIAL DEFINITION

With the ENERGY PLANTS course, students will be provided with general information about energy production, transmission and distribution, and energy resources used in rail systems. In addition, it is aimed to improve students' awareness of energy efficiency and the environment. Technical trips will be organized so that the students can observe the energy facilities on the job. In order to practice, the course should be supported by homework, practices and knowledge.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Energy Production	40
B. Energy Resources	40
C. Energy Efficiency	20

TOPICS

A. Energy Production

AIM: To understand the energy production, transmission and distribution process.

LEARNING OUTCOMES

1. Classifies the resources used in energy production.
2. Comprehends the energy generation, transmission and distribution process.
3. Explains network types and properties according to voltages.
4. Explains the switchyard and its equipment and the national regulations to be complied with.

B. Energy Resources

AIM: To recognize the types of energy sources used in rail systems, their working principles and maintenance processes.





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LEARNING OUTCOMES

1. Explains the types and working principles of rectifiers and batteries.
2. Explains the working principles of inverters and converters.
3. Classifies power distribution systems.
4. Explains catenary, city network, generator, and feeding circuits.
5. Understands the general structure and working principle of UPS systems.
6. Recognizes the purpose and types of grounding.

C. Energy Efficiency

AIM: To raise awareness about energy efficiency, environment and energy recycling.

1. Lists traditional and renewable energy types.
2. Explains the transformation processes.
3. Comprehends the energy saving methods in the industry.
4. Understands the effect of recycling in energy saving.

Gains a conscious perspective on energy consumption.





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PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	RAILWAY ELECTRIFICATION I
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To recognize the types, equipment, general features and structures of railway electrification systems.
2. To know the design criteria, project and installation processes and basic components of catenary systems.
3. To understand the control, measurement, maintenance and repair processes of the catenary line.
4. To work in accordance with electrical operating rules and working at height rules.

SPECIAL DEFINITION

With the RAILWAY ELECTRIFICATION I course, students will be provided with general information about the general characteristics of railway electrification, the design and installation of catenary systems, and their maintenance and repair. Technical trips will be organized so that the students can observe the catenary facilities on the job. In order to practice, the course should be supported by homework, practices and knowledge.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Railway Electrification	30
B. Catenary Systems	40
C. Maintenance and Repair of Catenary Systems	20
D. Safety in Electrification Systems	10

TOPICS

A. Railway Electrification

AIM: To recognize the types, equipment, general features and structures of railway electrification systems.

LEARNING OUTCOMES

1. Classifies the electrification systems of rail systems.
2. Recognizes the equipment and general features of electrification systems.
3. Comprehends the general structures of AC/DC supply systems.





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B. Catenary Systems

AIM: To know the design criteria, project and installation processes and basic components of catenary systems.

LEARNING OUTCOMES

1. Explains the geometric characteristics of basic catenary system and the design criteria.
2. Recognizes the components and equipments of the catenary system.
3. Explains the design principles and installation stages of catenary systems.
4. Explains the types and properties of the conductors used in the catenary system.
5. Explains the feeding systems and facility areas.
6. Explains electrical maneuvers.

C. Maintenance and Repair of Catenary Systems

AIM: To understand the control, measurement, maintenance and repair processes of the catenary line.

LEARNING OUTCOMES

1. Lists the control parameters of the catenary line.
2. Recognizes the measuring and control machines of the catenary line.
3. Explains the maintenance processes of catenary systems.
4. Explains the testing and procedures for commissioning after maintenance.

D. Safety in Electrification Systems

AIM: To work in accordance with electrical operating rules and working at height rules.

LEARNING OUTCOMES

1. Comprehends the rules to be followed under electrical operation.
2. Knows the signs and plates related to electrification systems and their meanings.
3. Lists the general rules about working at height.
4. Recognizes the protective equipment and methods against falling.





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PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	RAILWAY ELECTRIFICATION II
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To know the railway substation and its components, to comprehend their duties and maintenance procedures.
2. To comprehend telecommand center and its components and their duties.
3. To explain the importance of grounding, its types and the points to be considered while grounding.
4. To explain the measures to be taken regarding occupational safety and operational safety in high voltage facilities.

SPECIAL DEFINITION

With the RAILWAY ELECTRIFICATION II course, students will be provided with general information about the general characteristics of transformer and telecommand systems, as well as their maintenance and repair. Technical trips will be organized so that the students can observe the transformer and telecommand facilities on the job. In order to practice, the course should be supported by homework, practices and knowledge.

EVALUATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Transformer Systems	40
B. Telecommand Systems	30
C. Grounding	15
D. Safety in High Voltage Facilities	15

TOPICS

A. Transformer Systems

AIM: To know the railway substation and its components, to comprehend their duties and maintenance procedures.

LEARNING OUTCOMES

1. Recognizes the substation and its components.
2. Reads single line diagrams of substations.
3. Explains the types and functions of transformers in the substation.
4. Comprehends the on-off devices used in high voltage circuits and their properties.





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5. Explains the functions of surge arresters and protection relays.
6. Explains the points to be considered in the maintenance of substations.

B. Telecommand Systems

AIM: To comprehend telecommand center and its components and their duties.

LEARNING OUTCOMES

1. Recognizes Scada systems.
2. Recognizes telecommand center and its components.
3. Explains the working principle of the telecommand system.
4. Explains the points to be considered in the maintenance of the telcommand system.

C. Grounding

AIM: To explain the importance of grounding, its types and the points to be considered while grounding.

LEARNING OUTCOMES

1. Understands the concept of grounding and its importance.
2. Explains the types of grounding.
3. Explains the points to be considered in grounding.
4. Measures the grounding resistance.

D. Safety in High Voltage Facilities

AIM: To explain the measures to be taken regarding occupational safety and operational safety in high voltage facilities.

LEARNING OUTCOMES

1. Knows the safety precautions to be taken in high voltage facilities.
2. Explains the requirements for regulation and operational safety of high voltage facilities.





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PROGRAM TITLE COURSE CODE AND TITLE COURSE SEMESTER WEEKLY COURSE PERIOD COURSE DURATION	RAIL SYSTEM ELECTRIC ELECTRONICS COMMUNICATION TECHNOLOGY I
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AIMS

1. To provide an overview of mobile data transmission systems.
2. To get to know the types of operation of radio communication systems.
3. To get to know the mobile systems of the higher generations.
4. To describe LTE systems – systems parameters, system architecture, physical layer.
5. To get to know ITS – Intelligent Transport Systems.
6. To describe 5G systems.

SPECIAL DEFINITION

The course aims to introduce students to the principles and techniques of terrestrial radio communication systems for the transmission of telephone, data and multimedia signals. The gradual introduction of these technologies into telematics applications, including applications designed to increase the safety of transport infrastructure operations are aimed as well.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Overview of mobile data transmission systems	10
B. Types of operation of radio communication systems	15
C. Mobile systems of higher generation	15
D. LTE systems – systems parameters, system architecture, physical layer	20
E. ITS – Intelligent Transport Systems	20
F. 5G systems	20





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TOPICS

A. Overview of mobile data transmission systems

AIM: To provide an overview of mobile data transmission systems.

LEARNING OUTCOMES

1. Understands the main principle of mobile data.
2. Understands the mobile data transmission systems.

B. Types of operation of radio communication systems

AIM: To get to know the types of operation of radio communication systems.

LEARNING OUTCOMES

1. Understands the methods of mass access.
2. Understands radio communication systems.

C. Mobile systems of higher generation

AIM: To get to know the mobile systems of the higher generations.

LEARNING OUTCOMES

1. Understands data transmission parameters.
2. Understands system architecture.
3. Understands high-speed data transmission of mobile systems.

