



UNIVERSITI TENAGA  
NASIONAL

Lembaga Letrik Negara  
Tanah Melayu

**panduan  
skim latihan  
pegawai-pegawai  
kanan baru**

1983

( PINDAAN A )

42

**UNIVERSITI TENAGA  
NASIONAL**

**ACTION WILL BE TAKEN AGAINST ANY  
STAFF WHO UNDERLINES WORDS, MAKES  
NOTES IN THE MARGINS OR DISFIGURES  
OR DAMAGES BOOKS IN ANY WAY.**



**Lembaga Letrik Negara  
Tanah Melayu**

**PANDUAN  
SKIM LATIHAN  
PEGAWAI-PEGAWAI  
KANAN BARU**

**1983  
(Pindaan A)**

## KANDUNGAN

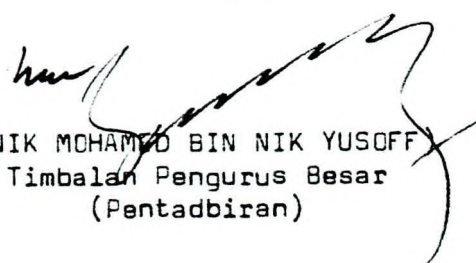
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## SEPATAH KATA

Buku Panduan Skim Latihan Pegawai-Pegawai Kanan Baru ini telah diulangkaji atas beberapa sebab seperti pembentukan kursus baru, penyampaian latihan yang licin dan berkesan dan perubahan strategi latihan.

Sukalah saya nyatakan di sini bahawa kejayaan Skim Latihan ini adalah tanggungjawab bersama di antara Jabatan Pelajaran dan Latihan, ILSAS, Jabatan-Jabatan di mana pegawai-pegawai ini sedang bertugas dan akhirnya pegawai-pegawai kanan baru sendiri. Oleh itu kerjasama yang rapat di antara satu sama lain perlu sentiasa terjalin.

Ketua-Ketua Jabatan di mana pegawai-pegawai ini bertugas hendaklah sentiasa menyalurkan makluman balas dan teguran-teguran yang membina kepada Pegawai Pelajaran dan Latihan Kanan demi untuk memperbaiki dan mempertingkatkan lagi skim latihan ini.



(NIK MOHAMMAD BIN NIK YUSOFF)  
Timbalan Pengurus Besar  
(Pentadbiran)

Nov. 1983.

**JABATAN PELAJARAN DAN LATIHAN  
LEMBAGA LETRIK NEGARA**

**TUGAS-TUGAS LEMBAGA**

*Lembaga mempunyai tanggungjawab yang dikanunkan bagi:-*

*Memajukan penjanaaan tenaga elektrik bagi pembangunan ekonomi Semenanjung Malaysia;*

*Mengadakan bekalan tenaga itu dengan harga yang berpatutan;*

*Menasihatkan Menteri yang bertanggungjawab mengenai tenaga elektrik atas semua perkara berkenaan dengan penjanaaan kuasa dan kegunaannya;*

*Mengurus dan mengendalikan pemasangan elektrik yang telah dipindah-milikan, yang diperolehi atau yang dibina sendiri;*

*Membuat peraturan bagi penjanaaan dan kegunaan tenaga;*

*Membina dan mengendalikan talian bekalan dan stesen-stesen untuk menjana dan menjual tenaga;*

*dan*

*Memperolehi loji elektrik dan harta.*

**SKIM LATIHAN PEGAWAI-PEGAWAI KANAN BARU  
LEMBAGA LETRIK NEGARA**

**1. PENDAHULUAN**

*Lembaga Letrik Negara adalah sebuah Badan Perusahaan Awam yang bertanggungjawab untuk menjana, menghantar dan membahagi kuasa elektrik di Semenanjung Malaysia Barat. Lembaga mengendali dan menyelenggara stesen-stesen Janaelektrik, talian-talian penghantaran dan pembahagian. Lembaga juga membina stesen-stesen Janaelektrik baru untuk tujuan mengganti stesen-stesen lama atau pun meninggi keupayaan penjanaaan; membina talian bekalan grid baru dan sistem pembahagian untuk menampung permintaan pertambahan kuasa elektrik samada dari sektor perindustrian atau pengguna-pengguna kediaman.*

*Pada masa ini, kuasa elektrik dijana dengan mengguna minyak dan air (haidero). Atas sebab-sebab perubahan ekonomi dunia, Lembaga Letrik Negara telah pun merancang untuk menjana tenaga elektrik dengan mengguna arang batu dan gas. Bagi menemui perkembangan sistem, perubahan teknologi dan perkembangan organisasi, maka satu skim latihan yang sistematik untuk pegawai-pegawai baru Lembaga perlu dilaksanakan supaya ianya dapat menentukan bahawa pegawai-pegawai baru yang berkhidmat dengan Lembaga ini dapat mencapai pengetahuan, kecekapan dan sikap sejajar dengan kehendak dan keperluan organisasi.*

## 2. MATLAMAT LATIHAN

*Matlamat skim latihan ini secara umum telah pun dinyatakan di dalam Panduan Pelajaran dan Latihan, No. 35 (Lampiran A). Patut dinyatakan di sini bahawa latihan untuk seorang Pegawai di dalam konteks ianya sebagai satu proses latihan berterusan untuk menambah pengetahuan, kemahiran dan pengalaman adalah merangkumi sepanjang masa perkhidmatan beliau dengan Lembaga, terutama apabila mengambil-alih jawatan baru, beliau perlu diberi kemudahan untuk menghadiri kursus-kursus di dalam aspek kerja baru atau kursus "refresher" (pembaharuan) untuk membolehkan beliau meningkat pengetahuan beliau sejajar dengan perkembangan masa. Di dalam hubungan ini, Lembaga akan memastikan bahawa satu integrasi rapat ujud di antara latihan permulaan sebagaimana dirancang di dalam skim ini dan latih-latihan terkemudian yang diberi oleh Lembaga dari segi kemajuan kerjaya beliau.*

## 3. LATIHAN FORMAL DAN LATIHAN-DALAM-KERJA

*Satu sifat penting yang ditekankan oleh skim ini ialah kadar latihan formal/ latihan-dalam-kerja dan bekerja (produktif) adalah lebih kurang 40 % : 60 % di dalam masa tiga (3) tahun. Program yang dirancang di dalam skim ini, adalah merupakan kepada aspek kerja-kerja yang diperlui oleh organisasi dengan mengguna di mana boleh pengetahuan-pengetahuan yang telah pun mereka perolehi di Universiti atau di Kolej dan dengan ini kecenderongan mereka dapat disemaikan.*

*Latihan-dalam-kerja adalah penting untuk melengkap latihan formal. Faktor penting yang dikatakan demikian ialah kerana setengah-setengah kelengkapan loji atau proses tidak dapat diselakukan di bilek-bilek kuliah atau makmal dan sesungguhnya juga adalah dirasai penting untuk pegawai-pegawai baru merasa suasana keadaan kerja sebenar dan juga untuk mendedahkan mereka secara langsung kepada kakitangan-kakitangan yang mana di satu masa nanti mereka dikehendaki menyelia pula. Adalah juga penting semasa menjalani latihan-dalam-kerja ini, mereka dikehendaki mengambil bahagian yang aktif di dalam aktiviti-aktiviti kerja, yang dilakukan di stesen-stesen di mana mereka membuat latihan yang tidak sekadar memerhati sahaja oleh kerana penglibatan yang aktif ini akan merapatkan mereka dengan kakitangan-kakitangan penyelia atau pegawai-pegawai rendah. Walau bagaimanapun, memang tidak dapat dielakkan bahawa sebahagian masa akan digunakan untuk memerhati sahaja dan ini mestilah digunakan dengan sebaik-baiknya.*

*Pendekatan pegawai baru pula hendaklah lebih analitikal iaitu ia hendaklah mencari dan mencatat faktor mengapa satu-satu kerja itu dilakukan sebegitu rupa; cara yang digunakan, susunan aktiviti kerja dan masa yang diambil. Ia juga sepatutnya membuat kesimpulan butir-butir yang penting yang mana sebagai seorang Jurutera Penyelia, patut mengambil perhatian. Ia juga dikehendaki berbincang dengan Jurutera yang berpengalaman apa yang dipelajari dan membuat perbincangan dari masa kesemasa.*

## 4. KESELAMATAN PERUSAHAAN

*Keselamatan merupakan satu aspek yang mustahak di dalam kerja, terutama Jurutera dan arahan keselamatan yang berkaitan akan dimasukkan di tiap-tiap peringkat latihan di mana perlu. Keselamatan orang ramai, kakitangan yang bekerja di bawah jagaannya dan keselamatan dirinya sendiri sepatutnya menjadi peringatan sebelum beliau melaksanakan sesuatu kerja dan ianya hendaklah menjadi satu tabiat dan amalan sebelum memulakan sesuatu kerja.*

