

ANNEX 6

NTI TRAINING COURSES AND NECESSARY EQUIPMENT

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TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Switching and Traffic (1)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Electronic exchange I (Basic)	<p>Basic knowledge and technology on system structure, software and hardware of a digital switching system. (Demonstration and experimental laboratory work: 25%)</p> <p>(1) Switching system, function structure, hardware structure outline. (2) Voice signal digitization and multiplexing technology. (3) Speech path structure. (Space switch and time switch). (4) Switch control. (Microprocessor application and stored program control). (5) Interface with subscriber circuit and with trunk circuit. (6) Digital switching software and data base.</p>	<p>• 4 times /year • 2 weeks /time (60 hours) • 20 prsns/time (80prsns/year)</p>	<p>(1) Digital switching system (1 unit) comprising: ① Digital switching equipment (1set) ② M/A terminal (5 sets) ③ Power unit with an automatic voltage regulator (1 set) ④ Spare parts (1 lot) ⑤ Measuring equipment • Digital multi-meter (1 set) • Frequency counter (1 set) • Oscillator/level-meter (1 set) • Logic analyzer (1 set) • Auto TMS (1 set) ⑥ Maintenance tools (lot) ⑦ MDF, VDE, DDF, cables (1 lot) ⑧ Documentation (1 set) (2) Artificial traffic generator ① Unit for subscriber circuits (3 Sets) ② Unit for analog trunk circuits (1 sets) ③ Unit for digital transmission interfaces (1 set) (3) No.7 signaling monitor (1 set) (4) Training simulator (1 set) (5) On-line personal computer (1 set)</p>	<p>None (13) (6) (1) None</p>	<p>(1) Digital switching system ① The processing capacity shall be minimum because of training use. ② The number of modules for the subscriber circuits, trunk circuits, etc. shall be minimum because of training use. ③ The signaling systems now in use in Egypt and the No.7 signaling system which is planned to be introduced in future shall be provided. ④ The charging system shall be provided with such functions as flat rate, periodic pulse metering and detailed message charging, corresponding to the running system and the function of the planned switching system. ⑤ The central processing unit shall be dual. ⑥ Five maintenance and administration terminals shall be provided on account of experimental study effects. ⑦ Subscriber services shall be the same as those of existing digital switching systems in Egypt. ⑧ The switching system shall be interconnected to the planned transmission system, which is requested to be provided simultaneously with the switching system, for the understanding of a total telecommunication system.</p>	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Switching and Traffic (2)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name	Subject/contents				
Electronic exchange II (Advanced)	<p>Function block forming technology, system configuration technology, signaling system, control system, and interfacing technology to transmission systems; system designing of small PABXs; and case studies of small subroutines by assembly language. (Demonstrations and experimental laboratory work: 25%)</p> <p>(1) System structure, details of each function, service menu and its contents</p> <p>(2) Time-division speech path structure and control technology</p> <p>(3) Details of the stored program control system of a digital switching system, including processor structure and call processing operation.</p> <p>(4) Software structure and signaling systems: signaling system of subscriber lines, signaling system between exchanges, common channel signaling system</p> <p>(5) Case studies</p> <p>(6) Designing technology of small PABXs</p> <p>• Assembly language subroutine experiment</p>	<ul style="list-style-type: none"> • 4 times /year • 2 weeks /time (60 hours) • 20 prsns/time (80prsns/year) 	To share the equipment selected for the Electronic Exchange I.	Same as to the left.	<p>(Continued)</p> <ul style="list-style-type: none"> • The subscriber circuits, trunk circuits and digital interfaces shall be terminated at the MDF, enabling connection by NTL to the outside, if necessary. • It is agreed that telephone sets for experimental call origination and termination are provided by NTL. <p>(2) Artificial traffic generator</p> <ul style="list-style-type: none"> • Artificial traffic generators are necessary to originate a certain amount of traffic for load tests of the switching system and for giving load to transmission system, for the system has no working subscribers because of training use. Five sets of traffic generators shall be provided corresponding to the traffic amount necessary to carry out the load test. <p>(3) No.7 signal monitoring equipment</p> <ul style="list-style-type: none"> • A No.7 signal monitoring equipment shall be provided to help trainees analyze and understand the contents of the signal. <p>(4) Training simulator</p> <ul style="list-style-type: none"> • A training simulator is selected to support understanding of the switching system operation methods. <p>(5) On-line personal computer</p> <ul style="list-style-type: none"> • A personal computer set is selected for accessing the data base in NTL, supporting activities to ARENTO, developing office automation systems for maintenance and operation work.

