

| PROGRAMME: HIGHER NATIONAL DIPLOMA IN RAILWAY ENGINEERING TECHNOLOGY | | | |
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| COURSE TITLE: CIVIL INFRASTRUCTURE 1 BRIDGES AND CULVERTS) | COURSE CODE: RWE 323 | UNIT: 2 | CONTACT HOURS: 2HOURS/WEEK |
| | | | THEORETICAL: 1HOUR/WEEK |
| SEMESTER: 1 | PRE-REQUISITE : NONE | | PRACTICAL: 2HOURS/WEEK |
| <p>Goal: Know the principles and processes involved in the construction of bridges</p> <p>General Objectives:</p> <p>On completion of this module, the student/cadets should be able to:</p> <ol style="list-style-type: none"> 1.0 Know the principles and processes involved in the construction of bridges. 2.0 Understand planning for bridges site investigation and design principles 3.0 Know substructures of a bridge and their design 4.0 Know different types of bridge and their design 5.0 Know bearings and their importance and loads on bridges 6.0 Know bridges inspection and maintenances 7.0 Understand testing and strengthening of bridges. 8.0 Understand the protection and training works for bridges. | | | |

HIGHER NATIONAL DIPLOMA SEMESTER

| PROGRAMME: HIGHER NATIONAL DIPLOMA IN RAILWAY ENGINEERING | | | | | | |
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| COURSE: CIVIL INFRASTRUCTURES I (BRIDGES AND CULVERTS) | | | COURSE CODE: RWE 323 | CONTACT HOURS: 2 HOURS | | |
| GOAL: To produce diplomats who know the principles and processes involved in the construction of bridges | | | | | | |
| COURSE SPECIFICATION: THEORETICAL CONTENT | | | | COURSE SPECIFICATION: PRACTICAL CONTENT | | |
| <i>Week</i> | <i>Specific Learning Objectives</i> | <i>Teacher's Activities</i> | <i>Learning Resources</i> | <i>Specific Learning Objective</i> | <i>Teacher's Activities</i> | <i>Evaluation</i> |
| GENERAL OBJECTIVE 1.0 Know the principles and process involved in the construction of bridges. | | | | | | |
| | 1.1 Know definition of a bridge 1.2 Know importance of bridge 1.3 Know brief history of bridges development 1.4 Know factors affecting development of bridges 1.5 Know various Bridges terminologies. | <ul style="list-style-type: none"> • Define bridge and explain its importance. • Discuss brief history of bridges development • Explain factors affecting bridges development • Define various bridge terminologies | <ul style="list-style-type: none"> • O/H Projector • Teaching aids | | | |
| GENERAL OBJECTIVE 2.0 Understand Planning For Bridges Site Investigations And Design Principles | | | | | | |
| | 2.1 Know how to select bridge site 2,2 Know the preparation of, Index map, contour survey plan, cross and longitudinal | <ul style="list-style-type: none"> • Explain bridge site selection • Describe the preparation of site drawings such as index | <ul style="list-style-type: none"> • O/H Projector • Teaching aids | • | • | • |

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| | <p>sections, sub-soil profile</p> <p>2.3 Know Bridge site selection process for construction.</p> <p>2.4 Know the importance of the availability of construction materials</p> <p>2.5 Know how to determine Maximum flood discharge</p> <p>2.6 Know how to estimate the Number of spans of a Bridge</p> <p>2.7 Know where to locate piers And abutments</p> <p>2.8 Know how to determine depth of foundation.</p> | <p>map, contour plan and sub-soil profile report</p> <ul style="list-style-type: none"> • Explain 2.3 - 2.5 | | | | |
| GENERAL OBJECTIVE 3.0 Know sub-structures of a bridge and their design | | | | | | |
| | <p>3.1 Know definition of pier, abutment and types.</p> <p>3.2 Know forces acting on Piers, abutments and design considerations</p> <p>3.3 know definition of wing wall</p> <p>3.4 Know forces acting on wing walls and design considerations</p> | <ul style="list-style-type: none"> • Teach • Sketch • Explain 3.1-3.4 | <ul style="list-style-type: none"> • Static pictures • Video clips • O/H Projector • Teaching aids | • | • | • |
| GENERAL OBJECTIVE 4.0 Know different types of bridges and their design | | | | | | |
| | <p>4.1 Know the functional requirements and components of a bridge</p> | <ul style="list-style-type: none"> • Teach • Sketch • Explain 4.1-4.7 | <ul style="list-style-type: none"> • O/H projector • Teaching | • | • | • |