## 5. PENTADBIRAN DAN PENGAWASAN LATIHAN

*Pentadbiran skim latihan ini adalah dipusatkan di bawah Pegawai Pelajaran dan Latihan Kanan dan pengawasannya pula adalah tanggungjawab bersama Pegawai Pelajaran dan Latihan Kanan dan pihak Pengurusan Tempatan. Pegawai Pelajaran dan Latihan Kanan akan membentuk satu program bagi tiap-tiap pegawai baru. Program-program ini akan dirancang dengan kerjasama rapat dengan Ketua Jabatan di mana pegawai baru ini akan memula tugas. Lain-lain tugas Pegawai Pelajaran dan Latihan Kanan termasuklah:-*

- i) Berbincang dengan pegawai-pegawai yang sedang menjalani latihan mengenai latihan-latihan yang diprogramkan untuknya dan di mana perlu mengubahsuaikan susunan program-program ini dari masa kesemasa berpandukan kepada kemajuan, kehendak organisasi dan juga keadaan tempat latihan dari segi pengalaman, kemahiran yang boleh diperolehi oleh beliau.*
- ii) Pegawai Pelajaran dan Latihan Kanan akan mengawasi latihan dan beliau bersama Ketua Jabatan Tempatan/Pegawai Latihan Tempatan bertanggungjawab untuk memastikan bahawa pegawai baru menerima faedah dari latihan yang diperuntuk oleh skim ini dengan sepenuhnya.*
- iii) Menerima laporan dari Ketua Jabatan bersekali dengan ulasan; dan dari Institut Latihan menerima pencapaian kursus formal yang beliau hadiri.*
- iv) Menyediakan satu laporan yang bertulis mengenai kemajuan dan pencapaian pegawai-pegawai ini berasaskan kepada laporan-laporan yang diterima dari pegawai berkenaan atau Ketua Jabatan, samada yang bertulis atau lisan. Laporan ini juga mengandungi pandangan terhadap bakat dan minat pegawai berkenaan dan syor-syor penempatan kerja pegawai berkenaan kelak kepada pihak pengurusan.*

*Di stesen-stesen di mana pegawai di dalam latihan disangkut, Ketua-Ketua Jabatan Tempatan/Pegawai Latihan Tempatan adalah bertanggungjawab untuk menjadi pengajar dan penasihat. Tanggungjawab lain Ketua-Ketua Jabatan Tempatan/Pegawai Latihan Tempatan termasuklah juga menentukan assimilasi pelatih dengan kakitangan di dalam yunit di jabatan beliau; memastikan bahawa pelatih mendapat pengalaman yang berkaitan.*

*Perhatian patutlah juga diambil untuk menyemak dan meneliti kemajuan pelatih melalui laporan dan ulasan Ketua Jabatan supaya tindakan pemulihan dapat diambil untuk membetulkan apa-apa juga kepincangan yang mungkin timbul dan satu sistem maklum-balas untuk menilai latihan yang diterima dari berbagai-bagai jabatan di dalam program latihan mereka.*

*Kursus Formal mengandungi kuliah atau amali yang mana akan dapat menunjukkan samada pelatih memperolehi kemahiran dan pengetahuan yang dirancangan. Untuk latihan-dalam-kerja pula, sedikit sebanyak maklum-balas dapat diperolehi dari laporan yang diterima dari pelatih, tetapi sumber yang penting ialah ulasan dari Ketua Jabatan di mana pelatih berkenaan menjalani latihan-dalam-kerja.*

## 6. REKOD LATIHAN DAN LAPORAN

*Pegawai-Pegawai kanan baru akan diberi sebuah fail latihan untuk menyimpan:-*

- i) Catitan Harian*
- ii) Nota-nota*
- iii) Laporan semasa-dalam-latihan*

*Rekod latihan dan laporan ini adalah satu sistem yang mendokong apa yang disifatkan sebagai yang lebih mustahak lagi iaitu Program Latihan. Perancangan Program Latihan adalah satu usaha yang memerlukan pengkhususan yang nyata supaya ianya mudah diikuti oleh mereka yang berkaitan dan dari segi praktik benar-benar mencerminkan keperluan semasa.*

### 6(i) CATITAN HARIAN

*Format dan cara mengisinya adalah seperti ditunjukkan di dalam Lampiran D. Format ini perlu diisi tiap-tiap hari dan ianya ialah bukti bahawa pelatih telah membuat lawatan yang berkaitan dengan program latihan. Adalah mustahak yang pilihan lawatan-lawatan yang dibuat akan memberi menafaat yang maksima memandangkan tempoh "attachment" yang singkat.*

### 6(ii) NOTA-NOTA

*Disamping mencatat kerja-kerja harian pegawai dalam latihan perlu juga membuat nota-nota di mana perlu untuk mencatat butir-butir kerja harian lebih mendasarnya dengan cara melukis pelan cakar atau menulis keterangan lebih lanjut. Ketua Jabatan Tempatan/Pegawai Latihan Tempatan perlulah memeriksa fail latihan dari masa ke semasa supaya catitan-catitan merangkumi butir-butir yang perlu dipelajari. Pegawai tersebut perlulah memberi nasihat ke atas bidang-bidang yang belum ditemui oleh pelatih-pelatih. Dengan cara ini objektif program latihan ini dapat dipenuhi.*

### 6(iii) LAPORAN SEMASA-DALAM-LATIHAN

*Laporan adalah perlu pada 3 peringkat:-*

- a) Peringkat Penyesuaian (familiarisation) - Satu laporan mesti dihantar selepas pelatih melapor diri di Stesen/Jabatan 3 bulan dan tidak lewat daripada 6 bulan. Isi kandungan laporan ini lebih menitikberatkan Fungsi Jabatan, Carta Organisasi dan Kakitangan, Peranan Seksyen-Seksyen dalam Jabatan, Data-Data seperti Bilangan Pencawang, Bilangan Pengguna dan sebagainya.*
- b) Laporan semasa dalam latihan - Bilangan laporan bergantung kepada jumlah stesen.*
- c) Peringkat Akhir - Satu laporan yang merangkumi latihan selama 3 tahun dan laporan ini mungkin boleh juga digunakan untuk mendapat keahlian professional dari Institut Kejuruteraan atau lain-lain badan professional.*



7. **PROGRAM KURSUS DAN PANDUAN LATIHAN-DALAM-KERJA**

*Kursus-kursus formal di Institut Latihan atau di Institut Latihan dalam negeri seperti disenaraikan di dalam Lampiran B. Program ini perlu, mungkin akan diubahsuai-kan untuk menemui keadaan semasa. Panduan mengenai pengetahuan dan kemahiran yang patut pelatih-pelatih perolehi apabila mereka disangkut di jabatan-jabatan tertentu semasa latih-dalam-kerja ialah seperti di dalam Lampiran C.*

**LEMBAGA LETRIK NEGARA  
TANAH MELAYU**

*Bil. Surat Kita : LLN. 15/5/380/*

*Peti Surat 1003  
Kuala Lumpur 22-06*

*9 Disember 1981*

**PANDUAN PELAJARAN DAN LATIHAN NO. 35**

**SKIM LATIHAN BAGI PEGAWAI-PEGAWAI  
BARU DI DALAM LEMBAGA LETRIK NEGARA**

*Jawatankuasa Pelajaran dan Latihan telah meluluskan satu skim latihan bagi pegawai-pegawai baru bertujuan menambahkan kecekapan dan kemahiran pegawai-pegawai tersebut supaya dapat menjalani tugas-tugas mereka dengan berkesan dan produktif. Skim tersebut akan mengambil masa 3 tahun dan ianya akan dilancarkan dalam bulan September 1982.*

*Skim ini adalah untuk:*

- (i) Pegawai-pegawai tetap yang baru di dalam Lembaga.*
- (ii) Pegawai-pegawai yang sedang berkhidmat dari tahun 1975 hingga 1981 dengan menyertai kursus-kursus khas.*

*Objektif:*

- (i) Memberi penerangan terhadap LLN secara keseluruhannya dan peranan-peranan yang dimainkan oleh berbagai jabatan di dalam organisasi ini.*
- (ii) Memberikan pengetahuan serta kemahiran asas dan khusus dan yang berkaitan, untuk pegawai-pegawai tersebut sebelum mereka menjalani tugas-tugas masing-masing.*
- (iii) Memberi latihan bagi memenuhi syarat-syarat keperluan am, ikhtisas, berkanun dan perkhidmatan di mana yang boleh.*

