KURIKULUM

JURUGEGAS JENTERA

(workshop
diesel,
hydr
steam)

Evaluation – (1) under
on-the job training is still not effective
(2) unsuitable placement, ~~too much~~

Suggests = Final year apprentice to be given responsible work.

OBJECTIVES

The Apprenticeship Training programme is aimed at producing tradesmen having the following characterisitics:-

- high degree of skill in the trade to which he shall be appointed at the end of the programme

- appreciative of the technicalities of his job

- aware of his responsibility as a party to implementing the NEB's functions and national aspirations

- aware that his business is to serve the community

A tradesmen, following a normal career development and advancement path, usually proceed to become junior technician as a promotional process. The formal apprenticeship training programme at the Training Institute, therefore, is not only to provide him with the immediate need of the skill as a tradesmen, but also a preparation for his advancement to higher post, with short supplementary upgrading courses.

As the stress is on the acquisition of industrial skill, the implementation of Technical (Industrial) Training should be made with minimum academic theoretical approach. As far as possible, actual job situation must be created, stressing the importance of industrial safety and regulations.

TRADE APPRENTICES CURRICULUM

COMMON MODULE (1300) — 24 Weeks — 1128 Periods

TRADE APPRENTICES CURRICULUM

MECHANICAL FITTER

1ST MODULE (1321) — 12 Weeks — 564 Periods

TRADE APPRENTICES CURRICULUM

MECHANICAL FITTER

2ND MODULE (1321) — 12 Weeks — 564 Periods

TRADE APPRENTICES CURRICULUM

MECHANICAL FITTER

3RD MODULE (1321) — 12 Weeks — 564 Periods

COMMON MODULE

MATHEMATICS

Common Module — **66 Periods**

- Daily Arithmetic
  - . Daily business
  - . Percentages
- Operation With Numbers
  - . Reciprocal
  - . Square and square roots
  - . Surds
  - . Exponent
- Geometry
  - . Area
  - . Volume
  - . Circle
  - . Similar triangles
- Trigonometry
  - . Pythagoras theorem
  - . Trigonometric ratios
- Algebraic Process
  - . Addition, subtraction, multiplication and division of algebraic expressions
  - . Linear simultaneous equation

LANGUAGE AND COMMUNICATIONS
(Bahasa Malaysia and English)

Common Module — 22 Periods

- Oral Expression
  - . Pronunciation
  - . Language ethiquet
- Vocabulary Expansion
- Comprehension
  - . Idea analysis
  - . Assembly and organisation of ideas
  - . Precis
- Letter writing
  - . Informal
  - . Formal

CIVICS

Common Module — 22 Periods

- Role of individual in society
- Work as a trust
- Cultures
  - . Cultural development in Malaysia
  - . Realisation of national culture
- Government
  - . Systems of government
  - . Government of Malaysia
  - . Government Agencies
- Industrial Relations

ISLAMIC STUDIES

Common Module — 22 Periods

- Tauhid (Akidah)
  - Perkembangan pemikiran manusia
  - Ugama sebagai sistem hidup
  - Rukun Taqwa dalam Islam
  - Konsep-konsep Rukun Iman dan Islam
- Tasauwuf (Akhlak)
  - Ibadat sebagai alat kegigihan Iman
  - Berhemah tinggi
  - Merendah diri dalam Islam
  - Sabar
  - Ikhlas
  - Takabbur
- Fiqah (Syariah)
  - Kefardhuan dan hikmah sembahyang
  - Pendekatan manusia kepada sembahyang
  - Sembahyang Jumaat
  - Sembahyang Jamaah

BOARD'S REGULATIONS

Common Module **22 Periods**

- Organization of the L.L.N.
  - . Technical functions of L.L.N.
  - . Functional divisions of L.L.N.
  - . Organization of power stations
  - . Organization of L.L.N. districts
- Terms and Conditions of Service
  - . Recruitment and appointment
  - . Promotions and transfer
  - . Working hours
  - . Disciplines
- Perquisites
  - . Normal allowances
  - . Leaves

PHYSICAL EDUCATION

Common Module — 44 Periods

To develop physical fitness, agility and team spirit in preparation for the trainees to be familiar with strenuous and vigorous manual work.