D. LTE systems – systems parameters, system architecture, physical layer

AIM: To describe LTE systems – systems parameters, system architecture, and physical layer.

LEARNING OUTCOMES

1. Understands of LTE systems parameters.
2. Understands of physical layer of LTE systems.

E. ITS – Intelligent Transport Systems

AIM: To get to know ITS – Intelligent Transport Systems.

LEARNING OUTCOMES

1. Understands application of ITS to the field of road transport.
2. Analyze data from ITS systems.
3. Control, manage and plan transportation by ITS.

F. 5G systems

AIM: To describe 5G systems.

LEARNING OUTCOMES

1. Understands the Internet of Things concept.
2. Understands the channel coding techniques for 5G.





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PROGRAM TITLE COURSE CODE AND TITLE COURSE SEMESTER WEEKLY COURSE PERIOD COURSE DURATION	RAIL SYSTEM ELECTRIC ELECTRONICS COMMUNICATION TECHNOLOGY II
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AIMS

1. To expand the knowledge of mobile data transmission systems.
2. To get to know properties and mass access methods of communication systems.
3. To get to know the evolution of GSM for data transmission.
4. To analyse 3G systems – architecture, physical layer, and data transmission.
5. To get to know standards 802.11x and 802.11p.
6. To describe WPAN personal networks.

SPECIAL DEFINITION

The aim of the course is to analyse of the principles of data transmission in 2G to 4G networks, which are gradually reflected in the issue of the use of mobile communication systems for telematics applications. The studies of access networks according to the 802.11x standard and other technologies applicable in intelligent transport systems are also included.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Data transmission systems	15
B. Properties and mass access methods	15
C. GSM	20
D. 3G, 4G, 5G	20
E. Standards 802.11x and 802.11p	10
F. WPAN	20





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TOPICS

A. Data transmission systems

AIM: To expand the knowledge of mobile data transmission.

LEARNING OUTCOMES

1. Analysis of the main principles of mobile data.
2. Analysis of the mobile data transmission systems.

B. Properties and mass access methods

AIM: To get to know properties and mass access methods of communication systems.

LEARNING OUTCOMES

1. Analysis of the methods of mass access.
2. Analysis of the radio communication systems.

C. GSM

AIM: To get to know the evolution of GSM for data transmission.

LEARNING OUTCOMES

1. Description of GSM.
2. Usage of GSM.
3. Evolution of GSM.

D. 3G

AIM: To analyse 3G, 4G and 5G systems – architecture, physical layer, and data transmission.

LEARNING OUTCOMES

1. Description of the 3G, 4G and 5G architectures.
2. Analysis of the 3G, 4G and 5G physical layer.
3. Principles of the 3G, 4G and 5G data transmission.

E. Standards 802.11x and 802.11p

AIM: To get to know standards 802.11x and 802.11p.

LEARNING OUTCOMES

1. Analysis of the standard 802.11x.
2. Analysis of the standard 802.11p.

F. WPAN

AIM: To describe WPAN personal networks.

LEARNING OUTCOMES

1. Principles of personal networks.
2. Description of WPAN.





DEVELOPMENT OF EDUCATION MODULES FOR RAIL SYSTEM ELECTRICS ELECTRONICS



PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	COMMUNICATION TECHNOLOGY II
COURSE SEMESTER	
WEEKLY COURSE PERIOD	ELECTRONICS
COURSE DURATION	

AIMS

1. To provide a comprehensive understanding of the fundamental concepts and principles of electronics.
2. To familiarize students with various electronic components, devices, and circuits.
3. To develop practical skills in designing, analyzing, and troubleshooting electronic circuits.
4. To introduce students to the applications of electronics in various fields such as telecommunications, power systems, and optoelectronics.
5. To cultivate an appreciation for the importance of reliability, safety, and ethical considerations in electronic design and implementation.

SPECIAL DEFINITION

Provide students with a solid foundation in the principles and practices of electronics. Equip students with the necessary knowledge and skills to work in various electronic industries or pursue further education in the field.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Introduction to Electronics	15
B. Digital Electronic	15
C. Analog Electronics	20
D. Electronic Systems	20
E. Electronic Circuit Design	30





DEVELOPMENT OF EDUCATION MODULES FOR RAIL SYSTEM ELECTRICS ELECTRONICS



TOPICS

A. Introduction to Electronics

AIM: To understand basics of electronics.

LEARNING OUTCOMES

1. To know basic electronic components and their functions, circuit analysis techniques and laws (Ohm's law, Kirchhoff's laws, etc.), electrical safety procedures and practices.

B. Digital Electronics

AIM: To understand basics of electronics.

LEARNING OUTCOMES

2. To know Boolean algebra and logic gates, combinational and sequential logic circuits, digital integrated circuits and microcontrollers.

C. Analog Electronics

AIM: To get to know analog electronics

LEARNING OUTCOMES

1. To understand amplifiers and operational amplifiers, transistors and their applications. filters and oscillators.

D. Electronic Systems

AIM: To get to know the electronic systems.

LEARNING OUTCOMES

1. To understand power supplies and voltage regulation, communication systems and principles. sensors and actuators.

E. Electronic Circuit Design

AIM: To get know electronic circuit design

LEARNING OUTCOMES

1. To get know schematic diagrams and circuit simulation, PCB (Printed Circuit Board) design and layout, troubleshooting and debugging techniques.





DEVELOPMENT OF EDUCATION MODULES FOR RAIL SYSTEM ELECTRICS ELECTRONICS



PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	RAILWAY TELECOMMUNICATION
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To explain the types and specifications of railway telecommunication systems.
2. To comprehend the importance of telephone switchboards in railway telecommunications, the basic equipment and the working principle
3. To recognize the transmission lines used in railway telecommunication and to explain their general characteristics.

SPECIAL DEFINITION

With the RAILWAY TELECOMMUNICATION course, students will be introduced to railway communication systems with their general features, and they will be provided with general information about telephone systems and transmission lines used in railway communication. Technical trips will be organized so that the students can observe the railway communication systems on the job. In order to practice, the course should be supported by homework, practices and knowledge.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Communication Systems	40
B. Telephone Systems	30
C. Lines of Transmission	30

TOPICS

A. Communication Systems

AIM: To explain the types and specifications of railway telecommunication systems.

LEARNING OUTCOMES

1. Knows the basic components of the telecommunication system.
2. Knows railway telecommunication systems.
3. Explains the advantages and disadvantages of wireless communication systems.
4. Explains the features and general structure of the GSM-R system.
5. Explains wired telecommunication systems.





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B. Telephone Systems

AIM: To comprehend the importance of telephone switchboards in railway telecommunications, the basic equipment and the working principle

LEARNING OUTCOMES

1. Knows the development and features of telephone switchboards.
2. Explains the basic equipment and working principle of automatic telephone switchboards.
3. Comprehends the features of dispatcher telephone system.

C. Lines of Transmission

AIM: To recognize the transmission lines used in railway telecommunication and to explain their general characteristics.

LEARNING OUTCOMES

1. Knows the types of transmission lines and their usage areas.
2. Explains the properties of overhead line and telephone cables.
3. Explains the structure and technical features of signal and energy cables.
4. Defines the high frequency cable.
5. Comprehends the transmission problems that may occur in underground cables.
6. Explain the structure, types and application areas of fiber optic cable.





DEVELOPMENT OF EDUCATION MODULES FOR RAIL SYSTEM ELECTRICS ELECTRONICS



PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	RAILWAY SIGNALLING
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To recognize the basic concepts, historical development and basic principles of railway signaling systems.
2. To comprehend the central and trackside equipment and working principles of railway signaling systems.
3. To recognize the concept and types of interlocking, to comprehend interlocking circuits.
4. To understand the working principles and maintenance processes of train protection and control systems.
5. To comprehend the working principles and maintenance processes of level crossing protection systems.