*Ciri-Ciri Utama:*

- (i) Kursus pengenalan di peringkat awal untuk memberi pegawai-pegawai kefahaman oleh berbagai jabatan di dalam organisasi ini di dalam konteks peranan dan pembangunan kerjayanya.*
- (ii) Satu siri kursus 'formal' dan seminar yang lebih terperinci meliputi pengetahuan serta kemahiran asas dan khusus, dan yang berkaitan, untuk sesuatu tugas sealiran dengan fungsi-fungsi utama organisasi ini. Kursus-kursus ini mengandungi modul-modul yang merangkumi aspek-aspek merekabentuk, merancang, pembinaan, kendalian dan senggaraan.*

- (iii) *Penempatan latihan-dalam-kerja di berbagai-bagai jabatan atau stesen yang berkenaan. Di dalam tempoh ini setiap pegawai akan diberi tugas-tugas yang tertentu oleh Ketua-Ketua Jabatan.*
- (iv) *Penempatan latihan-dalam-kerja dengan badan-badan/ajensi-ajensi luar.*
- (v) *Setiap pegawai hendaklah menyimpan satu buku catitan latihan untuk disahkan oleh Ketua Jabatan di mana latihan dijalankan. Buku catitan ini hendaklah sentiasa teratur untuk pemeriksaan pada bila-bila masa.*
- (vi) *Satu siri laporan hendaklah dikemukakan oleh setiap pegawai dari semasa ke semasa.*
- (vii) *Penilaian ke atas kemajuan setiap pegawai oleh Ketua Jabatan dari semasa ke semasa.*
- (viii) *Penilaian ke atas kemajuan setiap pegawai oleh Jabatan Pelajaran & Latihan untuk dikemukakan kepada pihak Pengurusan dari semasa ke semasa.*
- (ix) *Bagi pegawai-pegawai yang sedang berkhidmat dari tahun 1975 - 1981 ciri-ciri latihan akan diubahsuaikan mengikut pengalaman dan keperluan masing-masing.*

*Isi Kandungan:*

	<i>Tahun I</i>	<i>Tahun II</i>	<i>Tahun III</i>
1. <i>Menyertai kursus suaikenal</i>	<i>2 minggu</i>	-	-
2. <i>Menyesuaikan diri dengan tugas-tugas yang berkaitan di stesen/jabatan di bawah penyeliaan Ketua Stesen/ Jabatan.</i>	<i>12 minggu</i>	-	-
3. <i>Menyertai kursus dalam bentuk 'core module' yang berkaitan dengan jawatannya.</i>	<i>12 minggu (asas)</i>	<i>10 minggu (Pengkhususan)</i>	<i>8 minggu</i>
4. <i>Latihan-dalam-kerja</i>	<i>12 minggu</i>	<i>10 minggu</i>	<i>8 minggu</i>
5. <i>Menghadiri seminar dan kursus-kursus pendek dalam negeri.</i>	-	<i>Jangka masanya tertakluk kepada jenis kursus yang telah dirancang.</i>	

***Pecahan peratus skim latihan:***

- |                     |  |                               |
|---------------------|--|-------------------------------|
| <b><i>(i)</i></b>   | <b><i>Kerja-Kerja produktif berkaitan dengan jawatan pertama</i></b> | <b><i>60% = 90 minggu</i></b> |
| <b><i>(ii)</i></b>  | <b><i>Menyertai kursus-kursus rasmi</i></b>                          | <b><i>20% = 30 minggu</i></b> |
| <b><i>(iii)</i></b> | <b><i>Menjalani latihan-dalam-kerja</i></b>                          | <b><i>20% = 30 Minggu</i></b> |

***Keterangan lanjut mengenai skim ini akan diumumkan dari semasa ke semasa.***

***T.T.  
Haji Mohd. Khalid b. Din  
TIMBALAN PENGURUS BESAR (PENTADBIRAN)  
Lembaga Letrik Negara***

***Senarai Edaran 'A'  
Serta Kesatuan***

**SEQUENCE TRAINING COMPONENTS FOR ENGINEERS  
(DISTRIBUTION) AT ILSAS**

<b>SEQUENCE TRAINING COMPONENTS</b>	<b>TRAINING COMPONENTS</b>	<b>DURATION</b>
YEAR 1	<p><b>DC I</b></p> <p><b>DC I (DISTRIBUTION COURSE I)</b> <b>11kV SYSTEM</b></p> <ol style="list-style-type: none"> <li>1. <i>Overhead Line</i></li> <li>2. <i>Underground Cable</i></li> <li>3. <i>Substation</i></li> <li>4. <i>Planning</i></li> </ol>	<b>3 WEEKS</b>
	<p><b>DC II</b></p> <p><b>DC II (DISTRIBUTION COURSE II)</b></p> <ol style="list-style-type: none"> <li>1. <i>Consumers Procedures and Electrical Installation and Testing.</i></li> <li>2. <i>Meters Installation</i></li> </ol>	<b>3 WEEKS</b>
YEAR 2	<p><b>DC III</b></p> <p><b>DC III (DISTRIBUTION COURSE III)</b></p> <ol style="list-style-type: none"> <li>1. <i>Protection</i></li> <li>2. <i>Operation of 11kV S/S</i></li> <li>3. <i>Cable Fault Location</i></li> </ol>	<b>3 WEEKS</b>
	<p><b>DC IV</b></p> <p><b>DC IV (DISTRIBUTION COURSE IV)</b> <b>33kV SYSTEM</b></p> <ol style="list-style-type: none"> <li>1. <i>Overhead Lines</i></li> <li>2. <i>Oil Filled Cables</i></li> <li>3. <i>Substation</i></li> </ol>	<b>3 WEEKS</b>
YEAR 3	<p><b>DC V</b></p> <p><b>SPECIAL MODULES</b></p>	

**KANDUNGAN KURSUS FORMAL (TEKNIKAL) DI ILSAS  
JURUTERA (PEMBAHAGIAN)**

**YEAR 1**

**DISTRIBUTION COURSE 1**

**DURATION: 3 WEEKS**

**NO. OF PARTICIPANTS: 24**

*The module will cover on aspects of planning, construction and maintenance of distribution system up to 11 kV. The main objective of this module is to give the necessary training to the new engineers to acquire the Competence Certificate.*

**COURSE CONTENT:**

**1.1 ELECTRICAL DISTRIBUTION SYSTEM UP TO 11kV**

**1.1.1 OVERHEAD LINES**

*Poles dressing, erection and maintenance, stay splicing, positioning and erection, voltage drop calculation, conductors, bindings, line erection, street lighting and safety equipment.*

**1.1.2 UNDERGROUND CABLE**

*Cable system and record, cable construction, jointing materials, gas equipments, types of jointing and jointing practice, termination, cable rating, cable laying and cable testing.*

**1.1.3 SUBSTATION**

*Working safety, tool and equipment, substation instruments, standard substation and their layout, pre-preparation for substation erection, earthing system, dead phasing, precommission test, substation routine maintenance, switchgear maintenance, transformer maintenance.*

**1.1.4 PLANNING**

*Planning technique for distribution system, method of planning and requirements, minor work cost sheet and capital work authorisation.*

## **DISTRIBUTION COURSE II**

### **2.1 CONSUMERS PROCEDURE AND ELECTRICAL INSTALLATION AND TESTING**

**DURATION: 2 WEEKS**

**NO. OF PARTICIPANTS: 12**

#### **COURSE CONTENT:**

*Application from procedures, I.E.E. Regulation, Board Supply Rules, Design And Approval of Electrical Installation, Testing of electrical installations, Electrical equipment (motors, apparatus, etc.) Office organisation and maintenance of records, Tariffs, Consumers accounts, Theft of electricity, electrical accidents, Consumers complaints.*

### **2.2 METERS INSTALLATION**

**DURATION: 1 WEEK**

**NO. OF PARTICIPANTS: 12**

#### **COURSE CONTENT:**

*Construction and types of meters, Current transformers for metering, Technical consideration on tariff, Power factor improvement, Meters installation (tariff A, B, C, D & E), Theft of electricity and disturbance, Check meters for large consumers, Documentation, L.P. check readings, Meters calibration.*

## **YEAR II**

### **DISTRIBUTION COURSE III**

**DURATION: 3 WEEKS**

**NO. OF PARTICIPANTS: 12**

*The module consists of aspects of protection and operation of 11 kV Substation and Cable Fault Location.*

*The main objective of this training is to prepare the new engineers to acquire the Authorisation Certificate.*