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| | <p>4.2 Know bridge classification and bridge type selection</p> <p>4.3 Know the design of different types of foundation for bridges, e.g raft foundation, pile foundation, caisson foundation etc.</p> <p>4.4 Know different arch bridges</p> <p>4.5 Know different girder bridges</p> <p>4.6 Know different Low-cost bridges</p> <p>4.7 Know different types of permanent small bridges</p> | | <p>aids</p> <ul style="list-style-type: none"> • Video clips • Static picture | | | |
| GENERAL OBJECTIVE 5.0 Know bearings and their importance and loads on bridges | | | | | | |
| | <p>5.1 Know functional requirements and types of bearings</p> <p>5.2 know materials for bearing</p> <p>5.3 Know various types of joints in bridges</p> <p>5.4 Know different types of loads the bridge is expected to sustain</p> | <ul style="list-style-type: none"> • Teach • Sketch • Explain 5.1-5.5 | <ul style="list-style-type: none"> • O/H projector • Teaching aids • Video clips • Static pictures | <p>5.1 Identify various types of joints in bridges.</p> | <ul style="list-style-type: none"> • Arrange a visit to a bridge site | <ul style="list-style-type: none"> • |
| GENERAL OBJECTIVE 6.0 Know bridges Inspection and maintenance | | | | | | |
| | <p>6.1 Know aims, planning and schedule of bridge inspection</p> <p>6.2 Know the preliminary study details and safety measures to be adopted</p> | <ul style="list-style-type: none"> • Teach • Sketch • Explain 6.1-6.7 | <ul style="list-style-type: none"> • O/H projector • Teaching aids • Video clips • Static picture | <p>6.1 Demonstrate how the relevant inspection tools, devices and equipment are to be applied</p> | <ul style="list-style-type: none"> • Arrange visit to a bridge site • Display the relevant inspection tools, devices | |

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| | <p>6.3 Know the relevant inspection tools, devices and equipment</p> <p>6.4 Know the classification of inspection and areas to be checked during inspection</p> <p>6.5 Know the rating and rebuilding of existing bridges</p> <p>6.6 Know the general works of maintenance</p> <p>6.7 Know detail of remedial measures of bridges maintenance</p> | | | | <p>and equipment for the inspection</p> | |
| GENERAL OBJECTIVE 7.0 Understand Testing and strengthening of bridges. | | | | | | |
| | <p>7.1 Know the criteria and method of assessing the safe carrying capacity of a bridge</p> <p>7.2 Know the types of tests to be conducted on bridges and the relevant equipment</p> <p>7.3 Know test vehicles</p> <p>7.4 Know types of deterioration</p> <p>7.5 Know various methods of strengthening sub-structure and super –structure of bridges.</p> | <ul style="list-style-type: none"> • Teach • Sketch • Explain 7.1-75 | <ul style="list-style-type: none"> • O/H projector • Teaching aids • Video clips • Static picture | <ul style="list-style-type: none"> • | <ul style="list-style-type: none"> • Arrange visit to a bridge site | <ul style="list-style-type: none"> • |
| GENERAL OBJECTIVE 8.0 Understand the protection and Training works for bridges | | | | | | |
| | <p>8.1 Know the aims of river</p> | <ul style="list-style-type: none"> • Explain aims | <ul style="list-style-type: none"> • O/H | <ul style="list-style-type: none"> • | <ul style="list-style-type: none"> • Arrange visit | <ul style="list-style-type: none"> • |

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| | <p>training works</p> <p>8.2 Know various protection works for bridges such as, embankment, pitching, aprons, spurs or groynes etc.</p> | <p>of river training works</p> <ul style="list-style-type: none"> • Discuss the various protection works for bridges e.g embankment, pitching, aprons, spurs or groynes etc. | <p>projector</p> <ul style="list-style-type: none"> • Teaching aids • Video clips • Static pictures | | <p>to a functional bridge site</p> | |
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| PROGRAMME: HIGHER NATIONAL DIPLOMA IN RAILWAY ENGINEERING TECHNOLOGY | | | |
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| COURSE TITLE: ADVANCE RAILWAY OPERATIONS(INFRACTURE) | COURSE CODE: RWE 416 | UNIT: | CONTACT HOURS: 3HOURS/WEEK |
| | | | THEORETICAL: 1HOUR/WEEK |
| SEMESTER: 1 | PRE-REQUISITE : NONE | | PRACTICAL: 2HOURS/WEEK |
| <p>Goal: This is course is deigned to equip the students with knowledge of operations in railway system</p> <p>General Objectives:</p> <p>On completion of this module, the student/cadets should be able to:</p> <ol style="list-style-type: none"> 1.0 Know the organization commercial management practice and strategy development 2.0 To Understand Train Operation 3.0 Understand various Railway passenger system 4.0 Understand various Railway passenger system 5.0 Understand Terminal and Yard Operation and activities 6.0 Understand Signaling and Communication in Railway Operation 7.0 Understand Train Performance Capacity and Scheduling | | | |