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Switching and Traffic (3)
 TRAINING PROGRAM NAME: ARENTO Special Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Digital switching systems	<p>Basic technology, hardware, and software of digital switching systems, which are necessary to be high level ARENTO engineers. The contents cover those of the Electronic Exchanges I and II and features of switching systems currently in use and those planned for future use. Demonstrations and experimental laboratory work are 25% of the the study and case studies and seminars are within 10%.</p>	<ul style="list-style-type: none"> • 1 time /year • 3 months/time (50 hours) • 40 prsns /year (Evening course) 	To share the equipment selected for the Electronic Exchange I.	None	As stated in the Electronic Exchange I.	

TRAINING COURSES AND NECESSARY EQUIPMENT

As of the fiscal year 1991/1992

DEPARTMENT: Switching and Traffic(4)
 TRAINING PROGRAM NAME: Telecommunication Diploma

Training course		Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name	Subject/contents			
Switching system engineering	<p>A long-term course that cultivates high-level experts in the switching system field. It provides switching system operation analysis, program analysis, signal analysis and traffic analysis, which are inevitable for systems engineers to be pivotal in the maintenance and designing of switching systems</p> <p>(1) Stored program control technology, knowledge of software and hardware related to design technology</p> <p>(2) Speech path network technology</p> <p>Understanding of switching theory and traffic theory, and study of space division theory, time division theory, speech path structure theory, and control theory.</p> <p>(3) Interface and signaling system theory</p> <p>Study of signaling systems, conditions of subscriber interfaces, transmission interfaces, and their hardware technology.</p> <p>(4) Switching system software technology</p> <p>Study of such software technology as the CCITT high level language, call processing control and maintenance program etc. and their design concept, structure and functions.</p>	<ul style="list-style-type: none"> • 1 time /year • 14 hours /week (7 hours/week, for the 2-year course) • 30 weeks/year • 20 prsns/year 	To share the equipment selected for the Electronic Exchange I.	As stated in the Electronic Exchange I.

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Switching and Traffic (5)
 TRAINING PROGRAM NAME: Telecommunication Diploma

As of the fiscal year 1991/1992

Training course	Subject/contents		Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
	Course name					
Switching system engineering		<p>An advanced course on Electronic Exchanges I and II of the Continuing Education Program providing such high-level technology for switching system designing and maintenance as operation analysis of switching systems, program analysis, signal analysis, and traffic analysis.</p> <p>(1) Stored program control technology Knowledge of software and hardware related to design technology of digital switching systems.</p> <p>(2) Speech path network technology Understanding of switching theory and traffic theory, and study of space division theory, time division theory, speech path structure theory and control theory.</p> <p>(3) Interface and signaling system theory Study of signaling systems, conditions of subscriber interfaces, transmission interfaces, and their hardware technology.</p> <p>(4) Switching system software technology Study of such software technology as the CCITT high level language, call processing control, maintenance program, etc. and their design concept, structure and functions.</p>	<p>1 time /year 2 hours /week (1 hours/week, for the 2-year course) 30 weeks/year 20 prsns/year</p>	To share the equipment selected for the Electronic Exchange I.	Same as the left	As stated in the Electronic Exchange I.