### 3.1 PROTECTION AND OPERATION OF 11 kV SYSTEM

#### COURSE CONTENT:

#### 3.1.1 PROTECTION

*Introduction to protection, Fault calculation current and voltage transformer, IDMT O/C and E/F relays, Feeder unit protection solkor R and Translay, Distribution direction relay, Power transformers protection and auto-reclose.*

#### 3.1.2 OPERATION OF 11 kV SUBSTATION

*Certification system, Safety regulation, First Aid And Artificial Respiration, Operation of Switchgear, Live Phasing, Shutdown procedure and Diagnosis of Fault*

#### 3.1.3 CABLE FAULT LOCATION

*Type of Faults, Cable locating and identification, Pre-location of cable faults, Fault burning, Pinpoint location of cable fault, Locating fault using bridge and pulse echo equipment.*

### YEAR III

### DISTRIBUTION COURSE IV

DURATION: 3 WEEKS

NO. OF PARTICIPANTS: 24

*The module will deal on technical aspects of planning, construction and distribution of 33 kV system.*

#### COURSE CONTENT:

#### 4.1 PLANNING, CONSTRUCTION AND DISTRIBUTION OF 33 kV SYSTEM

##### 4.1.1 OVERHEAD LINES

*Work planning, route survey, levelling, way-leave, river crossing, pole spotting, project implementation, safety regulation, protecting earthing, poles, selection, assembly and planting, cross-arm assembly, pegging of stay and stay erection, binders, joints, jumpers, guards and clearance, forces on HT lines, current carrying and voltage drop, tension and sagging, stringing of HT lines, inspection and testing and 33kV lines maintenance.*



#### 4.1.2 OIL FILLED CABLES

*Tools and equipment, oil filled cable system, plumbing, cutting and capping oil restrictor and degassing, jointing preparation, straight through joint, oil stop joint, induced voltage bonding and earthing, oil flow test, impregnating co-efficient test, maintenance and fault location.*

#### 4.1.3 SUBSTATION

*Planning and site selection, pole mounted s/s designed and construction, ground mounted s/s designed and erection and installation, and substation maintenance.*

### DISTRIBUTION COURSE V

#### 5.1 SPECIALISED MODULE

**DURATION:** 3 MONTHS

**PARTICIPANTS:** Designation

*This is a specialised module intended for the engineer to take up the post at the end of this training. The methodology of training used is M.E.S. (Module of Employable Skill). The trainee will be posted at the place of training using work book prepared by the ILSAS. ILSAS will also monitor the training from time to time.*

*This specialised training can fall into one of the following fields:-*

##### 5.1.2 SPECIALISED FIELD

- a) *Transmission Lines Construction*
- b) *Transmission Substation Construction*
- c) *Transmission Line and Substation Maintenance*
- d) *Grid System Protection including Power Station Protection*

SEQUENCE TRAINING COMPONENTS FOR ENGINEERS  
(GENERATION) AT ILSAS

SEQUENCE TRAINING COMPONENTS	TRAINING COMPONENTS	DURATION	PARTICIPANTS
YEAR 1	<b>G.C. I</b>		
	<b>GC I (GENERATION COURSE I)</b>		
	1. Power Station Practice	1 week) <sub>2</sub>	M,E,I
	2. Industrial Safety I	1 week)	
	<b>GC II (GENERATION COURSE II)</b>		
	1. Introduction to Instrumentation	1 week)	M
	2. Power Station Mechanical Maintenance I	1 week) <sub>2</sub> )	
	<b>GC III (GENERATION COURSE III)</b>		
	1. Introduction to Instrumentation	1 week)	E
	2. Power Station Electrical Maintenance	1 week) <sub>2</sub> )	
	<b>GC IV (GENERATION COURSE IV)</b>		
	1. Instrumentation and Control Mod. 1	2 weeks) <sub>2</sub>	I
YEAR 2	<b>GC V</b>		
	<b>GC V (GENERATION COURSE V)</b>		
	1. Industrial Safety II	1 week) <sub>2</sub>	M,E,I
	2. Operation of 11kV Substation	1 week)	
	<b>GC VI (GENERATION COURSE VI)</b>		
	1. Instrumentation and Control Mod. II	2 weeks) <sub>2</sub> )	I
	<b>GC VII (GENERATION COURSE VII)</b>		
	1. Power Station Mechanical Maintenance II and III	2 weeks) <sub>2</sub> )	M
	<b>GC VIII</b>		
	<b>GC VIII (GENERATION COURSE VIII)</b>		
	1. Operations Training	2½ weeks) <sub>2½</sub>	M,E,I
YEAR 3	<b>GC IX</b>		
	<b>GC IX (GENERATION COURSE IX)</b>		
	1. Power Station Mechanical Maintenance IV	1 week) <sub>1</sub> )	M
	<b>GC X</b>		
	<b>GC X (GENERATION COURSE X)</b>		
	1. Maintenance Management	1 week) <sub>1</sub>	M,E,I

M = Mechanical Engineer,

E = Electrical Engineer,

I = Instrument Engineer

KANDUNGAN KURSUS FORMAL (TEKNIKAL) DI ILSAS  
JURUTERA (PENJANAAN)

YEAR - 1

GENERATION COURSE 1

1.1 POWER STATION PRACTICE

DURATION: 1 WEEK

NO. OF PARTICIPANTS: 24

COURSE CONTENT:

1.11 BOILER

*Development in the Design of A Conventional Power Plant, Factors Influencing the choice of Fuel, Detailed Design, Considerations, Site Layout, Construction Requirements, Influence of Site, Arrangement of Buildings, Programming, History and Development, Early Designs, Water Tube Boilers, Reasons for Increase in Steam Temperature and Pressures, Current Boiler Design and Layout.*

1.12 TURBINE

*Single Flow, Double Flow, Reversed Flow, Tandem Compound, Cross Compound, Impulse Type, Reaction Type, Compounding, High Pressure, Low Pressure, Cylinder Expansion, Methods of Support, Rotor Construction Principle types, Turbine Foundations, Concrete Steel.*

*Governor Functions, Nozzle Control, Throttle Control, Speed Signal, Centrifugal, Electronic, Basic Systems, Application to Large Turbines, Main and Auxiliary Governors, Unloading Gear, Emergency Trips, Overspeed Governors, Reheat Steam Valves.*

*Condenser, Surface Type, Direct Contact Type, Condenser Arrangement, Construction, Water Boxes, Tubes, Tubes Fixing, Double Tube Plates.*

*L.P. Feed Water Heaters, Surface Type, Design and Construction, Direct Contact Type, Advantages and Disadvantages, Control Problems, Design Consideration, Low Pressure Systems, Surface Type, Cascades Drainage, Direct Contact Type, Heater Extraction Pumps, Relative Levels.*

*High Pressure Heaters, Surface Type Design and Construction, High Pressure Systems, Booster Feed Pumps, System Arrangement, Pump Duty, Types and Drive, Design Construction, Thrust Loading, Light Loading Control Methods.*

*Types of system, Direct Cooled, River Water and Sea, Water Pump Types, Design Features.*

### 1.13 ELECTRICAL

*Generators, Design Principles and Construction, Hydrogen Cooling System, Effect of Pressure, Explosive Range.*

### 1.14 CHEMICAL SERVICE (OPTIONAL)

*Boiler and Feedwater Chemistry, Corrosion, Fuel Supplies, Fuel Oil Characteristics.*

### 1.15 MECHANICAL WORKSHOP

*Workshop Practice, Familiarisation with different types of machines and equipment used, Welding Process.*

## 1.2 INDUSTRIAL SAFETY 1

*DURATION: 1 week*

*NO. OF PARTICIPANTS: 24*

*COURSE CONTENT:*

*Workshop Safety and Discipline, Industrial Safety Practice (Accident Prevention and Case Study), Material Handling, Crane Signalling, Methods of lifting - manual, mechanical, electrically operated, hydraulically operated, Use of ladders, scaffolding erection - system scaffolding, Universal scaffolding, Permit to Work (P.T.W.), Earthing, Section Clearance and ground clearance, Pre-commissioning test, Interlocking and Sequencing.*

## GENERATION COURSE II

### 2.1 INTRODUCTION TO INSTRUMENTATION AND CONTROL

*DURATION: 1 week*

*NO. OF PARTICIPANTS: 12*

*COURSE CONTENT:*

*Power Station Instrumentation Overview, Methods of Measurement, Methods of Transmission, Process Control Loops, Auxiliary Control Loops, Sequence Control, Supervisory, Analytical Instruments.*