HIGHER NATIONAL DIPLOMA SEMESTER

| PROGRAMME: HIGHER NATIONAL DIPLOMA IN IN RAILWAY ENGINEERING | | | | | | |
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| COURSE: ADVANCE RAILWAY OPERATIONS (INFRACTURE) | | | COURSE CODE: RWE 416 | CONTACT HOURS: HOURS | | |
| GOAL: This course is designed to equip the students with knowledge of operations in railway system | | | | | | |
| COURSE SPECIFICATION: THEORETICAL CONTENT | | | | COURSE SPECIFICATION: PRACTICAL CONTENT | | |
| <i>Week</i> | <i>Specific Learning Objectives</i> | <i>Teacher's Activities</i> | <i>Learning Resources</i> | <i>Specific Learning Objective</i> | <i>Teacher's Activities</i> | <i>Evaluation</i> |
| | GENERAL OBJECTIVE 1.0 know the organization commercial management practice and strategy development | | | | | |
| | 1.1 Explain strategy development process 1.2 Explain the following management process (i) Organisational analysis (ii) Functional analysis (iii) Financial analysis 1.3 Explain Business plan development relation to (i) Government and Organisational structure (ii) Budgeting & Revenue (iii) Staff requirements (iv) Ticketing (v) Plant and Equipment (vi) Investment programmes | <ul style="list-style-type: none"> • Explain activities 1.1 to 1.3 | <ul style="list-style-type: none"> • Marker Board | | | |

| GENERAL OBJECTIVE 2.0 To Understand Train Operation | | | | | |
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| | 2.1 Define Train operations 2.2 List types of train Operations 2.3 Explain the following type of train operations (i) Terminal operations (ii) Local operations (iii) Line of Road operations | <ul style="list-style-type: none"> • Explain activities 2.1 to 2.3 | <ul style="list-style-type: none"> • Marker Board | | |
| GENERAL OBJECTIVE 3.0 Understand various Railway passenger system | | | | | |
| | 3.1 Explain Railway passenger system 3.1 List the types of rail passenger system 3.3 Explain the following rail passenger system (i) Heavy Rail Transit (ii) Light Rail Transit (iii) Rail commuter services (iv) High speed Rail | <ul style="list-style-type: none"> • Explain activities 3.1 to 3.3 | <ul style="list-style-type: none"> • Marker • Board | | |
| GENERAL OBJECTIVE 4.0 Understanding Railroad operation | | | | | |
| | 4.1 Explain Rail History in Nigeria 4.2 Explain Rail Road Organisation 4.3 Explain Railroad operation 4.4 List Types of freight Trains 4.5 Explain the movement of cars and trains | <ul style="list-style-type: none"> • Explain activities 4.1 to 4.6 | <ul style="list-style-type: none"> • Marker • Board | | |
| GENERAL OBJECTIVE 5.0 Understand Terminal and Yard Operation and activities | | | | | |

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| | <p>5.1 Explain Terminal and yard Operations</p> <p>5.2 List types of yard</p> <p>5.3 Explain each in 5.2</p> <p>5.4 Explain the component of Of 5.2</p> <p>5.5 Explain the following</p> <p>(i) Interchanging</p> <p>(ii) Classification</p> | <ul style="list-style-type: none"> • Explain activities 5.1 to 5.5 | <ul style="list-style-type: none"> • Marker • Board | | | |
| GENERAL OBJECTIVE 6.0 Understand Signaling and Communication in Railway Operation | | | | | | |
| | <p>6.1 Define the following</p> <p>(i) Signalling</p> <p>(ii) Communication</p> <p>6.2 Explain Railroad traffic Control</p> <p>6.3 List the types of rail road Traffic control</p> <p>6.4 Explain the following</p> <p>(i) Communication features</p> <p>(ii) positive Train Control (PTC)</p> | <ul style="list-style-type: none"> • Explain activities 6.1 to 6.4 | <ul style="list-style-type: none"> • Marker • Board | | | |
| GENERAL OBJECTIVE 7.0 Understand Train Performance Capacity and Scheduling | | | | | | |
| | <p>7.1 Explain train performance and Metrics</p> <p>7.2 List the factors affecting train performance</p> <p>7.3 Explain each in 7.2</p> <p>7.4 Explain the capacity factors and Metrics</p> | <ul style="list-style-type: none"> • Explain activities 7.1 to 7.7 | <ul style="list-style-type: none"> • Marker • Board | | | |