Achieved by:-

- Various exercises
- Gymnastics
- Games

PRINCIPLES OF ELECTRICITY
(Theory and Lab.)

Common Module — 154 Periods

- Electrical Current
  - . Nature
  - . Conducting and non-conducting bodies
- Sources of E.M.F.
- Types of Electrical Current
- Basic Electrical Units
- Electrical Cells
  - . Types and Construction
  - . Connection configuration
- Electrical Resistance
  - . Ohm's Law
  - . Resistivity
  - . Temperature Effect
  - . Connection configuration
- Kirchoffs' Law
- Electrical Power and Energy

- Magnetism

  . Magnetic Field

  . Magnetic Induction

  . Magnetic Flux

  . Hysteresis

  . Effect of magnetic field on conductors

  . Motor Effect

  . Electromagnetism - Application of electromagnet (Contactors)

- Electromagnetic Induction

  . Lenzs' Law

  . Self Induction

- Capacitor

  . Capacity

  . Charge and discharge

  . Connection Configuration

MECHANICAL SCIENCES
(Theory & Lab.)

Common Module — 176 Periods

METROLOGY

- Units of Physical Measurement
  - . Imperial and metric Systems
  - . Inter system conversion
- Linear and Angular Measurements

FUNDAMENTAL MECHANICS

- Scalar and Vector Quantity
- Mass and Weight
  - . Density
  - . Specific gravity
- Forces
  - . Composition and resolution
  - . Equilibrium
  - . Parallelogram of Forces
- Moments, level, torque and pulley
- Work, energy and power

PHYSICAL SCIENCE

- Pressure

  . Solid and liquid states

  . Pressure measurements

  . Flotation principle

- Heat and Temperature

  . Heat effect (Expansion in solids, liquids and gases)

  . Heat transfer

  . Quantity of heat

  . Specific heat

  . Latent heat

METALLURGY

- Types of Materials

  . Metals (Ferrous and Non-Ferrous)

  . Non-metals

- Strength of Materials

  . Ductility

  . Elasticity

  . Malleability

  . Hardness

  . Toughness

  . Brittleness

TECHNICAL DRAWING

Common Module — **66 Periods**

- Drawings
  - . Mechanical, electrical and civil blueprints
- Drawing Equipment
  - . Identification and use
  - . Paper Selection
- Lines
  - . Types and weighting
- Lettering
  - . Styles
- Scaling
- Dimensioning
  - . Aligned and unindirectional
- Geometry and Development
  - . Polygons and ellipses
  - . Bisection

- Projections

  . Pictorial

  . Orthographic, 1st and 3rd angle

  . Conversion of orthographic to pictorial

ELECTRICAL WIRING/INSTALLATION

Common Module — 110 Periods

- Introduction to Wiring/Installation Workshop
- Preparation of Conductors
  - . Types of conductors
  - . Exposing/baring
- Terminations
  - . Crimping and soldering of lugs
  - . At switches, plugs, distribution boxes
- Surface Wiring
  - . Lighting circuits
  - . Power circuits
  - . Discharge lighting
- Installation and Maintenance of Appliances
  - . Electric bell
  - . Stove
  - . Fan and regulator
  - . Water heater
  - . Lift

WELDING

Common Module — 66 Periods

- Introduction to Welding Workshop
- Arc Welding Technique
  - . Safety precautions in Arc welding
  - . Laying stringer beads
  - . Laying straight line
  - . Laying weaved beads by Arc welding
  - . Arc length
  - . Welding Positions
  - . Metal Building-up
- Electrodes for Arc Welding
- Types of joints
  - . Fillet weld Tee Joint
- Weld defects in Arc Welding
- Gas welding Techniques
  - . Safety precautions in gas welding
  - . Setting up of gas plant
  - . Flames used in gas welding
  - . Laying beads without filler rod
  - . Systems in Oxy-acetylene welding
  - . Techniques adopted in gas welding
  - . Laying beads with filler rod