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Network Planning Department(1)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Data communications and data network I.	<ul style="list-style-type: none"> • 2 times/year • 2 weeks /time (50 hours) • 20 prsns/time (40 prsns/year) 	Basic knowledge and technology of data communications such as data collection, transmission, error control, analog/digital conversion, and packet and message communications. (1) Data collection system outline (2) Data transmission technology (3) Error control (4) Line concentration and multiplexing (5) Data communication network structure	<ul style="list-style-type: none"> • 2 times/year • 2 weeks /time (50 hours) • 20 prsns/time (40 prsns/year) 	(1) Measuring equipment • Protocol analyzer (3 sets) • Data communication analyzer (2 sets) • Modem tester (2 sets) • Voice band analyzer (2 sets) • Digital transmission analyzer (2 sets) • Artificial telephone subscriber line (2 sets)	(1 set) None (3 sets) (1 set) None (1 set)	(1) Measuring equipment Two sets of each type of equipment shall be provided as standard so that an experimental system having the equipment at each end can be established. The experimental system shall be established properly making use of the artificial telephone lines or working lines, connecting measuring equipment or terminal equipment at both ends, in order to obtain a basic knowledge of data communication and of technology through analysis and monitoring of the transmitting signal on the systems and multiplexing technology shall be studied by means of the transmission equipment which shall be provided to the Transmission Department. An experimental system can be established through the network comprising the switching and the transmission system, connecting the terminal equipment to the network, when necessary. (2) Transmission system synchronization and multiplexing technology shall be studied by means of the transmission equipment which shall be provided to the Transmission Department. An experimental system can be established through the network comprising the switching and the transmission system, connecting the terminal equipment to the network, when necessary. (3) It is agreed that the terminal equipment shall be provided by NTL.

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Network planning department (2)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name	Subject/contents			
Data communication and data network II	<p>Technology necessary for a PCM transmission system, transmission band suppression, noise and error detection, error control, etc., as well as the data communication protocol, network structure, and the technology and contents of an integrated digital network (IDN) and an integrated services digital network (ISDN).</p>	<p>To share in the equipment selected for Data communication and data network I.</p>	<p>Same as the above course</p>	<p>As stated in the Data communication and data network I.</p>

TRAINING COURSES AND NECESSARY EQUIPMENT

As of the fiscal year 1991/1992

DEPARTMENT: Network Planning Department (3)
 TRAINING PROGRAM NAME: Telecommunications Diploma