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| | 7.5 Explain train movement and scheduling 7.6 List the factors in determining the train movement and scheduling 7.7 Solve problem on capacity and tools | | | | | |
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| PROGRAMME: HIGHER NATIONAL DIPLOMA IN RAILWAY ENGINEERING TECHNOLOGY | | | |
| COURSE: RAILWAY CONSTRUCTION MANAGEMENT | COURSE CODE: RWE 312 | UNIT: | CONTACT HOURS: 3HOURS/WEEK |
| | | | THEORETICAL: 1HOUR/WEEK |
| SEMESTER: 1 | PRE-REQUISITE : NONE | | PRACTICAL:2HOURS/WEEK |
| <p>Goal:</p> <p>General Objectives:</p> <p>On completion of this module, the student/cadets should be able to:</p> <ol style="list-style-type: none"> 1.0 Understand the historical badground of construction Management 2.0 Understand the basic principles, techniques and practice of Management 3.0 Understand the planning of Manpower and materials in construction 4.0 Understand the different construction equipment and selection criteria 5.0 Understanding Quality Assurance in Railway construction 6.0 Understanding risk management at construction site. 7.0 Understanding the application of CPM/PER techniques in construction management. | | | |

HIGHER NATIONAL DIPLOMA SEMESTER

PROGRAMME: HIGHER NATIONAL DIPLOMA IN IN RAILWAY ENGINEERING**COURSE:RAILWAY CONSTRUCTION MANAGEMENT****COURSE CODE: RWE
312****CONTACT HOURS: 2.0 HOURS****GOAL:****COURSE SPECIFICATION: THEORETICAL CONTENT****COURSE SPECIFICATION: PRACTICAL CONTENT**

| <i>Week</i> | <i>Specific Learning Objectives</i> | <i>Teacher's Activities</i> | <i>Learning Resources</i> | <i>Specific Learning Objective</i> | <i>Teacher's Activities</i> | <i>Evaluation</i> |
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| | GENERAL OBJECTIVE 1.0 Understand the historical badground of construction Management | | | | | |
| 3333 33 | 1.1 Define construction management 1.2 Distinguish between contract management and construction management processes 1.3 Outline recent scientific developments in Management | <ul style="list-style-type: none"> Discuss 1.1 – 1-3 citing practical situation | | | | |
| | GENERAL OBJECTIVE 2.0 Understand the basic principles, techniques and practice of Management | | | | | |
| | 2.1 Define the following processes of management <ul style="list-style-type: none"> - Forecasting - Planning - Control - Organisation - Co-ordinator - Motivation - Communication | <ul style="list-style-type: none"> Explain 2.1 using case studies where applicable | <ul style="list-style-type: none"> Recommended textbooks Lecture note, Case study | | | |

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| | <p>2.2 Describe productivity technique i.e operational techniques and network analysis</p> <p>2.3 Define resource allocation and levelling cost optimization, work flow quilling theory, flow graphs optimum gang size</p> <p>2.4 Define work study objectives and procedures, recording techniques, process charting and diagrams</p> <p>2.5 Explain sequencing scheduling and planning</p> <p>2.6 Carryout case studies using these principles</p> | | | | | |
| GENERAL OBJECTIVE 3.0 Understand the planning of manpower and materials in construction | | | | | | |
| | <p>3.1 Define Workers “productivity standard (WPS)</p> <p>3.2 Define workers production planning Norms</p> <p>3.3 Enumerate and Explain factors affecting production efficiency e.g work complexity, repetition of work, quality control, supervision, etc.</p> | <ul style="list-style-type: none"> • List and explain factors • Discuss the pyramid of Hierarchy • Define direct and indirect manpower • Use past performance data to schedule worker • State the | <ul style="list-style-type: none"> • Recommend text books, • Projectors, • While boards | | | |