- Filler Rods for gas Welding
- Weld defects in gas welding
- Butt joint by gas welding
- Brazing
  - Tee Joint and Butt Joint
- Gas Cutting
  - Manual Cutting
  - Profile Cutting

FITTING/SHEET METAL

Common Module — 110 Periods

FITTING

- Introduction to Fitting Workshop
- Marking and Work Holding
- Filing
- Hacksawing
- Measuring Instruments
- Clamps
- Fitting
- Chipping
- Drilling
- Rivetting
- Reaming, Tapping and Dicing

SHEET METAL

- Introduction to Sheet Metal Workshop
- Marking Out
- Cutting
- Mechanical Joints
- Soldering
- Simple Development
- Stakes
- Drilling
- Rivetting

MACHINING

Common Module **44 Periods**

- Introduction to Machining Workshop

- Turning

  - Introduction to Lathe Machine
  - Plain turning
  - Step turning
  - Taper turning
  - Chamfering
  - Knurling
  - Parting off

- General Machining

  - Introduction to milling, shaping and drilling machines
  - Types of cutting tools used on milling, shaping and drilling machines
  - Rectangular block milling
  - Milling of a "U" block
  - Grinding of plain cylinder

SUBSTATION/PROTECTION

Common Module — 44 Periods

- Identification and information on substation equipment and accessories

  . Types of substations

  . Types of distribution substations

  . Identification and function of equipment

  . Standard layout of distribution substation

- Identification and Function of Fuses

  . Fuse terminology

  . Identification of types of fuses

  . Discrimination of fuses

  . Fuse application

  . Installation and care of fuses

  . Replacement/installation of fuse in H.F.U.

TRANSMISSION AND DISTRIBUTION

Common Module — 66 Periods

- Generation, transmission and distribution of electrical energy
- L.V. Overhead Line
  - . Identification of components
  - . Knots
  - . Lifting and handling
  - . Safety belts, ladders and ropes
  - . Dressing of pole
  - . Planting of pole
  - . Climbing of pole
  - . Drum handling
  - . Conductor laying
  - . Binding of stay
- Underground distribution
  - . Types of underground cable
  - . Drum handling
  - . Cable construction
  - . L.V. Cable joint (demonstration only)
  - . Gas equipment
  - . Stripping a L.V. cable

- Pretinning of copper and aluminium earth tape
- Socketing process for cable up to 70 mm^2

NOTE:

Emphasis will be given to safe handling aspects and proper handling techniques.

FIRST MODULE

MATHEMATICS

First Module — **33 Periods**

- **Algebraic**
  - . Revision on algebraic processes
  - . Revision on linear simultaneous equation
  - . Quadratic equation

- Trigonometry
  - . Fundamental relationship between sine, cosine and tangent
  - . Sinusoidal function

- Circle
  - . Further treatment on properties of

- Vectors
  - . Addition and subtraction of

LANGUAGE AND COMMUNICATION
(Bahasa Malaysia And English)

First Module — **11 Periods**

- Oral Expression
  - Further treatment on language etiquette
  - Debates
- Vocabulary Expansion
- Comprehension
  - Further treatment on analysis, assembly and organisation of ideas

CIVICS

First Module — **11 Periods**

- Honesty and Integrity
- Modesty
- Achievement and Pride
- Self Control and Respect
- Personal Manners
- Role of Public Servants
- Public Relations

ISLAMIC STUDIES

First Module — **11 Periods**

- Tauhid
  - . Fungsi ambia dan rasul
- Fiqah
  - . Kefardhuan dan hikmah puasa
  - . Pendekatan manusia kepada pausa
  - . Jenis dan cara-cara berpuasa
- Sejarah
  - . Perkembagan Islam sebelum Hijrah

BOARD'S REGULATIONS

First Module — **11 Periods**

- Organization of L.L.N.
  - . Functions of departments relevant to tradesmen
- Terms and Conditions of Service
  - . Overtime
  - . Uniforms
  - . Accident at Work
- Perquisites

Further treatment on:-

- . Leaves
- . Allowances

PHYSICAL EDUCATION

First Module **22 Periods**

To develop physical fitness and agility and team spirit in preparation for the trainees to be familiar with strenous and vigorous manual work.