### 2.2 POWER STATION MECHANICAL MAINTENANCE I

*DURATION: 1 week*

*NO. OF PARTICIPANTS: 12*

*COURSE CONTENT:*

## 2.21 MAINTENANCE OF TRANSMISSION SYSTEMS, COUPLINGS AND SHAFT ALIGNMENT

*Maintenance of belt drives; chain drives; Gears and gear-boxes, Classification and identification of couplings, Key-fitting, Coupling-fitting, Coupling alignment, Removal and refitting of gear-slabs and shaft-sleeves using heat application, Fluid coupling maintenance.*

## 2.22 BEARING MAINTENANCE AND LUBRICATION

*Classification, identification and selection of bearings, Fitting of ball and roller bearings, Bearings lubrication, Bearings clearances, Scraping of Journal Whitmetal bearings, Bearings Remetalling, Types of Lubricants and their application, Oil Purifier maintenance, Bearing failures and their causes.*

### GENERATION COURSE III

#### 3.1 INTRODUCTION TO INSTRUMENTATION AND CONTROL

#### 3.2 POWER STATION ELECTRICAL MAINTENANCE

**DURATION:** 1 week

**NO. OF PARTICIPANTS:** 12

**COURSE CONTENT:**

*Generator and transformer maintenance, Switchgear - type and rating, duty of switchgear, operating mechanism, safety and interlocking, Industrial wiring and installation, Installation fault finding, L.V. Board maintenance, Motors, D.C. supply, valves, Actuators, solenoids, air condition control, lift maintenance, cathodic protection, Automatic voltage regulator, electric governor, gas turbine speed control.*

### GENERATION COURSE IV

#### 4.1 INSTRUMENTATION AND CONTROL MOD. I

**DURATION:** 2 WEEKS

**NO. OF PARTICIPANTS:** 6

**COURSE CONTENT:**

*Power Station Practice, Power Station Instrumentation Overview, Instrumentation Technology (Excluding Compressed air), Method of Measurements, Methods of Transmission, Methods of Presentation, Control System, Process Control Loops, Auxiliary Control Loops, Sequence Control, Supervisory (Boiler, Turbo-alternator), Auxiliary Plants, Alarm Systems, Interlock, Analytical Instruments, Data Acquisition System, Trouble Shooting Maintenance, Safety.*

YEAR 2

GENERATION COURSE V

5.1 INDUSTRIAL SAFETY II

DURATION: 1 WEEK

NO. OF PARTICIPANTS: 12

COURSE CONTENT:

*Factories and Machinery Safety Act, Accident Reporting Investigating and Analysis Guarding of Machinery, Fire Fighting, First Aid and Artificial Respiration, Personal Protective Equipment.*

5.2 OPERATION OF 11 kV SUBSTATION

DURATION: 1 WEEK

NO. OF PARTICIPANTS: 12

COURSE CONTENT:

*Certification system, Safety Regulation, First Aid And Artificial Respiration, Operation of Switchgear, Live Phasing, Diagnosing of fault.*

GENERATION COURSE VI

6.1 INSTRUMENTATION AND CONTROL MOD. II

DURATION: 2 WEEKS

NO. OF PARTICIPANTS: 6

COURSE CONTENT:

*Power Station Practice, Power Station Instrumentation Overview, Instrumentation Technology (Excluding Compressed Air.), Method of Measurements, Methods of Transmission, Methods of Presentation, Control System, Process Control Loops, Auxiliary Control Loops, Sequence Control, Supervisory (Boiler, Turbo-alternator) Auxiliary Plants, Alarm Systems, Interlock, Analytical Instruments, Data Acquisition System, Trouble Shooting Maintenance, Safety.*

GENERATION COURSE VII

7.1 POWER STATION MECHANICAL MAINTENANCE II

7.11 MAINTENANCE OF PUMPS, COMPRESSOR, PIPES AND PIPEWORK

DURATION: 1 WEEK

NO. OF PARTICIPANTS: 12

**COURSE CONTENT:**

*Classification and identification of pumps, Pumps routine maintenance, Types of glands and glands-repacking, Adjustment of mechanical seals, Building up of Pump-shafts by spray-welding technique, Pump overhaul, Classification and identification of compressors, Compressed air system routine maintenance, Compressor overhaul, Maintenance of air-conditioning systems, Air pressure vessel overhaul, Maintenance of pneumatic tools, Identification of pipe-fittings, pipe-symbols, working diagrams and pipe supports, Pipe-cutting; threading; bending; and expanding, Pipe-circuit fabrication, Hydraulic pressure-testing, Large pipe distance-piece removing and refitting, Condenser-tube removing and refitting.*

**7.12 MAINTENANCE OF VALVES AND BOILER FITTINGS**

**DURATION:** 1 WEEK

**NO. OF PARTICIPANTS:** 12

**COURSE CONTENT:**

*Classification and identification of valves, Valves glands repacking, Valves overhaul, Overhaul and resetting of safety valves, Steam trap maintenance, Gauge glasses maintenance, Maintenance and overhaul of gauge-glasses; valves actuators; sootblowers; burners, fuel oil heaters; draught fans; steam drum internals, Seal injection technique of valve-leak arresting.*

**7.2 POWER STATION MECHANICAL MAINTENANCE III**

**7.21 STEAM STATION MAINTENANCE**

**DURATION:** 1 WEEK

**NO. OF PARTICIPANTS:** 12

**COURSE CONTENT:**

*Turbine routine maintenance, turbine overhaul procedures, turbine shafts alignment, bearings inspection, generator rotor withdrawal, bolt-heating and slinging and lifting.*

**GENERATION COURSE VIII**

**8.1 OPERATIONS TRAINING**

**DURATION:** 3½ WEEKS

**NO. OF PARTICIPANTS:** 6

**COURSE CONTENT:**

*Outline of thermal power plant equipment, Construction of boiler, drum, furnace, superheater, reheater, economiser, air heater, Combustion equipment, fuel oil system, burner oil heater, oil pump, Draught equipment, forced draft and balance draft system fans, construction of turbine, control and bearing oil system, turbine supervisory and protective equipment, Condenser, Feed water heater,*

**COURSE CONTENT:**

*Classification and identification of pumps, Pumps routine maintenance, Types of glands-repacking, Adjustment of mechanical seals, Building up of pump-shafts by spray-welding technique, Pump overhaul, Classification and identification of compressors, Compressed air system routine maintenance, Compressor overhaul, Maintenance of air-conditioning systems, Air pressure vessel overhaul, Maintenance of pneumatic tools, Identification of pipe-fittings, pipe-symbols, working diagrams and pipe supports, Pipe-cutting; threading; bending; and expanding, Pipe-circuit fabrication, Hydraulic pressure-testing, Large pipe distance-piece removing and refitting, Condenser-tube removing and refitting.*

**7.12 MAINTENANCE OF VALVES AND BOILER FITTINGS**

**DURATION: 1 WEEK**

**NO. OF PARTICIPANTS: 12**

**COURSE CONTENT:**

*Classification and identification of valves, Valves glands repacking, Valves overhaul Overhaul and resetting of safety valves, Steam trap maintenance, Gauge glasses maintenance, Maintenance and overhaul of gauge-glasses; valve actuators; sootblowers; burners; fuel oil heaters; draught fans; steam drum internals, Seal injection technique of valve-leak arresting.*

**7.2 POWER STATION MECHANICAL MAINTENANCE III**

**7.21 STEAM STATION MAINTENANCE**

**DURATION: 1 WEEK**

**NO. OF PARTICIPANTS: 12**

**COURSE CONTENT:**

*Turbine routine maintenance, turbine overhaul procedures, turbine shafts alignment, bearings inspection, generator rotor withdrawal, bolt-heating and slinging and lifting.*

**GENERATION COURSE VIII**

**8.1 OPERATIONS TRAINING**

**DURATION: 2½ WEEKS**

**NO. OF PARTICIPANTS: 6**

**COURSE CONTENT:**

*Outline of thermal power plant equipment, Construction of boiler, drum, furnace, superheater, reheater, economiser, air heater, Combustion equipment, fuel oil system, burner, oil heater, oil pump, Draught equipment, forced draft and balance draft system fans, Construction of turbine, control and bearing oil system, turbine supervisory and protective equipment, Condenser, Feedwater heater, Deaerator Air ejector, Gland sealing system, Generator, Exciter, Hydrogen cooling system, Seal oil system, AVR, AVQC, Main transformer and its protective relays, Insulating oil and bushing tap changer, Construction of substation, types of substation*



*configuration, Extra-high tension circuit breakers protective relays, General instrumentation, Automatic control and plant interlock, Start-up and shut-down operation on simulator, Normal operation, Corrective measures for faults, synchronising, Load control, Frequency control, Switching.*