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| | <p>3.4 Know construction task force heirarcing and relationship</p> <p>3.5 Know scheduling of construction site workers</p> <p>3.6 Know planning of construction materials</p> <p>3.7 Understand the need for materials inventory</p> | <p>relationship between WPS, amount of work, completion period and Number of workers required</p> <ul style="list-style-type: none"> • Explain the concept of ABC classification of construction materials • Define materials wastage standard • Define materials provision process e.g identification of materials package, materials quantity estimation, material procurement enquires etc. • Explain materials inventory • Explain inventory costs • Define inventory cost terminology | | | | |
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| | | <p>e.g ordering cost, holding cost lead-time etc.</p> <ul style="list-style-type: none"> Define Economic Order Quality (EOQ) | | | | |
| GENERAL OBJECTIVE 4.0 Understand the different construction equipment's and selection criteria | | | | | | |
| | <p>4.1 Know methods for classifying construction equipment</p> <p>4.2 Know earth factor in Earthwork</p> <p>4.3 Know the different earthwork and material handling equipment</p> <p>4.4 Understand the factors influencing equipment selection.</p> | <ul style="list-style-type: none"> Discuss the classification of major equipment State the reason of classification Discuss earth/ground condition as it affects suitability to the job Explain ground characteristic influence on equipment performance e.g equipment suitability, digging effort, earthmoving equipment output etc. List the different earth work equipment such as <ul style="list-style-type: none"> Earth | | | | |

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| | | <p>excavating equipment</p> <ul style="list-style-type: none">- Earth cutting and Hauling equipment- Earth compacting and grading equipment- Concreting plant and equipment <ul style="list-style-type: none">• Discuss types of cranes for material Handling e.g Tower cranes and mobile cranes• Explain crane output estimation• Discuss the following :<ul style="list-style-type: none">- Task consideration e.g mature of work, rate quality output- Site constraints- Equipment suitability- Operating reliability- Maintainability | | | | |
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| | | <ul style="list-style-type: none"> - Economic consideration e.g owning cost, re-sale value • Commercial consideration | | | | |
| GENERAL OBJECTIVE 5.0 Understand Quality Assurance in Railway Construction | | | | | | |
| | <p>5.1 Understand Quality Assurance in Construction</p> <p>5.2 Know elements of Quality Assurance system</p> | <ul style="list-style-type: none"> • Explain quality assurance (QA) • Differential Quality Assurance from Quality Control • Explain the need for quality assurance in the context of railway construction • List and discuss the following element of Quality Control for a railway construction • Assessing requirement of a railway construction • Choice of quality materials and design • Development of | | | | |

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| | | specifications and acceptance criteria <ul style="list-style-type: none"> • Choice of construction methods/equipment/plant • Inspection and Quality Control • Assessing Quality of the finished permanent way • Periodic Inspection and maintenance measures. | | | | |
| GENERAL OBJECTIVE 6.0 Understand Risk Management at Construction Site | | | | | | |
| | 6.1 Know the concept of risk and risk management in construction 6.2 Know risk, risk assessment And risk mitigation | <ul style="list-style-type: none"> • Define risk • Explain risk management strategy • Explain risk identification approach e.g sources of risk, risk events, risk check list of the railway construction • Explain risk assessment approach e.g Risk Quantitative and Quantive | | | | |

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| | 6.3 Understand human side of risk management | <p>assessment approach.</p> <ul style="list-style-type: none"> • Explain risk mitigation • List risk mitigation measures such as Risk transfers, Risk differed, risk reduction • Give typical examples of Risk mitigation • Explain the human factor in risk management • Identify role of the project manager in managing risk | | | | |
| GENERAL OBJECTIVE 7.0 Understanding the application of CPM/PERT techniques in construction Management. | | | | | | |
| | <p>7.1 Understand CPM Network analysis fundamentals</p> <p>7.2 Understand PERT Network modelling and Time analysis methodology</p> | <ul style="list-style-type: none"> • Define Critical Path Methods (CPM) • List and explain network elements i.e activity and event. • Explain network modelling and numbering of events • Explain event | <ul style="list-style-type: none"> • Recommended text books, • Visuals, projectors etc. | | | |

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| | | <p>timings and connected terms e.g Earliest start time (EST), LST,EFT,LFT, etc</p> <ul style="list-style-type: none">• Define critical path• Use a typical project to model a network using CPM• Explain how to model a PERT network• Evaluate the critical path• Differentiate between PERT and CPM. | | | | |
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| PROGRAMME: HIGHER NATIONAL DIPLOMA IN RAILWAY ENGINEERING TECHNOLOGY | | | |
|--|-----------------------------|--------------|-----------------------------------|
| COURSE TITLE: Quantity control | COURSE CODE: RWE 425 | UNIT: | CONTACT HOURS: 3HOURS/WEEK |
| | | | THEORETICAL: 1HOUR/WEEK |
| SEMESTER: 1 | PRE-REQUISITE : NONE | | PRACTICAL:2HOURS/WEEK |
| <p>Goal: The course is designed to acquaint the students with knowledge of quality control and its application in the railway industry.</p> <p>General Objectives:</p> <p>On completion of this module, the student/cadets should be able to:</p> <ol style="list-style-type: none"> 1.0 Understand the concept of quality control 2.0 Understand quality management and organization 3.0 Understand the concept of quality control of machine elements 4.0 Understand the concept of quality assurance and economic 5.0 Understand the application of statistical quality control in the railway industry 6.0 Understand the concept of quality control and safety. | | | |