SPECIAL DEFINITION

With the RAILWAY SIGNALLING course, students will be provided with the development of their knowledge and skills on the installation, control, maintenance and repair of railway signaling systems. Technical trips will be organized so that the students can observe the maintenance and repair activities of signaling systems on the job. In order to practice, the course should be supported by homework, practices and knowledge.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

<i>TOPICS</i>	<i>Ratios of Topics (%)</i>
A. Basic Principles of Railway Signaling	20
B. Signaling System Equipments	30
C. Interlocking Systems	20
D. Train Protection and Control Systems	20
E. Level Crossing Protection Systems	10

TOPICS

A. Basic Principles of Railway Signaling

AIM: To recognize the basic concepts, historical development and basic principles of railway signaling systems.





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LEARNING OUTCOMES

1. Recognizes the basic concepts of railway signaling systems.
2. Explains the development processes and purpose of railway signaling systems.
3. Evaluates the effect of signaling and control systems on railway safety.
4. Explains the basic principles of signaling and control systems.

B. Signaling System Equipments

AIM: To comprehend the central and trackside equipment and working principles of railway signaling systems.

LEARNING OUTCOMES

1. Recognizes the general architecture of the signaling system.
2. Explains the central equipment of the signaling system and its functions.
3. Lists the trackside signaling equipment.
4. Explains the signal types and where they are placed along the trackside.
5. Explains the switch control systems.
6. Explains train detection systems.

C. Interlocking Systems

AIM: To recognize the concept and types of interlocking, to comprehend interlocking circuits.

LEARNING OUTCOMES

1. Explains the concept and types of interlocking.
2. Comprehends the interlocking circuit between signals.
3. Comprehends the interlocking circuit between the signal and the switch.

D. Train Protection and Control Systems

AIM: To understand the working principles and maintenance processes of train protection and control systems.

LEARNING OUTCOMES

1. Explains ATS, ATP and ATC systems and its working principles.
2. Explains the ETCS system and levels.
3. Explains CBTC system and its working principles.

E. Level Crossing Protection Systems

AIM: To comprehend the working principles and maintenance processes of level crossing protection systems

LEARNING OUTCOMES

1. Explains the types and working principles of level crossings.
2. Explains the maintenance processes of level crossing protection systems.





**DEVELOPMENT OF EDUCATION MODULES
FOR RAIL SYSTEM ELECTRICS ELECTRONICS**



PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	COMPUTER AID CIRCUIT ANALYSIS
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To develop an understanding of computer-aided circuit analysis tools and their applications.
2. To gain practical skills in using circuit simulation software for analyzing electronic circuits.
3. To learn various types of circuit analyses and their relevance in electronic design.

SPECIAL DEFINITION

Computer-aided circuit analysis is a valuable tool for students. It can be used to analyze and design circuits quickly and easily. By learning how to use this software, students can gain a valuable skill that will be useful in their future careers.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Basic electrical concepts and laws	30
B. Circuit analysis	30
C. Simulation and analysis of circuits using computer software	40

TOPICS

A. Basic electrical concepts and laws

AIM: To understand basic electrical concepts and laws

LEARNING OUTCOMES

1. Demonstrate a thorough understanding of electrical concepts, laws, and circuit analysis techniques.
2. Apply circuit analysis techniques to solve complex electrical and electronic circuits.

B. Circuit analysis

AIM: To analyze the circuit (resistive and reactive circuits) and do transient analysis

LEARNING OUTCOMES

1. Analyze the behavior of resistive and reactive circuits under different operating conditions.
2. Evaluate and interpret the results obtained from computer simulations and experiments.





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C. Simulation and analysis of circuits using computer software

AIM: To simulate and analyze of circuits using computer software

LEARNING OUTCOMES

1. Troubleshooting and debugging techniques for circuit analysis.
2. Applications of circuit analysis in various engineering fields.





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PROGRAM TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE CODE AND TITLE	DIGITAL ELECTRONICS
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To be able to install and operate basic logic circuits.
2. To be able to build and operate compound logic circuits.
3. To build and operate arithmetic logic circuits.
4. To establish and operate sequential logic circuits.
5. To be able to set up and operate counter and recorder circuits.
6. To convert analog-digital signals to each other by establishing ADC and DAC circuits.

SPECIAL DEFINITION

With the DIGITAL ELECTRONICS course, students will be provided with basic knowledge and skills so that they can use digital electronic circuits and systems and eliminate malfunctions. In order to practice, the course should be supported by homework, practices and knowledge.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Basic Logic Circuits	25
B. Compound Logic Circuits	15
C. Arithmetic Logic Circuits	15
D. Sequential Logic Circuits	15
E. Counter and Recorder Circuits	15
F. ADC-DAC Circuits	15

TOPICS

A. Basic Logic Circuits

AIM: To be able to build and operate basic logic circuits.

LEARNING OUTCOMES

1. Comprehends number systems.
2. Can set up and run logic circuits.
3. Explains Boolean mathematics.
4. Builds and draws circuits using Karnough maps.

B. Compound Logic Circuits





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AIM: To be able to build and operate compound logic circuits.

LEARNING OUTCOMES

1. Can set up and operate decoder circuits.
2. Can set up and operate encoder circuits.
3. Can set up and operate data selector circuits.
4. Can set up and operate data distributor circuits.

C. Arithmetic Logic Circuits

AIM: To be able to build and operate arithmetic logic circuits.

LEARNING OUTCOMES

1. Can set up and operate collector circuits.
2. Can set up and run extractor circuits.
3. Can set up and operate comparator circuits.

D. Sequential Logic Circuits

AIM: To be able to build and operate sequential logic circuits.

LEARNING OUTCOMES

1. Can set up and operate multivibrator circuits.
2. Can set up and run flip flop ICs.
3. Designs flip flop circuits.

E. Counter and Recorder Circuits

AIM: To be able to set up and operate counter and recorder circuits.

LEARNING OUTCOMES

1. Can set up and operate asynchronous counter circuits.
2. Can set up and operate synchronous counter circuits.
3. Defines the recorder and memory units.

F. ADC-DAC Circuits

AIM: To be able to convert analog-digital signals to each other by establishing ADC and DAC circuits.

LEARNING OUTCOMES

1. Sets up ADC circuits and converts analog signals to digital signals.
2. Sets up DAC circuits and converts digital signals to analog signals.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE SEMESTER	RAIL SYSTEM CONSTRUCTION
WEEKLY COURSE PERIOD	NEW APPROACHES IN RAILWAY TRAFFIC
COURSE DURATION	MANAGEMENT

AIMS

1. To evaluate the historical and technological development of rail systems traffic management systems.
2. To comprehend the general structures and characteristics of today's rail systems traffic management systems and their effects on railway management.
3. To comprehend the general structures and characteristics of train protection and control systems and their effects on railway management.
4. To recognize the global and national development process of high-speed train management.

SPECIAL DEFINITION

With the NEW APPROACHES IN RAILWAY TRAFFIC MANAGEMENT course, students will be able to evaluate the development process of rail system traffic management systems, get to know today's and future traffic management systems, comprehend their effects on railway management, and gain basic knowledge and skills on traffic management systems and train protection and control systems. Technical trips will be organized for the students to get to know the national high speed train management closely. In order to practice, the course should be supported by homework, practices and knowledge.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Historical Development of Traffic Management Systems	10
B. Traffic Management Systems	30
C. European Railway Traffic Management System (ERTMS)	30
D. Train Protection and Control Systems	20
E. High Speed Train Management	10

TOPICS

A. Development of Traffic Management Systems

AIM: To evaluate the historical and technological development of rail systems traffic management systems.