**YEAR 3**

**GENERATION COURSE IX**

**9.1 POWER STATION MECHANICAL MAINTENANCE IV**

**9.12 BOILER MAINTENANCE**

**DURATION: 1 WEEK**

**NO. OF PARTICIPANTS: 12**

**COURSE CONTENT:**

*Boiler routine maintenance, boiler overhaul procedures, rotary air-heater maintenance, drum internals inspection, furnace maintenance.*

**GENERATION COURSE X**

**10.1 MAINTENANCE MANAGEMENT**

**DURATION: 1 WEEK**

**NO. OF PARTICIPANTS: 12**

**COURSE CONTENT:**

**10.11 TECHNICAL**

*Maintenance checklists, Maintenance schedules, Diagnosis of log sheet data, Maintenance techniques, Metal fatigue (case studies), Charts for major overhaul, Application of computer in maintenance.*

**10.12 MANAGEMENT**

*Staff discipline, Work Study, Labour laws, Engineer as Instructor, Staff Motivation, Board's circulars, Stores procedures, Stock level spares, Maintenance planning, Communication, reports, Budget and budgeting control.*

**KANDUNGAN KURSUS FORMAL (PENGURUSAN DAN PENTADBIRAN  
DI ILSAS ATAU INSTITUSI-INSTITUSI LATIHAN DALAM NEGERI**

**TAHUN I**

	<i>NAMA KURSUS</i>	<i>TEMPOH</i>	<i>PESERTA</i>
1.	<i>Induction Course</i>		<i>A,B,C,D,E,F</i>
2.	<i>Basic Management</i>		<i>A,B,C,D,E,F</i>
3.	<i>Office Management</i>		<i>A,B,C,D,E,F</i>
4.	<i>Industrial Safety</i>		<i>A,B,C,D,E,F</i>
5.	<i>Public Relations</i>		<i>A,B,C,D,E,F</i>
6.	<i>Board's Financial Management</i>		<i>A,B,C,D,E,F</i>

**TAHUN II**

1.	<i>Personnel Management</i>		<i>A,B,C,D,E,F</i>
2.	<i>Profit and Cash Flow Management</i>		<i>E</i>
3.	<i>Credit Management</i>		<i>E</i>
4.	<i>Basic of Computer Systems</i>		<i>A,B,C,D,E,F</i>
5.	<i>Effective Materials Control</i>		<i>A,B,C,D,E,F</i>

**TAHUN III**

1.	<i>Industrial Relations</i>		<i>A,B,C,D,E,F</i>
2.	<i>Project and Management Control</i>		<i>A,B,C</i>
3.	<i>Budgeting and Budgetary Control</i>		<i>A,B,C,D,E,F</i>
4.	<i>Computer Audit and Internal Control</i>		<i>E</i>

**LEGENDA**

<i>A</i>	-	<i>Distribution Engineer</i>
<i>B</i>	-	<i>Generation Engineer</i>
<i>C</i>	-	<i>Civil Engineer (Hydro)</i>
<i>D</i>	-	<i>Chemist</i>
<i>E</i>	-	<i>Accountant</i>
<i>F</i>	-	<i>Administrator</i>

**PANDUAN PROGRAM LATIHAN-DALAM-KERJA  
JURUTERA AWAM**

**ORIENTATION WITH DEPARTMENT**

**LOCATION**

**1. SUPERVISORY WORKS AT WORKSITE**

**KNOWLEDGE/SKILL TO ACQUIRE**

*Project management and control (including planning techniques, construction plant management, resources management, contract and tendering procedure), Geotechnical engineering (soil mechanical and geology), Effective negotiation and communication with contractors, Civil Engineering design and drawing (such as dam, tunnel, buildings, highway, hydraulic structures, etc.), Survey, General management and administration, Inspection of works (quality control, work measurement, etc.). Bills of Quantity (Claims, payments, etc.), engineering economics.*

**2. DESIGN WORKS**

*Civil engineering design (such above), Specialised subject; structural steel; Foundation problem; Soil mechanics; Concrete technology; Geology; Hydrology; Use of computer; Dam; analysis; etc., Contract Specification; General management and administration; Engineering economics.*

**3. MAINTENANCE**

*Project Management and control (including contract and tendering procedure payments, etc.); Inspection of Works (quality control, work measurement, etc.). Reports and Remedial works; Inter-departmental co-ordination and liaison work; Civil engineering design and drawing's specialised subjects; Surveying; Structural Steel; Foundation problem; Soil mechanic; Concrete technology; Contract specification; General management and administration.*

**4. FEASIBILITY STUDIES AND PLANNING**

*Hydrology - maintenance of equipment and analysis of data; General management and administration; Project management and control (including contract and tendering procedure, planning techniques); Engineering economics; Contract specialised, Civil Engineering design and drawing; Specialised subjects (for theory and practical); geology; Survey; Soil mechanic; Statistic; Structural and Concrete design, etc.; Local government agency co-ordination and liaison work.*

**PANDUAN PROGRAM LATIHAN-DALAM-KERJA  
AKAUNTAN**

**ORIENTATION WITHIN DEPARTMENT**

**LOCATION**

**1. LEJER STOR**

**KNOWLEDGE/SKILL TO ACQUIRE**

*Mengendalikan angka-angka kawalan stok dan pergerakannya; Menyediakan akaun stok; Menyediakan Penyata setengah tahun dan tahunan akaun stor; Memeriksa "material transfer note" "goods receive notes" dan sebagainya.*

**2. PEMBAYARAN**

*The Operation of LLN Bank Account; Cash Receipt summary; Purchase of foreign currency; Work Flow chart.*

**3. GAJI**

*Pembayaran gaji, E.P.F., Income Tax, etc.; Lebihmasa, Lembaran Masa Kerja; Pinjaman Kereta, Sewa Beli Basikal.*

**4. PROJEK**

*Records of Loans acquired by Board; Records of contracts for project; Repayment and withdrawal of loans; Payment to contractors, Expatriate Personnel.*

**5. BELANJAWAN**

*Budget for stations; To Check and verify variances between actual and budget.*

**6. MODAL DAN BAYARTUNTUT**

*Annual and supplementary budgets; Calculation of depreciation; Annual Report for BELB and a quartely progress report on all jobs. Record on rechargeable jobs; prepare quartely P & L A/C on rechargeable jobs; Bill authority and public for expenditure incurred on rechargeable jobs.*

**7. LEJER AM**

*Accounting system; Nominal ledger; Subsidiary Ledger; General Ledger System; Quarterly Accounts; Final Accounts.*

8. **PEMEROSAN DATA ELEKTRONIK**

*Overall function of E.D.P.; Application Dev. and maintenance; Payroll, supply function, MMS Gen.; Ledger system; Production Operations; Material planning; Consumers a/c app.*

9. **AUDIT DALAM**

*Financial Audit, Stores Audit, Attending special investigation; Discrepancies of Stores Audit.*

10. **JURUTERA (PENGGUNA) (KL-UTARA)**

*Cash collection and inward remittances; Consumers procedures; Ledgers and monthly sundry debtors return, Deposit cards and monthly deposit return bank; Guarantee; Request for service contribution and application to install wiring.*

**PANDUAN PROGRAM LATIHAN-DALAM-KERJA  
JURUTERA (PEMBAHAGIAN)**

**LOCATION**

**1. MAINS (UNDERGROUND)**

**KNOWLEDGE/SKILL TO ACQUIRE**

*Route survey and selection; Negotiations with public and private authorities and individuals; Excavation, back-grilling and reinstating of cable tranches and joint holes by both manual and mechanical methods; Installing cable ducts; Installing service, m.v./l.v. and h.v. cables up to and including 33kV, Testing and fault location of cable; Joints and terminations for cables up to 33kV; Programming and supervising cable installation and jointing work.*

**2. MAINS (OVERHEAD)**

*Route survey and selection; preparation of profile; Negotiations with public and private authorities and individuals; Liaison with Board's planning and wayleave sections; Excavating, fabricating and erection of supports and stays, and reinstatement; Running out, tensioning and sagging of conductors; Jointing, terminating and binding of conductors, Erection of ancillary equipment; Patrolling and reporting Programming and supervision overhead line work.*

**3. SUBSTATION**

*The preparation of plans for extensions to and replacement of distribution networks operating up to 33kV. The preparation of forecasts e.g. future requirements for plant and equipment. The preparation of individual project involving technical and economic comparison of alternative schemes. The preparation of other schemes e.g. the replacement of assets which have been found unsuitable for future service. Initiation of network surveys and appraisal of these surveys. Analysis of loadings on existing equipment; Preparation of annual budget; Design of substation.*