HIGHER NATIONAL DIPLOMA SEMESTER

| PROGRAMME: HIGHER NATIONAL DIPLOMA IN IN RAILWAY ENGINEERING | | | | | | |
|--|--|---|--|--|---------------------------------|-------------------|
| COURSE:QUALITY CONTROL | | | COURSE CODE: RWE 425 | | CONTACT HOURS: 2.0 HOURS | |
| GOAL: The course is designed to acquaint the students with knowledge of quality control | | | | | | |
| COURSE SPECIFICATION: THEORETICAL CONTENT | | | | COURSE SPECIFICATION: PRACTICAL CONTENT | | |
| <i>Week</i> | <i>Specific Learning Objectives</i> | <i>Teacher's Activities</i> | <i>Learning Resources</i> | <i>Specific Learning Objective</i> | <i>Teacher's Activities</i> | <i>Evaluation</i> |
| GENERAL OBJECTIVE 1.0 Understand the Concept of Quality Control. | | | | | | |
| 1-2 | 1.1 Define quality control 1.2 List the advantages of quality control 1.3 Explain the concept mass production 1.4 Explain interchangeability 1.5 List advantages of interchangeability. 1.6 List out the stages of quality control process 1.7 Explain the stages in 1.6 | <ul style="list-style-type: none"> • Explain activities 1.1 to 1.7 | <ul style="list-style-type: none"> • Marker board | | | |
| GENERAL OBJECTIVE 2.0 Understand Quality Management and Organization | | | | | | |
| 3-5 | 2.1 List the major roles of quality management 2.2 Explain the list in 2.1 2.3 List the different units of quality control department 2.4 Explain the roles of each of 2.3 2.5 Explain the concept of total quality management (T&M) | <ul style="list-style-type: none"> • Explain 2.1 to 2.5 | <ul style="list-style-type: none"> • Marker Board | | | |

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| | 2.6 Sketch a typical organogram of quality control department | | | | | |
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GENERAL OBJECTIVE 3.0 Understand The Concept of Quality Control of Machine Elements

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| 6-9 | <p>3.1 List the classification of measuring tools and instruments</p> <p>3.2 Explain the list 3.1</p> <p>3.3 List the instruments used For measuring: (i) Gear (ii) Surface finish (iii) Flatness and Parallelon (iv) Screw thread (v) Sqarencess</p> <p>3.4 Explain each of 3.3</p> <p>3.5 Explain: (i) Measurement (ii) Gauging (iii) Comparison</p> <p>3.6 State Taylor's principles of Gauging</p> <p>3.7 Explain Taylor's principle of Gauging</p> <p>3.8 State Abbe's principle of Alignment</p> <p>3.9 Explain Abbe's principle of alignment</p> | <ul style="list-style-type: none"> • Explain 3.1 to 3.12 | <ul style="list-style-type: none"> • Marker • board | <p>3.1 Carryout measurement using the various instruments listed in 3.3</p> <p>3.2 Carryout gauging test</p> <p>3.3 Carryout comparison test</p> <p>3.4 Carryout alignment test On railway track</p> | <ul style="list-style-type: none"> • Different measuring instruments • Go and No Go gauges comparator Slip gauges did gauges • Different alignment test instruments in level |
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| | <p>3.10 Explain:</p> <p>(i) Limits and fits</p> <p>(ii) Accuracy</p> <p>(iii) Precision</p> <p>(iv) Tolerance</p> <p>3.11 List sources of misalignments in Rail tracks</p> <p>3.12 Explain the list in 3-11</p> | | | | | |
| GENERAL OBJECTIVE 4.0 Understand concept of quality Assurance and Economics | | | | | | |
| 10-13 | <p>4.1 Explain Quality Assurance</p> <p>4.2 Explain Quality Economics</p> <p>4.3 List the data life cycle</p> <p>4.4 Explain the list in 4.3</p> <p>4.5 List the stages of Developing a quality Assurance Project as Applicable to a railway System</p> <p>4.6 Explain the list in 4.5</p> <p>4.7 Explain</p> <p>(i) Quality audit</p> <p>(ii) Vendor quality</p> <p>(vi) Quality circles</p> <p>(iv) cost of quality</p> <p>(v) Economic of design quality</p> <p>(vii) Internal and External Failure costs</p> <p>4.8 Explain the difference between Quality Assurance and Quality Control</p> | <ul style="list-style-type: none"> • Explain 4.1 to 4.8 | <ul style="list-style-type: none"> • Marker board | | | |