Training course		Subject/contents	Term/capacity	Selected equipment	Existing Similar equipment	Arrangement and selection reason
Course name						
Network planning and management	<p>Cultivation of engineers who can work out a stable and economical network design, coordinating the switching and the transmission system, according to the growth in volume and transition in quality of the telecommunications network.</p> <p>Study of network management technology for maintaining stable telecommunications services such as restriction of call origination and termination in emergency, based on measured or monitored information, and study of design methodology of optimum network for integrated services digital network, computer network, and data communication network.</p> <p>(1) Practice of traffic engineering and network planning (2) Data communications network and computer network (3) Telecommunications network management and network control technology (4) Telecommunications network data base (5) Integrated digital network design</p>	<ul style="list-style-type: none"> • 1 time /year • 14 hours/week • 30 week/year (7 hours/week, for 2-year course) • 20 persons/year 	<p>(1) Traffic measuring equipment</p> <ul style="list-style-type: none"> • Traffic measuring equipment (5 sets) • Off-line personal computer (2 sets) <p>(2) Telecommunications network design support system</p> <ul style="list-style-type: none"> • Graphic work station (1 set) • Color graphic printer (1 set) <p>(2) On-line personal computer</p> <ul style="list-style-type: none"> • Personal computer with a 40 MB hard disk (4 sets) • Personal computer with a 20 MB hard disk (4 sets) 	None	<p>(1) Traffic measuring equipment</p> <p>Measuring equipment for subscriber line traffic and personal computers are selected. The subscriber line traffic is the essential data for designing a telecommunications network. The personal computers shall be used for calculation and analysis of the collected data. As to the traffic measuring equipment for a telephone switching system, it is deleted because the digital telephone switching system is equipped with that function and the requested equipment for independent measurement of digital telephone switches is not commercially available.</p> <p>(2) Telecommunications network design support system</p> <p>One system is selected for the use of the diploma course and co-working of the network design between NPI and ARENTO.</p> <p>(3) On-line personal computer</p> <p>Designing a telecommunications network requires a database containing subscriber data, geographic data of exchanges, switching system data, transmission data, cost data, etc. of the area or country concerned. Four personal computers with a 40 MB hard disk for each are selected for establishing and managing the above mentioned data base, while four other personal computers with a 20 MB hard disk for each are selected for the study on telecommunications network design and data base in this diploma course.</p> <p>* ARENTO special courses.</p>	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Transmission Department (1)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Microwave Engineering	To learn the basics of electronics and circuit theory, and system engineering in the microwave transmission equipment. (1) Basic characteristics of microwaves (2) Basic characteristics and measurements of microwave components (wave guide impedance etc.) (3) Characteristics and measurements of microwave passive component (filters, directional couplers etc.) (4) Characteristics and measurement of microwave active components (transistor & parametric amplifiers, etc.) (5) Basic antenna theory in VHF & UHF (6) Microwave integrated circuits (MIC) (microstrip circuits etc.) (7) Microwave measurements (power frequency, impedance, etc.)	• 2 times /year • 2 weeks /time (60 hours/w) • 20 prsns/time (40 prsns/year)	(1) Microwave training bench (4 sets)	(2 sets)	(1) A microwave transmission system is composed of many kinds of circuit benches, so that microwave training benches are selected for easy handling and training, and economy. (2) NTI has 2 sets of the training benches (not completed), so 4 complete sets of benches are provided in consideration of the number of trainees in a course. (3) Necessary test and measuring equipment are attached to the training bench, but it is more effective for training to use the equipment shown below selected in other training courses. • Power meter • Frequency meter • Synchronoscope	
Digital Communications	To learn basic digital theory and digital modulation technique (1) Feature and comparison of digital and analog transmission (2) Theory of PCM technique (sampling, quantization and coding)	• 4 times /year • 2 weeks /time (60 hours/w) • 20 prsns/time (80 prsns/year)	Common use of the equipment selected in [Digital line of sight microwave communication systems]	None	(1) Equipment for this course is not selected because of common use with other courses.	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Transmission Department (2)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing Similar equipment	Arrangement and selection reason
Course name						
ditto		(3) PCM signal transmission . Intersymbol interference . Synchronous & Asynchronous transmission (4) Delta Modulation (DM) . Linear DM . Adaptive DM (5) Digital Modulation technique . FSK, PSK, QAM . Signal equalizer . S/N improvement	ditto	ditto	ditto	ditto
Analog Line-of-Sight Microwave Communication Systems		To acquire knowledge of modulation -demodulation technique, microwave propagation effects and analog components	. 4 times /year . 2 weeks /time (60 hours/w) . 20 prsns/time (80 prsns/year)	None	Some	Analog equipment are not selected.
Digital Line of Sight Microwave Communication Systems		To learn digital MODEM techniques, microwave propagation effects, and digital circuit characteristics in digital microwave transmission systems (1) Overview of digital microwave systems (2) Modulation, Demodulation . PCM & TDM . PSK, DPSK, QAM . Spectral efficiency (3) Propagation effects . Fading theory . Diversity techniques	. 4 times /year . 2 weeks /time (60 hours/w) . 20 prsns/time (80 prsns/year)	(1) 6GHz Digital Radio (1 set) (2) 11GHz Digital Radio (1 set) (3) PCM Multiplexer (1 set) (4) 6GHz Antenna System (1 set) (5) 11GHz Antenna System (1 set) (6) System Display Board (2 sets) (7) Solar Power System (1 set)	None	(1) It is very important to comprehend the actual transmission equipment. With this, digital 6GHz SS MS radio equipment (+1 sys) to which is attached supervisory & control equipment, and antenna systems are selected. Digital 11GHz 140MHz radio equipment (1 sys) with antenna system is also selected for system and equipment tests and microwave propagation experiments. (2) The minimum number of PCM multiplexers (MUX) is selected for comprehension of the MUX and overall test including the switch.