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LEARNING OUTCOMES

1. Explains the historical development of rail systems traffic management systems.
2. Explains the technological development of rail systems traffic management systems.

B. Traffic Management Systems

AIM: To comprehend the general structures and characteristics of today's rail systems traffic management systems and their effects on railway management.

LEARNING OUTCOMES

1. Knows the types and general characteristics of national railway traffic management systems.
2. Evaluates the effects of railway traffic management systems on railway management.
3. Explains the integration of railway operation processes and procedures.

C. European Railway Traffic Management System (ERTMS)

AIM: To comprehend the general structures and characteristics of today's rail systems traffic management systems and their effects on railway management.

LEARNING OUTCOMES

1. Understands the concept of interoperability and its effects.
2. Explains the ERTMS/ETCS development process.
3. Knows ETCS levels and operating modes.
4. Recognizes ETCS trackside and on-board components.
5. Knows Global System for Mobile Communications for Railways (GSM-R)
6. Knows Future Railway Mobile Communications System (FRMCS)

D. Train Protection and Control Systems

AIM: To comprehend the general structures and features of train protection and control systems and their effects on railway management.

LEARNING OUTCOMES

1. Evaluates the effects of train protection and control systems on railway operation and safety.
2. Explains ATS, ATP and ATC systems and working principles.
3. Explains CBTC system and working principle.

E. High Speed Train Operation

AIM: To recognize the global and national development process of high-speed train management.

LEARNING OUTCOMES

1. Explains the global development process of high speed train management.
2. Knows the national high-speed train lines in operation and management features.





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PROGRAM TITLE COURSE CODE AND TITLE COURSE SEMESTER WEEKLY COURSE PERIOD COURSE DURATION	RAIL SYSTEM MANAGEMENT MAINTENANCE OF RAILWAY VEHICLES AND CERTIFICATION
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AIMS

1. To understand the basic concepts and application areas of Management Systems and their impact on maintenance management and productivity.
2. To comprehend the basic concepts, organizations and ECM regulations of railway vehicle maintenance management system and certification.
3. Associating the Entity in Charge of Maintenance and its responsibilities with the ECM functions.
4. To understand the ECM certification process.

SPECIAL DEFINITION

With the MAINTENANCE OF RAILWAY VEHICLES AND CERTIFICATION course, students will be provided with knowledge and skills regarding the maintenance management and certification processes of railway vehicles. It is intended that students comprehend the duties of a maintenance organization regarding ECM regulations and practices. A technical visit will be organized to an Entity in charge of Maintenance and they will be informed on the job about the ECM functions and certification process. In order to practice, the course should be supported by homework, practices and knowledge.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Maintenance Management	10
B. Vehicle Maintenance Management	30
C. ECM Functions	40
D. ECM Certification Process	20

TOPICS

A. Maintenance Management

AIM: To understand the basic concepts and application areas of Management Systems and their impact on maintenance management and efficiency.

LEARNING OUTCOMES

1. Recognizes management systems and application areas.





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2. Interprets the basic concepts such as accreditation, certification, system, process, procedure, function, qualification etc.
3. Explains the relationship between quality management system, maintenance management and productivity.

B. Vehicle Maintenance Management

AIM: To comprehend the basic concepts, organizations and ECM regulations of railway vehicle maintenance management system and certification.

LEARNING OUTCOMES

1. Explains the national and international institutions and regulations regarding the maintenance and certification of railway vehicles.
2. Explains certification of entities in charge of maintenance (ECM) certification and requirements.
3. Explains the main actors, responsibilities and relationships in the ECM certification process.

C. ECM Functions

AIM: To link the Entity in charge of Maintenance and its responsibilities with ECM functions.

LEARNING OUTCOMES

1. Evaluates the entity in charge of maintenance and its responsibilities.
2. Explains the management function.
3. Explains the maintenance development function.
4. Explains the fleet management function.
5. Explains the maintenance delivery function.
6. Evaluates the relationship between ECM functions.

D. ECM Certification Process

AIM: To understand the ECM certification process.

LEARNING OUTCOMES

1. Describes the ECM certification process in general.
2. Knows the special requirements of the authority or approver.
3. Comprehends ECM documentation and application applications.





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PROGRAM TITLE COURSE CODE AND TITLE COURSE SEMESTER WEEKLY COURSE PERIOD COURSE DURATION	RAIL SYSTEM MANAGEMENT RAIL SYSTEM ELECTRIC ELECTRONICS RAIL SYSTEM CONSTRUCTION WORK SAFETY 2+2; 4,0
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AIMS

1. To understand their health and safety responsibilities and why it's important to work safely.
2. To understand the difference between hazards and risks.
3. To be able to identify common workplace hazards.
4. To appreciate and improve upon safety performance within the workplace.

SPECIAL DEFINITIONS

Course topics will be the presentation of the subject in need of explanation instead of every aspect of the place should be given. On-site observations and practices related to the course subjects can be given.

EVAULATION TABLE

The percentages of the studies conducted related to topic and teaching style are given according to their weights in the table below. While final exam questions preparing, this percentage shall be taken into account.

TOPICS	Ratios of Topics (%)
A. Introducing Working Safely	25
B. Defining hazard and risk	25
C. Identifying common hazards	25
D. Improving safety performance	25

TOPICS

A. Introducing Working Safely

AIMS: To be able to explain the concept of work safely





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LEARNING OUTCOMES

1. To explain the concept of health and safety
2. To know the principles of accident theory
3. To know the moral, legal and financial reasons to work safely

B. Defining hazard and risk

AIMS: To be able to define hazards and risks

LEARNING OUTCOMES

1. To know the concept of hazard and risk
2. To know the 5-step risk assessment process

C. Identifying common hazards

AIMS: To be able to identify common hazards

LEARNING OUTCOMES

1. To know how to identify common hazards
2. To know how to prevent and control a range of workplace hazards

D. Improving safety performance

AIMS: To be able to know and use information on how to improve safety performance

LEARNING OUTCOMES

1. To understand Health and Safety Management System: Plan - Do - Check – Act
2. To know the health and safety responsibilities of: individuals, safety representatives, contractors and enforcement officers
3. To know systems and Procedures including: emergency procedures, Safe Systems of Work, PPE, Permit-to-Work, safety signs, first aid arrangements and accident reporting





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE SEMESTER	RAIL SYSTEM CONSTRUCTION
WEEKLY COURSE PERIOD	SAFETY CRITICAL COMMUNICATION
COURSE DURATION	

AIMS

1. To evaluate the concept and conceptual aspect of safety critical communication.
2. To know the basic elements of safety critical communication and to associate it with the profession.
3. To comprehend the importance of speech rules and patterns in safety critical communication.
4. To communicate using effective communication skills.
5. To apprehend the basic communication errors and barriers.
6. To be able to work in accordance with team communication and teamwork and to manage work stress.

SPECIAL DEFINITION

With the SAFETY CRITICAL COMMUNICATION course, students' awareness of safe working, effective communication, team communication and teamwork and corporate culture will be raised. At the same time, it is aimed to increase their morale and motivation towards the profession with exemplary practices they may encounter in their working life. In order to practice, the course should be supported by homework, practices and knowledge.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Safety Critical Communication and Its Importance	10
B. Key Elements of Safety Critical Communication	20
C. Speech Rules and Patterns	20
D. Effective Communication Skills	20
E. Communication Barriers	15
F. Collaboration in Communication and Managing Work Stress	15

TOPICS

A. Safety Critical Communication and Its Importance

AIM: To evaluate the concept of safety critical communication and its conceptual aspect.