**4. CONSUMER**

*Procedures of consumers billing; Large metering reading; Approval of A form; Criteria for Certification of tester's results; Consumers contract; Meters installation supervision consumers' complaints on domestic meter reading.*

**PANDUAN PROGRAM LATIHAN-DALAM-KERJA  
JURUTERA (PENJANAAN KUASA)**

**ORIENTATION WITHIN DEPARTMENTS**

**LOCATION**

**1. BOILER**

**KNOWLEDGE/SKILL TO ACQUIRE**

*Plant Layout; Oil Fired; Superheaters and Reheaters; Economisers; Steam Temperatures Control; Boiler Drums; I.D. and F.D. Fans; Application and Method of Control; Air Heaters; Starting Up/Shutdown; Emergency Operation; Automatic Combustion Control/Manual Operation; Oil Burners; Ignitors; Sootblowing System; Fuel Oil Heaters; Fuel Oil Pumps; Reheat Cycles.*

**2. TURBINE**

*Turbine Blading, Blade sealing, Cylinder Construction; Alignment; Steam Chests; Control Valves; Bearing; Couplings; Shaft Alignment; Speed Control; Load Control; Starting Up/Shutting Down; Emergency Operation; On Load Valve Testing; Turbine Lubricating Oil Systems; Pumps; Pressure Regulations; Valve; Coolers; Filters; Oil Purifiers; Turbine Glands; Glands Sealing Systems; Drainage Provisions; Condensers; Condensers Cleaning; Air Ejectors; Condensate Extraction Pumps; L.P. Feedwater Heaters; Deaerators; Water Level Control; Bypass System; High Pressure Heaters; Drainage Bypass System; Feed Valves; Operation and Control; Boiler Feed Pumps; Layout of Culverts; Pumphouse Layout, Circulating Pumps; Cooling Water System Valves.*

## *LOCATION*

### *1. ELECTRICAL MAINTENANCE*

#### *KNOWLEDGE/SKILL TO ACQUIRE*

*Generators; Hydrogen Cooling System; Hydrogen Sealing System; Charging/Discharging of Hydrogen Gas; Gas Storage and Distribution; Excitation and Voltage Regulation; Protection of Alternators; Station Auxiliary; Turbine and Boiler Auxiliary Boards; Electrical Control Room; Switchfuses and Contractors; Electric Motors; Interlocking and Sequencing; Protection; Station Transformers; Unit Transformers; D.C. Supplies.*

### *2. INSTRUMENTATION*

*Measuring Equipment; Pressure; Temperature; Flow and Level Measurement; Chemical Analysis Equipment; Required Accuracy of Measuring of Equipment; Automatic Controls; Associated Equipment; Sequence Control Equipment; Control Centre Layout; Data Acquisition Systems.*

### *3. OPERATION*

*Synchronising and Loading, Efficiency and Tests; Fuel Oil Handling.*

### *4. CHEMICAL SERVICES*

*Water Treatment, Sampling and Testing; Flue Gases Lubricating Oils; Insulating Oil Circulating Water; Corrosion; Chlorination; Condenser Problems.*

### *5. MECHANICAL WORKSHOP*

*Mechanical Repair Works Carried Out.*



**ORIENTATION WITHIN DEPARTMENTS**

**LOCATION**

**TAHUN I DAN TAHUN II**

**1. STATION CHEMICAL SERVICE**

**KNOWLEDGE/SKILL TO ACQUIRE**

*Routine Laboratory Control Tests and their significance:-*

*Raw water and boiler water analysis and their significance; Analytical control of feed water quality and steam purity; Feed line and boiler corrosion; prevention of corrosion by chemical conditioning; Lubricating oil analysis; Fuel oil analysis; Condenser leakage; detection and remedial action. Water treatment plant and condensate polishing plant operation; Regeneration procedure for these plants; Electrochlorination Plant Operation and ferrous sulphate treatment system; Chlorination process and C.W. system marine fouling problems; Plant inspection with Station Chemist; Boiler overhaul inspection; Turbine overhaul inspection; Inspection of other pressure vessels.*

**2. OPERATION ( 3 MONTHS)**

*Boiler and Turbine House:- Banking procedure of boiler; shutdown procedure of turbine; Starting procedure of boiler; starting procedure of turbine; Fuel system; Combustion process and combustion control; Feedwater flow system; Steam flow system; Lubricating oil system; Flue gas system and low temperature corrosion control in boiler. Control Room Operation: Functions of control room; Operation procedure for loading and unloading of generator; Operation procedure for overhaul of OCB & ACB.*

*Shift Charge Engineer:- Function of Shift Charge Engineer; Management of shift personnel in maintaining a round the clock running of generating plant; Procedure involved in the issue of Permit-to-work. Significance in the strict compliance of the procedure; Periodic testing of tripping devices and safety alarms.*

**3. BOILER MAINTENANCE (3 MONTHS)**

*Components of boiler, their identification and functions; boiler auxiliaries - draught plant; sootblowers; Fuel oil heater; A.C.C. air compressor; Combustion system maintenance; Maintenance of remote boiler water level indicator; Maintenance of boiler safety valves; sampling valves and other valves.*

**4. TURBINE MAINTENANCE (3 MONTHS)**

*Components of turbine, steam flow through turbine, maintenance of turbine bearings and glands; Condenser, its construction; selection of tube materials, necessity for*

*periodic cleaning; Condenser leakage detection and rectification; Turbine house auxiliaries, C.W. system, generator gas coolers, turbine lubricating oil system and oil purifiers, feedwater system with deaerator L.P. heater and H.P. heater; Maintenance of different types of valves, bearings and strainers.*

5. **ELECTRICAL MAINTENANCE (1 MONTH)**

*Maintenance of electrical equipment and attendance to routine defects; Generators and its components; overhaul of generators; Cathodic protection; Maintenance of transformer, OCB and ACB.*

6. **INSTRUMENT MAINTENANCE (1 MONTH)**

*Importance of accurate instruments; Measurements of pressure; Measurements of temperature; Measurement of flow; Orsat apparatus for analysis of flue gas; Maintenance of automatic recording meters such as pH meter, conductivity meter, dissolved oxygen meter, silica and sodium meter.*

7. **OPERATIONAL EFFICIENCY (3 WEEKS)**

*Data logging; Efficiency calculation; Importance of operating plant at Maximum efficiency; Combustion efficiency; theoretical air for combustion, excess air and carbon dioxide.*

8. **MECHANICAL WORKSHOP**

*Workshop practice; Familiarisation with different types of machines and equipment used; Welding process; Mechanical repair works carried out.*

**TAHUN III**

1. *On the job training and exposure to different chemical orientated plants in other stations.*
2. *Participation in Pre-commissioning activities of boilers and turbines, performance test and reliability trial pertaining to water treatment plant; condensate polishing plant; ferrous sulphate dosing and other chemical plants.*
3. *Training attachment to Scientific Services Laboratory in R&D department for 1 - 2 months.*
4. *Attendance in seminars and courses on corrosion and related subjects.*
5. *Training course in laboratory safety and the handling and storage of hazardous chemicals.*

**PANDUAN PROGRAM LATIHAN-DALAM-KERJA  
PEGAWAI PENTADBIR**

**ORIENTATION WITHIN DEPARTMENTS**

**LOCATION**

**1. PEJABAT KAKITANGAN**

**KNOWLEDGE/SKILL TO ACQUIRE**

**1.1 Perkhidmatan (4 minggu)**

*Syarat-syarat Perkhidmatan, Cuti, Pencen, Borang-Borang Kewangan, Gaji, Elaun, Kemudahan Pinjaman.*

**1.2 Perjawatan (1 minggu)**

*Perlantikan, Kenaikan Pangkat, Pertukaran, Disiplin.*

**2. PEJABAT KEWANGAN  
(6 minggu)**

*Lejer, Setor, Pembayaran, Gaji, Projek, Belanjawan, Modal dan bayartuntut, Lejer Am, Audit Dalam.*

**3. PEJABAT PEMEROSAN DATA ELEKTRONIK (2 minggu)**

*Accounts and audit, Consumers accounts and District office, Stores and Purchasing.*

**4. PEJABAT PERNIAGAAN (1 minggu)**

*Jenis-jenis tarif, Polis-polisi perniagaan.*

**5. PEJABAT MEMBELI DAN KONTRAK**

*Belian tempatan dan pentadbiran, Perancang Kejuruteraan, Pendaftaran kontraktor dan kenderaan, Belian seberang laut dan kontrak tempatan.*