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Transmission Department (3)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
ditto	(4) Digital equipment • Equalizer • Timing recovery • Antenna & feeder system • Supervisory & control system (5) Interference • Frequency allocation • Types of interference • Frequency plan (6) Link Engineering • Performance impairments, objectives & analysis • Link analysis (7) Measurements of digital microwave system • System analysis	ditto	(8) Testing Equipment • Power meter (4) • Frequency counter (2) • Digital transmission analyzer (2) • Spectrum analyzer (2) • Synchroscope (4) • Microwave system analyzer (2) • Microwave frequency converter (2) • Vector signal generator (2) • Vector modulation analyzer (1) • Noise test set (1) • Jitter modulation generator (1) • Error rate measuring equipment (2) • Trucking signal generator (1) • Digital signal generator (2) • Chart recorder (3)	(3) (Micro Band) (2) (") (1) (") (1) (") (2) (over 100MHz) (0) (") (0) (") (0) (") (0) (") (0) (") (0) (") (1) (") (1) (") (1) (") (2) (") (1) (") (1) (")	(3) A set of solar power system is selected for studying the power characteristics under several conditions assumed in relay stations. (4) The test and measuring equipment which is indispensable for training is selected so as to apply to various measurements.	
Satellite Communication Systems	To learn basic characteristics, necessary techniques, access system and composition of an earth station in a satellite communication system (1) Overview of satellite system engineering	• 2 times /year • 2 weeks /time (60 hours/w) • 20 prsns/time (40 prsns/year)	(1) Satellite TV receiver (1 set) (2) Antenna system (1 set) (3) TV monitor (1)	None	(1) A set of satellite receiver system receiving EUTELSAT TV signals is selected without a transmitter, because it is not allowed to access the EUTELSAT with this system.	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Transmission Department (4)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course	Course name	Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
			ditto			
ditto		(2) Orbital aspects of satellite communications - Attitude control etc. (3) Modulation & multiplex - FM/FDM, FM/SCPC - BPSK, QPSK (4) Satellite link design - Design of up/down link - Propagation effects (5) Multiple access - FDMA, TDMA - Demand access (6) Earth station technology - Antenna, feeder system - Low noise/High power amplifier - FDM/TDM system	ditto	(4) Testing and measuring equipment - Video signal analyzer (1) - TV signal transmitter (1) - Video signal generator (1) - TV waveform monitor (1)	(0) (0) (0) (0)	(2) In measuring receiver characteristics, measuring signals are sent to the IF input from a "Video signal generator" and "TV signal transmitter" are analyzed by "Video signal analyzer" and "TV waveform monitor". (3) The antenna has a diameter of 4.5 meters to keep minimum video quality for training. (4) Direction adjustment of the antenna is operated manually, not automatically because of higher cost.
Optical Fiber Communication Systems (1)		To learn basic theory and transmission equipment of optical fiber communication system (1) Overview of optical fiber communication systems (2) Propagation effects in optical fibers - Fiber material & structural features - Propagation in fibers - Attenuation & dispersions in fibers (3) Optical cables & connectors	- 4 times /year - 2 weeks /time (60 hours/w) - 20 prsns/time (80 prsns/year)	(1) 140MB Optical Transmission System (1+1 system) - Optical terminal equipment - Optical repeater equipment - Supervisory/controlling equipment - Optical fiber & cable (2) Testing & Measuring Equipment - Opt. light source (2) - Opt. power meter (2) - Opt. wavelength meter (2) - Opt. white light source (1) - Opt. spectrum analyzer (2)	None (2) (2) (1) (0) (0)	(1) There are many kinds of optical transmission systems by long haul, short haul and capacity. Here, a 140MB optical transmission system is selected in consideration of the current trend and future tendency. The selected systems satisfy the training courses, so that other optical systems are excluded. (2) In supervisory/controlling equipment, part of functions unnecessary for training are excluded to reduce the cost. (3) All the test equipment provided are operated in a single mode as well as the optical transmission system.