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LEARNING OUTCOMES

1. Defines safety critical tasks.
2. Explains the impact of safety critical communication on safety.
3. Evaluates the effect of safety critical communication on safety during the task.
4. Distinguishes between safety critical communication and everyday communication.

B. Key Elements of Safety Critical Communication

AIM: To know the key elements of safety critical communication and to associate it with the profession.

LEARNING OUTCOMES

1. Lists the stages of safety critical communication.
2. Carries out the profession in accordance with the key elements of safety critical communication.
3. Explains the necessity of individual responsibility and leadership responsibility in communication.
4. Embraces individual responsibility falls on him/her in safety critical communication.

C. Speech Rules and Patterns

AIM: To understand the importance of speech rules and patterns in safety critical communication.

LEARNING OUTCOMES

1. Knows the national speech rules and patterns related to the profession.
2. Explains the importance of speech rules and patterns in safety critical communication.
3. Gives importance to work by following the rules and patterns of speech.

D. Effective Communication Skills

AIM: To communicate using effective communication skills.

LEARNING OUTCOMES

1. Explains the key elements of effective communication skills.
2. Lists the differences between hearing and listening.
3. Evaluates the importance of active listening in safety critical communication.
4. Repeats orders while carrying out the duty.
5. Cares about the key rules of effective communication during the duty.

E. Communication Barriers

AIM: To understand basic communication errors and barriers.

LEARNING OUTCOMES

1. Explains common mistakes and communication barriers in communication.
2. Realizes the basic communication mistakes made during communication.

F. Collaboration in Communication and Managing Work Stress

AIM: To work in accordance with team communication and teamwork and to be able to manage work stress.

LEARNING OUTCOMES

1. Explains the benefits of cooperation in communication brought to working life.





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2. Takes appropriate measures to manage work stress.
3. Minds cooperating with teammates during the execution of safety critical duties.





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PROGRAM TITLE COURSE CODE AND TITLE COURSE SEMESTER WEEKLY COURSE PERIOD COURSE DURATION	RAIL SYSTEM MANAGEMENT RAIL SYSTEM ELECTRIC ELECTRONICS RAIL SYSTEM CONSTRUCTION CRISIS MANAGEMENT 2+2; 4,0
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AIMS

1. To be able to explain the concept of crisis management
2. To know how the information flow occurs related to crisis management
3. Utilization of information related to crisis management

SPECIAL DEFINITIONS

Course topics will be the presentation of the subject in need of explanation instead of every aspect of the place should be given. On-site observations and practices related to the course subjects can be given.

EVAULATION TABLE

The percentages of the studies conducted related to topic and teaching style are given according to their weights in the table below. While final exam questions preparing, this percentage shall be taken into account.

TOPICS	Ratios of Topics (%)
A. Introduction to Crisis Management	25
B. Identifying a Crisis; Crisis Management Basics; Crisis Stages; Establishing a Crisis Management Team; The Role of the Crisis Manager	25
C. Putting Crisis Management Into Action; Crisis Management Decisions; Emergency Response Scenarios	25
D. Common Crisis Management Plan; Weaknesses Contingency Plans; Damage Control; Crisis Management Checklist	25





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TOPICS

A. Introduction to Crisis Management

AIMS: To be able to explain the concept of crisis management

LEARNING OUTCOMES

1. To explain the concept of crisis management
2. To know the principles of crisis management

B. Identifying a Crisis; Crisis Management Basics; Crisis Stages; Establishing a Crisis Management Team; The Role of the Crisis Manager

AIMS: To be able to know the basics and stages of crisis management

LEARNING OUTCOMES

3. To know the basics of crisis management
4. To know its stages
5. To know how to establish a crisis management team and the role of the crisis manager

C. Putting Crisis Management Into Action; Crisis Management Decisions; Emergency Response Scenarios

AIMS: To be able to know how to put crisis management into practice.

LEARNING OUTCOMES

3. To know the implementation level of crisis management
4. To know how to make crisis management decisions
5. To know how to deal with emergency response scenarios.

D. Common Crisis Management Plan; Weaknesses Contingency Plans; Damage Control; Crisis Management Checklist

AIMS: To be able to know and use information related crisis management plans, damage control and checklists...

LEARNING OUTCOMES

4. To understand the common crisis management plans;
5. To know weaknesses plans;
6. To know damage controls;
7. To know crisis management checklists.





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PROGRAM TITLE COURSE CODE AND TITLE COURSE SEMESTER WEEKLY COURSE PERIOD COURSE DURATION	RAIL SYSTEM MANAGEMENT INTRODUCTION TO PROFESSIONAL LIFE
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AIMS

1. Get to know different professions in the field of operation and transport
2. Insight into various commercial and administrative professions in the railway sector
3. Know that the rail transport sector opens up a wide range of career opportunities in the fields of engineering, technology and IT
4. Get to know further professional employment opportunities in public personnel transport
5. Insight into ways of dealing with customers in a purposeful and professional manner
6. Get to know the basic elements of dealing professionally with customers and possible complaints

SPECIAL DEFINITION

In this module, the student learns about different occupational areas with corresponding occupational possibilities in the field of 'rail transport'. A basic short introduction to the topics of business etiquette and complaint management provide employees who work with customers (e.g. at the information/sales counter, train attendants, etc.) important know-how on how to act in a more professional and customer-oriented way.

EVAULATION TABLE

The percentages of the conducted studies according per subject are given in the table below. These percentages shall be taken into account during the preparation of final exam.

TOPICS	Ratios of Topics (%)
A. Professions in the railway operations and transport sector	15
B. Professions in the commercial sector and in administration	15
C. Job opportunities in the field of engineering, technology & IT	15
D. Professions in public transport	20
E. Business etiquette when working with customers in rail transportation	20
F. Customer orientation and complaint management	





DEVELOPMENT OF EDUCATION MODULES FOR RAIL SYSTEM ELECTRICS ELECTRONICS



TOPICS

A. Professions in the railway operations and transport sector

AIM: Get to know different professions in the field of operation and transport

LEARNING OUTCOMES

1. Insight into different occupational possibilities in the field of operation and traffic in railway transport.
2. Develop a basic understanding of what tasks railway operations managers, train service providers, locomotive shunting drivers, train drivers, traffic masters, etc. perform.
3. Knowledge about training, earning opportunities and career opportunities as a railway employee in the area of operations and traffic.

B. Professions in the commercial sector and in administration

AIM: Insight into various commercial and administrative professions in the railway sector

LEARNING OUTCOMES

1. Know which commercial and administrative job opportunities are available in the field of rail transport.
2. Development of a basic understanding of the tasks performed by commercial staff for rail and road transport/for freight forwarding and logistics/for transport services, controllers, stewards, train attendants, etc.
3. Knowledge of training, earning opportunities and career opportunities as a railway employee in the commercial area or administration.

C. Job opportunities in the field of engineering, technology & IT

AIM: Know that the rail transport sector opens up a wide range of career opportunities in the fields of engineering, technology and IT

LEARNING OUTCOMES

1. Development of a basic understanding of the importance and necessity of well-qualified employees in the field of engineering, technology and IT in railway transport.
2. Insight into basic fields of activity of industrial-technical specialists in the field of railway transport (e.g. mechatronics engineer, electrical engineer, operating technician in track construction, etc.).
3. Development of a basic understanding of diverse fields of work that are necessary for the holistic functioning of 'railway transport'.

D. Professions in public transport

AIM: Get to know further professional employment opportunities in public personnel transport

LEARNING OUTCOMES

1. Insight into various job opportunities in the field of public personnel transport.
2. Get to know basic tasks of customer service representatives, security workers, transport planners, train attendants, professional drivers, industrial mechanics, consultants etc. in rail transport.
3. Develop a basic understanding of diverse tasks and areas of activity in public personnel transport.