GENERAL OBJECTIVE 5.0 Understand the Concept of Statistical Quality Control in Railway Industry

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| | <p>5.1 Explain statistical quality control</p> <p>5.2 List the statistical terms Used in quality control</p> <p>5.3 Explain each of 5.2</p> <p>5.4 List the characteristics of a machine component for statistical Analysis</p> <p>5.5 Explain each of 5.4</p> <p>5.6 Define a control chart</p> <p>5.7 List the classes of control charts</p> <p>5.8 Explain each of 5.7</p> | <ul style="list-style-type: none"> • Explain 5.1 to 5.8 • Construct the different control charts for the students | Market Board | | | |
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GENERAL OBJECTIVE 6.0 Understand the concept of quality control and safety

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| 14-15 | <p>6.1 Explain the relationship between quality and safety</p> <p>6.2 List the factors affecting Safety compliance of Products</p> <p>6.3 Explain the list in 6.2</p> <p>6.4 Explain</p> <p>(i) Market Surveillance</p> <p>(ii) Implementation and</p> <p>(iii) Sustainability of safely Compliance policy of a Product</p> <p>6.5 Explain reliability of a product</p> <p>6.6 List factors affecting Reliability of a product</p> | Explain 6.1 to 6.7 | <ul style="list-style-type: none"> • Marker • Board | | | |
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| | 6.7 Explain the factors in 6.6 6.8 Explain railway ballast 6.9 List methods of control of Ballast quality 6.10 Explain the list in 6.9 | | | | | |
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| PROGRAMME: HIGHER NATIONAL DIPLOMA IN RAILWAY ENGINEERING TECHNOLOGY | | | |
|--|-----------------------------|--------------|-----------------------------------|
| COURSE TITLE: ADVANCE SIGNALLING AND COMMUNICATION | COURSE CODE: RWE 414 | UNIT: | CONTACT HOURS: 3HOURS/WEEK |
| | | | THEORETICAL: 1HOUR/WEEK |
| SEMESTER: 1 | PRE-REQUISITE : NONE | | PRACTICAL:2HOURS/WEEK |
| <p>Goal: To train graduate on advance signaling and communication.</p> <p>General Objectives:</p> <p>On completion of this module, the graduate should be able to:</p> <ol style="list-style-type: none"> 1.0 Understand train control in a safe manner for the condition ahead 2.0 Understand how to maintain a safe distance to any train ahead or dead end ahead 3.0 Understand how to prevent the setting of conflicting movement 4.0 Understand how to ensure that a point are locked in the correct position 5.0 Understand how to enable train operate to the head way required 6.0 Understand how train operate to the schedule speed with disruption consistent with speed. | | | |

HIGHER NATIONAL DIPLOMA SEMESTER

| PROGRAMME: HIGHER NATIONAL DIPLOMA IN IN RAILWAY ENGINEERING | | | | | | |
|--|--|--|--|--|---|---|
| COURSE: Advanced signalling and Communication | | | COURSE CODE: RWE 414 | | CONTACT HOURS: 2 HOURS | |
| GOAL: To train graduate on advance signaling and communication | | | | | | |
| COURSE SPECIFICATION: THEORETICAL CONTENT | | | | COURSE SPECIFICATION: PRACTICAL CONTENT | | |
| <i>Week</i> | <i>Specific Learning Objectives</i> | <i>Teacher's Activities</i> | <i>Learning Resources</i> | <i>Specific Learning Objective</i> | <i>Teacher's Activities</i> | <i>Evaluation</i> |
| GENERAL OBJECTIVE 1.0 To Control trains in a safe manna for the condition ahead. | | | | | | |
| | 1.1 Define railway signalling system 1.2 Track circuit 1.3 Operation of track circuit 1.4 Light interpretation 1.5 Explain how to Instil point | <ul style="list-style-type: none"> • Explain activities in 1.1 to 1.4 to student • Explain railway system Control pyramid • Explain process of point Installation and maintenance | <ul style="list-style-type: none"> • Marker board • Various model component of track circuit | 1.1 identify various Track circuit 1.2 identify current movement in the circuit | <ul style="list-style-type: none"> • Demonstrate with the aid of a simple diagram track circuit • Conduct operational a track circuit • Demonstrate installation of points | <ul style="list-style-type: none"> • Track the circuit • Complete model of track and switches |
| GENERAL OBJECTIVE 2.0 Understand how to maintain a safe distance to any train ahead or dead end ahead | | | | | | |
| | 2.1 Explain Point Operation 2.2 Explain locking and detection 2.3 Define European rail Train | <ul style="list-style-type: none"> • Explain activities 2.1 to 2.4 to student | <ul style="list-style-type: none"> • Marker board • Model of various component | 2.1 Identify various component of Point, locking and detection devices 2.2 Identify various | <ul style="list-style-type: none"> • Demonstrate Points on tracks, locking and detection of | <ul style="list-style-type: none"> • Chart showing point locking and |