Achieved by:-

- Various exercises
- Gymnastics
- Games

PRINCIPLES OF ELECTRICITY
(Theory and Lab.)

First Module — **77 Periods**

- Electro-magnetic Induction
  - . Further treatment on

- Capacitor
  - . Further treatment on

- Single Phase A.C.
  - . Generating of A.C.
  - . Properties of A.C.
  - . Electrical parameters in A.C.
  - . Active and reactive power
  - . Power factor

- Static Machine
  - . Principles of transformation and transformation ratio.
  - . Principles of transformer construction and types
  - . Performance of transformers

- Three Phase Generation
  - . Principle of

MECHANICAL SCIENCES
(Theory & Lab.)

First Module — **66 Periods**

- Metrology
  - . Engineering measurements, (tolerance, limit and fit)
- Fundamental Mechanics
  - . Friction
  - . Wheel and Axle
  - . Inclined plane and screw
  - . Basic kinematics
- Physical Science
  - . Coeffieients of expansion
- Metallurgy
  - . Heat treatment

TECHNICAL DRAWING (M)

First Module — **33 Periods**

- Section and Half Section and Symbols for Materials
- Screw Threads, Bolts, Nuts
- Welds
- Surface Symbols for Metalwork
- Pipe Diagrams and Pipe Symbols

HEAVY MECHANICAL WORKSHOP PRACTICE

First Module — 55 Periods

- Pipe work
  - Pipe fitting up to 3" diameter using G.I., steel, copper and P.V.C.
- Couplings
  - Classification and identification
  - Dismantling/assembling simple couplings
- Bearings
  - Classification and identification
  - Remetalling (theory)
- Diesel
  - Identification of components
  - Working principle
  - Dismantling/assembling of piston assembly and gear box.

POWER STATION PRACTICE

First Module — **77 Periods**

ELECTRICAL

- Identification of Generators, Exciters, AVR and Generator and unit Transformers

- Cabling
  - Generator main cabling
  - Station auxiliary cabling

- Auxiliary Plants
  - Switchgears
  - Generator auxiliaries
  - Transformers

- Control and Protection System
  - Station earth
  - D.C. supply
  - Cathodic protection

- Identification of Motors and their Applications

MECHANICAL

- Power Station Safety Regulation and Fire Fighting

- Identification of Mechanical Installations

- Types and Applications of

  . Pumps

  . Valves

  . Compressors

- Mechanical Circuits

  . P/S layout

  . C.W. circuit

  . Water and steam circuit

  . Air and gas circuit

  . Fuel circuit

  . Lub. oil circuit

NOTE:

Emphasis to be given to the role of pumps, compressors and fans.

FITTING AND SHEET METAL

First Module — 66 Periods

- Fitting

  Revision and further exercises on the following:

  . Filling
  . Hacksawing
  . Fitting
  . Chipping
  . Drilling
  . Rivetting
  . Taping and Dicing
  . Reaming

- Sheet Metal

  Revision and further exercises on the following:

  . Cutting
  . Mechanical joints
  . Soldering
  . Drilling
  . Rivetting

- Sheet Metal machines

- Strengthening Devices

- Parallel line sheet development

MACHINING

First Module — **22 Periods**

- Maintenance of Machining Tools.
  - . Lathe, drill, hacksaw, shaper and miller
  - . Greasing
  - . Lubricating oil change
  - . Coolant change
  - . Gear box check (visual)
  - . Detection of faulty operation (vibration)
  - . Tools grinding
  - . Grinding wheel change
- Lathe bed alignment
  - . Tailstock and headstock alignment
  - . Shimming
- Boring technique

WELDING

First Module — 22 Periods

ARC WELDING

- Revision and Further Exercises on:
  - . Laying beads - straight line and weaved
  - . Welding position - horizontal
  - . Metal building-up
- Butt-jointing-downhand
- Distortion of metals in welding

GAS WELDING

- Revision and Further Exercises on:
  - . Corner joint
  - . Brazing (pipe joints - brass)
  - . Gas cutting (manual)
  - . Profile cutting
- Testing of weld joints