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E. Business etiquette when working with customers in rail transportation

AIM: Insight into ways of dealing with customers in a purposeful and professional manner

LEARNING OUTCOMES

1. Development of a basic understanding of the importance and necessity of professional interaction with customers (especially for train attendants, customer service staff, etc.).
2. Know that first impressions, communication style (sound of voice, use of language, etc.), body language and appropriate manners determine the interaction with customers.
3. Know basic elements of goal-oriented and professional business etiquette that are relevant when working with customers in rail transport.

F. Customer orientation and complaint management

AIM: Get to know the basic elements of dealing professionally with customers and possible complaints

LEARNING OUTCOMES

1. Get to know basic elements to increase customer orientation.
2. Develop a basic understanding of how to deal with customer concerns, wishes and complaints.
3. Insight into target-oriented possibilities of satisfactory complaint management in rail transport.





DEVELOPMENT OF EDUCATION MODULES FOR RAIL SYSTEM ELECTRICS ELECTRONICS



PROGRAM TITLE	RAIL SYSTEM MANAGEMENT RAIL SYSTEM ELECTRIC ELECTRONICS RAIL SYSTEM CONSTRUCTION PROJECT ON RAILWAY TECHNOLOGY
COURSE CODE AND TITLE	
COURSE SEMESTER	
WEEKLY COURSE PERIOD	
COURSE DURATION	

AIMS

1. To choose a general topic for a railway technology theme, develop it into a research framework with related aims and objectives that can be investigated within various time and resource limits.
2. To gain knowledge of carrying out a systematic search in the library, in scientific and other databases.
3. To interpret and evaluate data and literature critically.
4. To argue, structure the argumentation, and follow good scientific use of references.
5. To identify ethical issues in a research project and register the project for ethical clearance.
6. To define and frame an independent research project under supervision.

SPECIAL DEFINITION

The course helps students to start writing their master thesis in time. Students acquire writing training and practical insights into the research process. The course aims at offering students more insight into the writing process behind a successful master thesis by working with a project proposal for the future master thesis. The project proposal forms the basis for the master thesis and the allocation of a supervisor.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Understanding the research framework	10
B. Good systematic literature review of the chosen topic	20
C. Interpretation and evaluation of data from the literature review	20
D. Discussion and argumentation of the outputs from the literature review	10
E. Identification of ethical issues of the chosen topics	20
F. Proposal of an independent research project	





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TOPICS

A. *Understanding the research framework*

AIM: To choose a general topic for a railway technology theme, develop it into a research framework with related aims and objectives that can be investigated within various time and resource limits.

LEARNING OUTCOMES

1. Draft paper (500 – 1000 words) with the aim to theme elaboration, perspective, and argument.
2. Compare the draft paper with other participants.

B. *Good systematic literature review of the chosen topic*

AIM: To gain knowledge of how to carry out a systematic search in the library, in scientific and other databases.

LEARNING OUTCOMES

1. The paper with literature review.
2. List of references from all databases which have been used.

C. *Interpretation and evaluation of data from the literature review*

AIM: To interpret and evaluate data and literature critically.

LEARNING OUTCOMES

1. Evaluation of the data from the literature review.
2. Comparison of the data from the literature review.

D. *Discussion and argumentation of the outputs from the literature review*

AIM: To argue, structure the argumentation, and follow good scientific use of references.

LEARNING OUTCOMES

1. Organized a discussion with the other participants.
2. Made a list of questions for discussion.
3. Evaluation of the discussion.

E. *Identification of ethical issues of the chosen topics*

AIM: To identify ethical issues in a research project and register the project for ethical clearance.

LEARNING OUTCOMES

1. Defines the ethical problems of research in general.
2. Identification of the ethical issues of the chosen topic.
3. Describes how could potential ethical conflicts be minimized.

F. *Proposal of an independent research project*

AIM: To define and frame an independent research project under supervision.

LEARNING OUTCOMES

1. Project draft (2 000 – 3 000 words), which seeks to develop the project towards a scientific problem, including essential references.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE SEMESTER	RAIL SYSTEM CONSTRUCTION
WEEKLY COURSE PERIOD	
COURSE DURATION	SOCIAL ENVIRONMENTAL RESPONSIBILITIES
	2+2; 4,0

AIMS

1. Understand the knowledge, process and practice of sustainability management in an organisation
2. Be able to outline and articulate different approaches to social environmental responsibilities and their relative merits and suitability
3. Effectively argue in favour of an environmental improvement programme
4. Understand and apply the practical implications of waste management, cleaner technology and the circular economy
5. Understand and appreciate the analysis and range of complex issues involved in environmental management
6. Know a range of corporate sustainability management strategies and control mechanisms and be able to develop appropriate action to address a specific set of environmental issues
7. Know the literature and networks with which to support ongoing needs in environmental management.

SPECIAL DEFINITIONS

Course topics will be the presentation of the subject in need of explanation instead of every aspect of the place should be given. On-site observations and practices related to the course subjects can be given.

EVAULATION TABLE

The percentages of the studies conducted related to topic and teaching style are given according to their weights in the table below. While final exam questions preparing, this percentage shall be taken into account.





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<i>TOPICS</i>	<i>Ratios of Topics (%)</i>
A. Introduction to Social Environmental Responsibilities	25
B. Corporate crime and malfeasance; Definitions and evaluation of key concepts, including corporate sustainability, corporate social responsibility (CSR), industrial ecology etc	25
C. Product-based sustainability; Reporting and stakeholder management	25
D. Risk management, risk perception and industrial accidents; Social enterprises, capital markets and corporate strategies.	25

TOPICS

A. Introduction to Social Environmental Responsibilities

AIMS: To be able to explain the concept of social environmental responsibilities

LEARNING OUTCOMES

1. To explain the concept of social environmental responsibilities
2. To know the principles of social environmental responsibilities

B. Corporate crime and malfeasance; Definitions and evaluation of key concepts, including corporate sustainability, corporate social responsibility (CSR), industrial ecology

AIMS: To be able to know what corporate crime and other elements

LEARNING OUTCOMES

1. To know the corporate crime and malfeasance
2. To know its definition and evaluation of key concepts including corporate sustainability
3. To know corporate social responsibility
4. To know industrial ecology

C. Product-based sustainability; Reporting and stakeholder management

AIMS: To be able to know what sustainability/reporting and stakeholder management are

LEARNING OUTCOMES

1. To know the product-based sustainability
2. To know what reporting and stakeholder management is.





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D. Risk management, risk perception and industrial accidents; Social enterprises, capital markets and corporate strategies.

AIMS: To be able to know risk management; social enterprises and its strategies.

LEARNING OUTCOMES

1. To understand the risk management;
2. To know risk perception and industrial accidents;
3. To know social enterprises
4. To know capital markets
5. To understand corporate strategies.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM MANAGEMENT
COURSE SEMESTER	RAIL SYSTEM ELECTRIC ELECTRONICS
WEEKLY COURSE PERIOD	RAIL SYSTEM CONSTRUCTION
COURSE DURATION	FOREIGN LANGUAGE

AIMS

1. Gain knowledge and experience in both oral and written communication in work related situations.
2. Practise and improving job-specific conversation in a foreign language
3. Have appropriate reading, listening, writing and speaking competences
4. Practise and improving job-specific conversation in the foreign language

SPECIAL DEFINITION

Foreign languages are an important competence that should be taught in railway transportation courses. Students should be able to speak, read, write in the foreign language for work related communication situations with customers and clients. They should know the respective vocabulary and grammar to inform them, reply to frequently asked questions and requests. In order to practice, the course should be supported by role-plays of work related situations and homework.

EVAULATION TABLE

The percentages of the conducted studies according per subject are given in the table below. These percentages shall be taken into account during the preparation of final exam.