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| | Management system (ERTMS) 2.4 Describe European rail Train Management system (ERTMS) | | of locking and detection devices | component of ERTMS | train • Demonstrate installation of ERTMS | detection • ERTMS trainer |
| GENERAL OBJECTIVE 3.0 Understand how to prevent the setting of conflicting movement. | | | | | | |
| | 3.1 Explain Interlocking 3.2 Explain how sliding bars are connected to the leaves 3.3 Explain computer based train control (CBTC) | • Explain the activities in 3.1 to 3.3 to student | • Marker board • Model of interlocking device | 3.1 Identify component of Interlocking 3.2 Identify how bars are connected to the lever 3.3 Identify component of CBTC | • Demonstrate simple interlocking system • Demonstrate connection to lever • Demonstrate use of CBTC | • Model interlocking devices • CBTC model trainer |
| GENERAL OBJECTIVE 4.0 Understand how to ensure that a point are locked in the correct position | | | | | | |
| | 4.1 Explain minimum headway 4.2 Explain Train management Control System (TMCS) | • Explain activities 4.1 to 4.2 to student | • Marker board | 4.1 Identify minimum time interval that can be run between train 4.3 Identify component of (TMCS) | • Demonstrate with the aid of simple diagram Headway distance & time • Demonstrate installation of TMCS | • Model training of TMCS |
| GENERAL OBJECTIVE 5.0 Understand how to enable train operate to the headway required | | | | | | |
| | 5.1 Explain home and distant signals 5.2 Explain automate warning system (AWS) | • Explain activities 5.1 to 5.2 to students | • Marker board | 5.1 Identify various components of (AWS) | • Demonstrate instillation of (AWS) | • Model of AWS training. |
| GENERAL OBJECTIVE 6.0 Understand how train operate to the schedule speed with disruption consistent with speed. | | | | | | |

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| | <p>6.1 Explain Two aspect colour lighting signalling</p> <p>6.2 Three aspect colour light signalling</p> <p>6.3 Four aspect colour light signalling</p> <p>6.4 Explain Training protection warning system (TPWS)</p> | <ul style="list-style-type: none"> • Explain activities 6.1 to 6.4 to student | <ul style="list-style-type: none"> • Markers board • Model & various colour light | <p>6.5 Identify various colour light used in signaling</p> <p>6.6 Identify component of TPWS</p> | <ul style="list-style-type: none"> • Demonstrate various colour light • Demonstrate installation of TPWS | <ul style="list-style-type: none"> • Model of various colour light • TPWS model Training |
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| PROGRAMME: HIGHER NATIONAL DIPLOMA IN RAILWAY ENGINEERING TECHNOLOGY | | | |
| COURSE TITLE: Railway Security and Protection | COURSE CODE: RWE 425 | UNIT: 2 | CONTACT HOURS: 2HOURS/WEEK |
| | | | THEORETICAL: 1HOUR/WEEK |
| SEMESTER: 1 | PRE-REQUISITE : NONE | | PRACTICAL:2HOURS/WEEK |
| <p>Goal: Know the principles and processes involved in the construction of bridges</p> <p>General Objectives:</p> <p>On completion of this module, the student/cadets should be able to:</p> <p>.</p> | | | |

HIGHER NATIONAL DIPLOMA SEMESTER

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| PROGRAMME: HIGHER NATIONAL DIPLOMA IN IN RAILWAY ENGINEERING | | | | | | |
| COURSE: | | | COURSE CODE: RWE | CONTACT HOURS: 2 HOURS | | |
| GOAL: | | | | | | |
| COURSE SPECIFICATION: THEORETICAL CONTENT | | | | COURSE SPECIFICATION: PRACTICAL CONTENT | | |
| <i>Week</i> | <i>Specific Learning Objectives</i> | <i>Teacher's Activities</i> | <i>Learning Resources</i> | <i>Specific Learning Objective</i> | <i>Teacher's Activities</i> | <i>Evaluation</i> |
| | GENERAL OBJECTIVE 1.0 | | | | | |
| | | • | • | | | |
| GENERAL OBJECTIVE 2.0 Understand Planning For Bridges Site Investigations And Design Principles | | | | | | |
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