**6. PEJABAT DAERAH (4 minggu)**

*Pentadbiran Pejabat Daerah.*

**7. PEJABAT SETIAUSAHA (2 minggu)**

*Urusetia Lembaga, Bahagian tanah, Undang-Undang dan kontrak, Keselamatan.*

**8. SETOR ( 2 minggu)**

*Pengurusan dan kawalan stok.*

9. *PEJABAT PERHUBUNGAN AWAM (1 minggu)*  
*Peranan jabatan Perhubungan Awam.*
10. *PEJABAT PELAJARAN DAN LATIHAN (2 minggu)*  
*Skim latihan, Biasiswa, Dermasiswa, Lembaga Peperiksaan, Jawatankuasa Pelajaran dan Latihan, Peperiksaan.*
11. *INSTITUT LATIHAN SULTAN AHMAD SHAH (2 minggu)*  
*Objektif penubuhan Institut Latihan Sultan Ahmad Shah, Konsep dan Peranan Institut Latihan Sultan Ahmad Shah, Kemudahan Latihan, Pentadbiran.*
12. *PEJABAT KEBAJIKAN (1 minggu)*  
*Kemudahan-kemudahan kebajikan.*
13. *PEJABAT PERHUBUNGAN PERUSAHAAN (1 minggu)*  
*Undang-undang buruh (Malaysia), Kesatuan Sekerja, Peraturan Rungutan Perseorangan.*
14. *JABATAN PERKHIDMATAN KEMAJUAN PENGURUSAN (4 minggu)*  
*Organisation And Method, Work Study, Problem Solving dan lain-lain kegiatan.*

## PANDUAN KEPADA KETUA JABATAN/PEGAWAI LATIHAN

1. *Semakkan catitan yang telah diisipenuhi dan pastikan butir-butir tepat dan betul.*
2. *Pastikan juga catitan yang diisikan itu dikemaskinikan (up-to-date).*
3. *Bagi tiap-tiap muka surat, sila semakkan butir-butir latihan dan buat ulasan sebelum menandatangani seterusnya.*
4. *Di mana perlu, tuan/puan bolehlah membuat pembedaan dan perbincangan dengan Pelatih/Perantis sebelum membuat apa-apa laporan ke Ibu Pejabat dengan mengguna senarai semakkan yang dibekalkan. (Sila lihat SENARAI SEMAKAN LATIHAN terlampir).*
5. *Jika didapati isi kandungan rekod latihan seseorang Pelatih/Perantis itu tidak mencerminkan aktiviti-aktiviti utama jabatan, maka tuan/puan boleh mengarahkan perubahan jadual latihan supaya latihan yang diikuti Pelatih/Perantis itu lebih berkaitan dengan aktiviti-aktiviti utama jabatan.*
6. *Catitan-catitan dan rekod-rekod latihan perlu disemak dan ditandatangani sebelum Pelatih/Perantis meninggalkan Daerah/Stesen mengikut jadual latihan mereka.*

## PANDUAN KEPADA PELATIH

1. *Fail ini bertujuan untuk menyediakan satu rekod latihan dan kerja yang dilakukan oleh Pelatih/Perantis di jabatan-jabatan berkenaan. Butir-butir latihan ini hendaklah dijadikan sebagai bahan untuk menyediakan laporan latihan seperti disyaratkan.*
2. *Fail ini mengandungi 2 bahagian iaitu catitan harian dan nota-nota.*
3. *Catitan Harian boleh dibuat dengan mengisipenuhkan Format A dengan butir-butir ringkas untuk diperiksa oleh Pegawai Latihan yang berkenaan. Catitan-catitan ini perlu dikemaskinikan (update) untuk pemeriksaan pada bila-bila masa mengikut arahan.*
4. *Butir-butir lanjut mengenai tempat, tugas atau kerja bolehlah dicatitkan sebagai nota-nota di dalam muka surat yang berkenaan. Butir-butir ini perlu mengandungi perkara-perkara seperti tujuan dan masa kerja dilakukan, peralatan dan bilangan kumpulan pekerja dan sebagainya, dan juga peranan yang dimainkan oleh Pelatih/Perantis iaitu samada sebagai seorang Pemerhati, Pembantu dan sebagainya. Nota-nota seeloknya disertakan dengan gambarajah-gambarajah dan carta-carta yang berkenaan.*
5. *Ditegaskan bahawa fail ini perlu disimpan sepanjang tempoh latihan dan segala catitan perlu dikemaskinikan (update). Jika terdapat laporan-laporan latihan yang tidak memuaskan tindakan tertentu akan diambil ke atas Pelatih/Perantis.*

FORMAT A

BULAN/TAHUN: .....19/.....

STESEN/JABATAN: .....

TAHUN LATIHAN: .....

SEKSYEN: .....

TARIKH	TEMPAT	TUGAS/KERJA	MUKA SURAT NOTA

(LAMPIRAN D)

ACTION WILL BE TAKEN AGAINST ANY  
STAFF WHO UNDER 100 WORDS, MAKES  
NOTES IN THE MARGINS OR DISFIGURES  
OR DAMAGES BOOKS IN ANY WAY.

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ULASAN KETUA JABATAN/PEGAWAI LATIHAN

KETUA JABATAN/PEGAWAI LATIHAN

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Tandatangan: .....

Nama: .....

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DATA PELATIH/PERANTIS

NAMA: .....

PEKERJA NO. (JIKA LLN) ..... NO. KAD PENGENALAN .....

MAJIKAN (JIKA PELATIH DARI LUAR LLN) .....

TEMPUH LATIHAN

TARIKH BERMULA: .....

TARIKH TAMAT: .....

BUTIR-BUTIR LATIHAN

J A B A T A N	TARIKH	
	MULAI	HINGGA



SENARAI SEMAK LATIHAN

Nama: \_\_\_\_\_

No.Pekerja: (Jika LLN) \_\_\_\_\_ No.K/Pengenalan: \_\_\_\_\_

Majikan: (Jika dari luar LLN) \_\_\_\_\_

Tempuh Latihan: Bermula \_\_\_\_\_ hingga \_\_\_\_\_

Tahun Latihan: (Jika berkaitan) \_\_\_\_\_

Stesen/Jabatan: \_\_\_\_\_

PANDUAN SEKIL

- 1 - Lemah
- 2 - Tidak Berapa Memuaskan
- 3 - Memuaskan
- 4 - Baik
- 5 - Terbaik

	1	2	3	4	5	CATITAN (Jika (/) dibuat didalam (1) atau (5))
1. <u>PENGETAHUAN TEKNIK</u> (Sejauhmana mengikut yang seharusnya diketahui).						
2. <u>KEFAHAMAN KERJA DAN PROSIDUR</u> (Samada memahami tujuan dan objektif kerja serta prosidur- prosidur yang berkaitan)						
3. <u>PENGETAHUAN MENGENAI KAEDAH-KAEDAH, PERATURAN DAN KESELAMATAN</u> (Berkaitan dengan kerja-kerja semasa latihan)						
4. <u>DAYA MELAPUR - TULISAN DAN LISAN</u> (Kebolehan melapurkan sesuatu dengan terang dan tepat)						
5. <u>KEHALUSAN PERHATIAN</u> (Samada dapat memberi perhatian yang detail terhadap sesuatu)						

	1	2	3	4	5	CATITAN Jika (/) dibuat didalam (1) atau (5)
6. <u>PENGLIBATAN KERJA</u> <u>PETUNJUK:</u> 1. Tidak indah langsung						
2. Menunjuk sedikit minat sahaja						
3. Berminat						
4. Lebih berminat dan menunjuk keinginan untuk melibatkan diri						
5. Penuh minat dan penglibatan						
7. <u>INISIATIF</u> (Berdaya usaha sendiri tanpa didorong atau di arah mengenai sesuatu)						
8. <u>POTENSI KEMAMPUAN</u> (Menunjukkan sifat- sifat berkebolehan untuk maju mengenai semua perkara)						
9. <u>PENERIMAAN</u> <u>TANGGUNGJAWAB</u> (Sejauhmana terlaksananya sesuatu tanggungjawab yang diserahkan kepada pelatih, samada sentiasa menkemukakan helah)						
10. <u>KERJASAMA</u> (Sejauhmana kerjasama diberi kepada pasukan sekerja ataupun pihak atasan)						
11. <u>PENYESUAIAN DIRI</u> (Sejauhmana pergaulan dengan orang bawahan dan pihak atasan semasa berlatih)						

.....  
Tandatangan Ketua Jabatan dan  
Cop

**UNIVERSITI TENAGA  
NASIONAL**

**ACTION WILL BE TAKEN AGAINST ANY  
STAFF WHO UNDERLINES WORDS, MAKES  
NOTES IN THE MARGINS OR DISFIGURES  
OR DAMAGES BOOKS IN ANY WAY.**