TOPICS	Ratios of Topics (%)
A. Listening and Speaking skills	30
B. Conversation Training	30
C. Reading skills	20
D. Writing skills	20

TOPICS

A. Listening and Speaking skills

AIM: Have knowledge and competences of understanding texts in typical work related topics that the student listens to; and be able to respond in spoken language in a respective formal manner.

LEARNING OUTCOMES

1. To listen carefully and respond to the content and context of communication in appropriate manner
2. To listen and respond to spoken language, including straightforward information and narratives, and follow straightforward explanations and instructions





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3. To speak to communicate information, feelings and opinions on typical work related topics, using appropriate formality
4. To engage in discussion with one or more people in a typical work related situation, making relevant points and responding to what others say to reach an understanding about typical work related topics.
5. To use clear and concise communication to proactively shape the development of a conversation

B. Conversation Training

AIM: Practising and improving job-specific conversation in a foreign language

LEARNING OUTCOMES

1. Practise goal-oriented communication in dealing with customers (e.g. information/consultation talks with customers, conversations between train attendants and customers, etc.).
2. Improve skills related to 'active listening', responding to customers' wishes, importance of appreciative and empathetic communication design
3. Practise solution-oriented communication in the case of complaints/claims from customers.

C. Reading skills

AIM: Foster the ability to read and understand typical work related texts and respond to respective contents.

LEARNING OUTCOMES

1. Read and understand short, straightforward texts on typical work related topics accurately and independently.
2. Read and obtain information from everyday sources that belong to the work context
3. Respond to the content and context of communication in appropriate manner

D. Writing skills

AIM: To be able to write information and opinions, ideas on work related topics.

LEARNING OUTCOMES

1. Write to communicate information and opinions with some adaptation to the intended audience.
2. Write to communicate information, ideas and opinions clearly using length, format and style appropriate to purpose and audience





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM ELECTRIC ELECTRONICS
COURSE SEMESTER	RAIL SYSTEM CONSTRUCTION
WEEKLY COURSE PERIOD	EFFECTIVE COMMUNICATION SKILLS
COURSE DURATION	

AIMS

1. Gaining knowledge and experience in both oral and written communication in work related situations.
2. Learn to express and interpret thoughts and feelings in both oral and written form.
3. Learn to listen to the needs, experiences, arguments and demands of others.
4. Learn to respect their views and respond to these in an adequate way.
5. Learn helpful communication strategies to improve communication skills.
6. Knowledge about elements of non-verbal communication as well as their importance in communication design.
7. Learn and practice simple ways to improve verbal communication skills.
8. Introduction to basic elements of written communication design.

SPECIAL DEFINITION

The concept of effective communication and related aspects should be taught in rail transportation courses. Students should be able to communicate to customers, they shall inform, help, support them in an appropriate way in typical work related situations. They should learn about the components that an effective communication builds upon and they should experience it on-site. Information about basic knowledge regarding effective communication should be obtained. In order to practice, the course should be supported by role-plays with peers to experience oral communication situation and by written homework to explore replies to customer requests, offers to customers on railway travels and trips in particular.





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EVAULATION TABLE

The percentages of the conducted studies according per subject are given in the table below. These percentages shall be taken into account during the preparation of final exam.

<i>TOPICS</i>	<i>Ratios of Topics (%)</i>
A. Written and oral expression and understanding	15
B. Respect for and understanding of diverse points of view and needs, demands and arguments of other people involved in the communication	15
C. Constructive and goal-oriented communication design	20
D. Nonverbal communication - body language	15
E. Verbal communication skills	20
F. Writing Communication in the workplace	15

TOPICS

A. *Written and oral expression and understanding*

AIM: Enrich the capacity of passing on knowledge and experience by communicating facts as well as expressing and interpreting thoughts and feelings in both oral and written form in work related communication situations.

LEARNING OUTCOMES

1. To know about communication channels of humans (visual, auditive and kinaesthetic/tactile).
2. To be able to reason and respond to requests when necessary and to be able to express agreement or disagreement in a constructive manner.
3. To use clear and concise communication to proactively shape the development of a conversation.
4. To know the 7 Cs in communication.

B. *Respect for and understanding diverse points of view and needs, demands and arguments of other people involved in the communication*

AIM: Foster the ability to listen to the needs, experiences, arguments and demands of others, to respect their views and respond to these in an adequate way.

LEARNING OUTCOMES

1. To know about “respect” as a basic value.
2. To be able to behave according to the code of conduct within certain settings.
3. To be able to listen carefully and to respond to the content and context of communication in an appropriate manner.
4. To be able to check attention and reception of information conveyed with the audience (people receiving the information).

C. *Constructive and goal-oriented communication design*





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AIM: Learn helpful communication strategies to improve communication skills.

LEARNING OUTCOMES

1. Sensitise one self towards counter-productive elements/ barriers in communication.
2. Practise goal-oriented ways of shaping communication in sensitive and difficult conversations (e.g. disagreements, misunderstandings, conflicts).
3. Get to know basic feedback rules and be able to apply constructive feedback.

D. Nonverbal communication - body language

AIM: Knowledge about elements of non-verbal communication as well as their importance in communication design.

LEARNING OUTCOMES

1. Know different types of nonverbal communication.
2. Develop a basic understanding of how nonverbal communication can and should be used in the workplace.
3. Be able to read, interpret and use body language.

E. Verbal communication skills

AIM: Learn and practice simple ways to improve verbal communication skills.

LEARNING OUTCOMES

1. Reflect upon/ be sensitised regarding one's own communication behavior.
2. Know that by listening attentively, reading body language, asking questions, etc., communication can be improved.
3. Be able to apply simple rhetorical and argumentation techniques.

F. Writing Communication in the workplace

AIM: Introduction to basic elements of written communication design.

LEARNING OUTCOMES

1. Know what to consider when writing emails, letters, reports, or presentations.
2. Become familiar with and practice effective writing strategies for written communication.
3. Develop goal-oriented strategies for optimising and routinising written communication in the workplace.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM CONSTRUCTION
COURSE SEMESTER	RAIL SYSTEM ELECTRIC ELECTRONICS
WEEKLY COURSE PERIOD	
COURSE DURATION	BASIC COMPUTER SKILLS

AIMS

1. To introduce students to the basics of computer hardware and software. This includes topics such as the different components of a computer, how to use a computer, and how to install and use software.
2. To help students develop the skills needed to use computers for everyday tasks, such as word processing, spreadsheeting, and internet browsing. This includes topics such as how to create and edit documents, how to create and use spreadsheets, and how to search for information on the internet.
3. To encourage students to use computers to learn new things and to be more productive in their lives. Computers can be a powerful tool for learning and productivity. By learning basic computer skills, students can gain the ability to use computers to improve their lives.

SPECIAL DEFINITION

Hands-on lab exercises: These exercises will give students a chance to practice the skills they have learned in the lecture. Online tutorials: These tutorials can provide students with additional information on the topics covered in the lecture. Discussion forums: These forums can provide students with a chance to ask questions and get help from their classmates and the instructor.

EVAULATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. These percentages shall be taken into account during the preparation of final exam questions.