SECOND MODULE

MATHEMATICS

Second Module — 33 Periods

- Simultaneous Equation
  - . Further treatment
- Quadratic Equation
  - . Further methods of solving
- Sinusoidal Function
  - . Further treatment on function in terms of time
- Three Dimensional Trigonometry
  - . Solids
  - . Sine/Cosine formulae
- Relative Speed
- Graphs
  - . Further examples
  - . Gradient

LANGUAGE AND COMMUNICATION
(Bahasa Malaysia And English)

Second Module — **11 Periods**

- Oral Expression
  - . Debates
  - . Telephone conversation

- Vocabulary Expansion

- Essay Writing
  - . Formulation of ideas
  - . Assembly of ideas

- Report Writing
  - . Log reporting
  - . Journalistic reporting

CIVICS

Second Module — **11 Periods**

- Constitution
- Citizenship
- Election
- Legal System
- Integrity of Law
- Crime and Punishment (Arrest)
- Social Sensitivities and Tolerances

ISLAMIC STUDIES

Second Module — 11 Periods

- Sejarah
  - Perkembangan Islam selepas Hijrah
  - Islam semasa Khalafa Arrasyidin
  - Islam selepas Khalafa Arrasyidin
  - Punca kejatuhan kerajaan Islam

- Tasauwuf
  - Amanah
  - Pemurah
  - Mengumpat
  - Hasad dan fitnah

BOARD'S REGULATIONS

Second Module — 11 Periods

- Service Ethics
  - Confidential Report
  - Personal Grievances
  - Employees' Unions

- Administrative Procedures
  - Financial
  - Stores
  - Security of Board's Properties

- Perquisites
  - Housing and Other Loans
  - Housing facilities

PHYSICAL EDUCATION

Second Module 22 Periods

To develop physical fitness and agility and team spirit in preparation for the trainees to be familiar with strenous and vigorous manual work.

Achieved by:-

- Various exercises
- Gymnastics
- Games

MECHANICAL SCIENCES
(Theory & Lab.)

Second Module — 132 Periods

METROLOGY

- Engineering measurement
- Tolerance, limits and fits
- Measuring instruments

FUNDAMENTAL MECHANICS

- Kinematics
- Projectile
- Simple Harmonic motion

PHYSICAL SCIENCE

- Applied Head:
  - Gas laws
  - Expansion and compression of gases
  - Properties of steam
  - Steam plant
  - Introduction to heat transmission

METALURGY

- Steel-manufacturing processes
- Heat treatment of steels
- Working processes

POWER STATION PRACTICE (M)

Second Module — 44 Periods

- Various NEB steam stations layout
  - . Boiler and Aux. in NEB stations
  - . Turbines and Aux. in NEB stations
- Layout and description of hydro stations
- Diesel station description
- Nomenclature and operation and aspect of typical types of:
  - . Pumps
  - . Compressor
  - . Valves
- Fire fighting equipment
- Safety regulation
- First aid/Artificial Respiration

HEAVY MECHANICAL WORKSHOP PRACTICE

Second Module — **88 Periods**

- Pipework Exercises
- Valves Maintenance and Reconditioning
- Pumps Routine Maintenance
- Compressors Routine Maintenance
- Diesel Engine Maintenance
- Top Overhaul

FITTING AND SHEET METAL

Second Module — 88 Periods

FITTING

- Revision and Further Exercises on:
  - . Filing
  - . Fitting
  - . Chipping
  - . Tapping and dicing
  - . Reaming
  - . Rivetting
- Hardening and Tempering of Tools
- Maintenance of Hand Tools (screwdrivers, drill bits, chisels, centre punch, scriber, divider)

SHEET METAL

- Revision and Further Exercises on:
  - . Cutting
  - . Mechanical joints
  - . Soldering
  - . Drilling
  - . Rivetting

- Rehabilitation of Ductings and Casings Peculiar tc Power Station Installation

- Radial Line Sheet Development

MACHINING

Second Module — 44 Periods

Revision and Further Exercises on:

- Turning
  - . Step turning
  - . Taper turning
  - . Chamfering
  - . Knurling
  - . Parting off

- General Machining
  - . Milling
  - . Shaping
  - . Drilling

WELDING

Second Module — 22 Periods

ARC WELDING

- Revision and Further Exercises on:-
  - . Welding position - vertical tee-jointing
  - . Metal spraying
  - . Butt-joint-horizontal position
- Testing of Weld-joints

GAS WELDING

- Revision and Further Exercises on:-
  - . Brazing (silver)
  - . Gas cutting
  - . Profile cutting
- Brazing of Non-ferrous Metals

THIRD MODULE

MATHEMATICS

Third Module — **22 Periods**

Revision on the common, the first and the second modules.