TOPICS	Ratios of Topics (%)
A. Introduction to computer, history of computer, operating systems, introduction to operating systems	30
B. Office software	40
C. Effective use of the Internet	30

TOPICS

- A. Introduction to computer, history of computer, operating systems, introduction to operating systems**

AIM: To know introduction to computer, history of computer, operating systems, introduction to operating systems





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LEARNING OUTCOMES

1. To know and use introduction to computer, history of computer, operating systems, introduction to operating systems

B. Office software

AIM: Using office software effectively

LEARNING OUTCOMES

1. To use word processors, spreadsheets programs, presentation programs.

C. Effective use of internet

AIM: To use of internet effectively

LEARNING OUTCOMES

1. To use effective use of the internet, computer and network security, latest strategic technologies of informatics, factors affecting technological developments, internet and technology addiction and prevention.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM CONSTRUCTION
COURSE SEMESTER	RAIL SYSTEM ELECTRIC ELECTRONICS
WEEKLY COURSE PERIOD	
COURSE DURATION	RAILWAY SYSTEM MANAGEMENT

AIMS

1. To be able to explain the definition of transportation in general, the historical development passenger and baggage transportation and the issues related to international transportation irregularities, process of railways and basic concepts
2. To be able to explain and apply the issues related to the provisions of domestic goods transportation
3. To be able to define and apply the issues related to the provisions of international railway goods,

SPECIAL STATEMENTS

In order to increase the student's technical equipment related to rail systems, it should be ensured that students understand the history of rail systems, general definitions, signs used to ensure traffic safety and the definition of traffic systems. Students are expected to reach maneuver communication, passenger and freight transport.

EVALUATION TABLE

The percentages of the studies conducted according to the subject and teaching style according to the subject areas are given in the table below. Final exam questions preparing this percentage shall be taken into account.

TOPICS	Ratios of Topics (%)
A. Definition of Transportation, Historical Development Process and Basic Concepts of Railways	30
B. Issues Concerning the Provisions of Domestic Goods Transportation	30
C. Issues relating to the provisions of international railroad goods, passengers and baggage provisions and issues concerning international transport irregularities	40

TOPICS

A. Definition of Transportation, Historical Development Process and Basic Concepts of Railways

AIM: To define the terms used in railways, to comprehend the concept of train and its features; classify trains, explain station concept, characteristics and types.

LEARNING OUTCOMES

1. Defines the terms used in railways.





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2. Defines the concept and characteristics of train; classify trains.
3. Defines station concept and properties; categorize stations.

B. Issues Concerning the Provisions of Domestic Goods Transportation

AIM: To be able to define pricing and freight payments with domestic goods transportation documents on railways, to comprehend the regulation of goods transportation documents, to explain pricing and freight payments.

LEARNING OUTCOMES

1. Defines domestic goods transportation documents and pricing and freight payments.
2. It generally issues documents for carrying goods. Apply pricing and freight payments on the document.

C. Issues relating to the provisions of international railroad goods, passengers and baggage provisions and issues concerning international transport irregularities

AIM: To define the provisions of international railway goods transportation, to comprehend international railway passenger and baggage transportation provisions, to explain international transportation irregularities.

LEARNING OUTCOMES

1. Defines and applies the issues related to the provisions of international rail transport of goods (CIM).
2. Identifies and applies the issues related to international railway passenger and baggage transport provisions (CIV).
3. Defines and applies the issues related to international transportation.





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PROGRAM TITLE COURSE CODE AND TITLE COURSE SEMESTER WEEKLY COURSE PERIOD COURSE DURATION	RAIL SYSTEM MANAGEMENT RAIL SYSTEM CONSTRUCTION RAIL SYSTEM ELECTRIC ELECTRONICS TRANSPORTATION MANAGEMENT
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AIMS

1. To be able to understand the key transportation concepts and objective;
2. To understand freight movements, intermodal transportation, modal characteristics, transportation policy, pricing and costing;
3. To know the changes occurring in the industry such as the emergence of third-party transportation providers, security, globalization, use of technology, and supply chain management.

SPECIAL DEFINITIONS

Course topics will be the presentation of the subject in need of explanation instead of every aspect of the place should be given. On-site observations and practices related to the course subjects can be given.

EVAULATION TABLE

The percentages of the studies conducted related to topic and teaching style are given according to their weights in the table below. While final exam questions preparing, this percentage shall be taken into account.





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<i>TOPICS</i>	<i>Ratios of Topics (%)</i>
A. Introduction to Transportation Management	25
B. Significance of transportation and effect on economic development and global trade;	25
C. Transportation economics; Transportation regulation and deregulation; Transportation public policy and promotion; Transportation and logistics	25
D. Modal characteristics and operations; Principles of transportation & logistics; Transportation costing and pricing; Transportation risk management and security; International transportation; Third-party transportation providers; Private transportation; Future transportation challenges	25

TOPICS

A. Introduction to Transportation Management

AIMS: To be able to explain the concept of transportation management

LEARNING OUTCOMES

1. To explain the concept of transportation management
2. To know the principles of transportation management

B. Significance of transportation and effect on economic development and global trade

AIMS: To be able to know what transportation management is

LEARNING OUTCOMES

1. To know the significance of transportation
2. To know its effect on economic development and global trade

C. Transportation economics; Transportation regulation and deregulation; Transportation public policy and promotion; Transportation and logistics

AIMS: To be able to know what transportation economics are.

LEARNING OUTCOMES

1. To know what transportation economics including its regulation and deregulation;
2. To know the transportation public policy and promotion;





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3. To know transportation and logistics

D. Modal characteristics and operations; Principles of transportation & logistics; Transportation costing and pricing; Transportation risk management and security; International transportation; Third-party transportation providers; Private transportation; Future transportation challenges

AIMS: To be able to know and use information related transportation management, its characteristics.

LEARNING OUTCOMES

1. To understand the transportation management and its characteristics/operations;
2. To know principles of transportation and logistics
3. To know its costing and pricing;
4. To know the risk management and security related to transportation management;
5. To understand the principles of international transportation;
6. To understand the third-party transportation providers and private transportation;
7. To know the future of transportation and its challenges.





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PROGRAM TITLE	RAIL SYSTEM MANAGEMENT
COURSE CODE AND TITLE	RAIL SYSTEM CONSTRUCTION
COURSE SEMESTER	RAIL SYSTEM ELECTRIC ELECTRONICS
WEEKLY COURSE PERIOD	LOGISTIC MANAGEMENT
COURSE DURATION	2+2; 4,0

AIMS

1. To be able to explain the concept of logistic management
2. To know how the information flow occurs related to logistic management
3. Utilization of information related to logistic management

SPECIAL DEFINITIONS

Course topics will be the presentation of the subject in need of explanation instead of every aspect of the place should be given. On-site observations and practices related to the course subjects can be given.

EVAULATION TABLE

The percentages of the studies conducted related to topic and teaching style are given according to their weights in the table below. While final exam questions preparing, this percentage shall be taken into account.

TOPICS	Ratios of Topics (%)
A. Introduction to logistic management	25
B. Logistic Management and its elements; Modern Concepts in Logistics	25
C. Role of logistics in strategy; Inbound and outbound supply chain management	25
D. Container – types; Different types of cargo; Packaging and Material Handling	25

TOPICS

A. Introduction to logistic management

AIMS: To be able to explain the concept of logistic management

LEARNING OUTCOMES

1. To explain the concept of logistic management





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2. To know the principles of logistic management and its history

B. Logistic Management and its elements; Modern Concepts in Logistics

AIMS: To be able to know what logistic management is and its elements and concepts.

LEARNING OUTCOMES

1. To know the elements of logistic management
2. To know its concepts in logistics

C. Role of logistics in strategy; Inbound and outbound supply chain management

AIMS: To be able to know what role of logistics and inbound/outbound supply chain management

LEARNING OUTCOMES

1. To know the role of strategic logistics
2. To know the inbound and outbound supply chain management

E. Container – types; Different types of cargo; Packaging and Material Handling

AIMS: To be able to know and use information related container types; cargo types, packaging and material handling

LEARNING OUTCOMES

1. To understand Container types;
2. To know different types of cargo;
3. To know packaging
4. To know material handling