LANGUAGE AND COMMUNICATION
(Bahasa Malaysia And English)

Third Module — 11 Periods

- Oral Expression
  - . Interviews
  - . Conducting of meetings

- Essay Writing
  - . Further exercises
  - . Report writing

- Comprehension
  - . Further exercises on precis

CIVICS

Third Module — **11 Periods**

- Taxation
- Expenditure
- Personel manners
- Right and wrong
- Man and his family

ISLAMIC STUDIES

Third Module — 11 Periods

- Tauhid
  - . Bidaah dan khurafat
  - . Kesempurnaan i'tiqad

- Fiqah
  - . Fardhu ain dan fardhu kifayah
  - . Menyempurnakan mayat
  - . Punca-punca hukum Islam
  - . Mazhab

- Tasauwuf
  - . Hidup untuk keredhaan Allah

BOARD'S REGULATIONS

Third Module — 11 Periods

- Organization of the L.L.N.
  - . Historical development of L.L.N.
  - . Electricity Act
  - . Career development and advancement
  - . Circulars
- Terms and Conditions of Service
  - . EPF and pensions
- Perquisites
  - . Medical facilities

MECHANICAL SCIENCES

Third Module — 143 Periods

METROLOGY

- Checking and Measurement of Surface:
  - Surface relationship and accuracy
  - Test for accuracy, flatness, squareness, parallelism, roundness, concentricity, angle of measurement
- Dimensional Analysis

FUNDAMENTAL MECHANICS

- Fluid Dynamics
  - Water Flow
  - Streamlines
  - Streamfunction
  - Turbulance
  - Small and large orifices
- Energy Losses in Pipelines

PHYSICAL SCIENCE

- Heat Transmission (circuit diagram and symbols)
- Hydrostatic Pressure on Surfaces

METALURGY

- Casting/moulding
- Plastics in Engineering
- Industrial Testing of Materials

FITTING AND SHEET METAL

Third Module **88 Periods**

FITTING

- Fabrication of Workshop Components Incorporating Revision on:
  - . Filing
  - . Fitting
  - . Chipping
  - . Tapping and dicing
  - . Reaming
  - . Rivetting

- Fabrication on Hand Tools Involving Hardening and Tempering Processes

SHEET METAL

- Revision and Further Exercises on Cutting, Mechanical Joints, Soldering, Drilling and Rivetting

- Geometrical/Triangulation Line Sheet Development

POWER STATION PRACTICE (M)

Third Module **44 Periods**

- Boiler Maintenance

  . Furnace, burners, sootblowers, header caps, safety valves, guage/level glasses

- Turbine Maintenance

  . Rotor, casings, bearings, glands, condenser, oil purifier, traps and strainers

- Hydro Turbines and Auxiliaries

- Gas Turbine Description

- Harmful Liquids and Gases and Precautions

HEAVY MECHANICAL WORKSHOP PRACTICE

Third Module — **154 Periods**

- Further Exercises on Pipework Overhuals of:
  - Valves
  - Pumps
  - Compressors
  - Diesel engine

- Maintenance of:
  - Couplings
  - Bearings
  - Transmission systems

FIRST AID AND ARTIFICIAL RESPIRATION

Third Module — **22 Periods**

- Rescue
  - . Release from live equipment
- Resuscitation
  - . Treatment after contact with live conductors
  - . Artificial respiration
  - . External cardiac massage
- First Aid for Injuries
  - . First aid kit
  - . Wounds and bleeding
  - . Shock
  - . Burns and scalds
  - . Foreign body in the eye
  - . Fractures
  - . Unconsciousness