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Transmission Department (5)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
ditto	(4) Optical Transmitters • Operation of optical sources (LED, LD) • Performance of optical sources (5) Optical receiver • Photodiector types & performance (6) Optical fiber communication systems • Optical fiber networks • Repeater span & attenuation (7) Measurements on optical fiber systems • fault location • Opto-electronic measurements	ditto	<ul style="list-style-type: none"> • Opt. fault locator (2) • Opt. chromatic dispersion measuring set (1) • Opt. return loss measuring set (1) • E/O converter (1) • O/E converter (1) • Fiber splicer (1) • Connectorization kit (1) • Opt. attenuator (4) • Opt. switch (4) • Opt. coupler (4) 	<ul style="list-style-type: none"> (2) (0) (0) (0) (1) (1) (0) (0) (1) (1) (1) (0) 	(4) The minimum number of test & measuring equipment is selected in consideration of the number of trainees and existing equipment which is mostly operated in a multi mode.	
Optical Fiber Communication Systems(II)	To learn higher knowledge of electronic and physical characteristics of optical transmission systems following the course of " Optical Fiber Communication Systems(I)" (1) Review of the previous course (2) Single mode fiber (3) Single mode lasers (4) System analysis (5) System applications (6) Coherent optical fiber communication system (7) Integrated optoelectronics (8) Cost analysis and system optimization	<ul style="list-style-type: none"> • 2 times /year • 2 weeks /time (60 hrs/w) • 20 prsns/time (40 prsns/year) 	(common use)	None	No equipment is selected as the equipment for this course is same as in the course of "Optical Fiber Communication Systems(I)"	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Transmission Department (6)
 TRAINING PROGRAM NAME: ARENTO Special Program
 As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Analog & Digital Transmission	Mostly same as the "Digital Communications" (Practice 25%, Research on assigned theme and seminar 10%)	. 1 time /year . 3 Months /time (50 hours) . 40 prsns/time (40 prsns/year) (Evening class)	(Common use)	None	No selection due to common use of the equipment selected in the related courses of the Continuing Education Program	
Microwave L.O.S & Satellite Communication Systems	Mostly same as the "Digital Line-of-Sight Microwave Communication System" and "Satellite Communication Systems" (ditto)	-ditto- (Evening class)	(Common use)	None	ditto	
Optical Fiber Communication Systems	Mostly same as the "Optical Fiber Communication System (I)" (ditto)	-ditto- (Evening class)	(Common use)	None	ditto	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Transmission Department (7)
 TRAINING PROGRAM NAME: Diploma Course

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Transmission Systems Engineering (Specialized Course)	This is a long training course for cultivating senior transmission engineers. The subject is composed of five courses as shown below (1) Microwave engineering (Almost same contents as in the related courses in the Continuing Education Program) (2) Microwave L.O.S. communication systems (-ditto-) (3) Satellite communication systems (-ditto-) (4) Optical fiber communication systems (-ditto-)	• 1 time /year • 30 Weeks/time • 14 hours /week (20 prsns/year)	(Common use)	None	No selection due to common use of the equipment selected in the related courses of the Continuing Education Program	
Digital Communications (Common core course)	Almost same contents in higher level as the related course in the Continuing Education Program.	• 4 times /year • 30 weeks/time • 2 hours /week (20 prsns x 4 courses/ year)	(Common use)	None	No equipment is selected	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Transmission Department (8)
 TRAINING PROGRAM NAME: Diploma Course

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Microwave and Optical Engineering (Specialized course: Communication Systems Equipment)	Almost same contents in higher level as the related course in the Continuing Education Program.	<ul style="list-style-type: none"> • 1 time /year • 30 weeks/year • 2 hours/week (20 prsns /year)	(Common use)	None	No equipment is selected.	
Transmission Systems Engineering (ditto)	ditto	ditto	(Common use)	None	ditto	
			On-line personal computer (1 set)	None	This is used for data base access, mathematic models of electronics and software forming.	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Electronics Department (1)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Digital electronics	<p>Various digital technology is applied to recent telecommunications equipment. This course offers the study of various digital elements and circuit fundamentals; and their applications to telecommunications equipment.</p> <p>(1) Digital gate circuit (2) Semiconductor switch (3) Logic circuit design (4) Logic system structure (5) Flip-flop circuit (6) Microprocessor system</p>	<p>• 2 times /year • 2 weeks /time (30 hours/w) • 20 prsns /time (40 prsns/year)</p>	<p>(1) Semiconductor element experimental equipment (2 sets) (2) Electronic experimental equipment (2 sets) (3) Analog/digital conversion experimental equipment (2 sets) (4) IC training equipment (2 sets) (5) IC trouble shooting kit (2 sets) (6) Logic probe (15 sets)</p>		<p>The selection is mainly aimed at fundamental training equipment for digital electronics. Arrangement is done on account of the price of each equipment, though providing 1 set for 2 trainees was requested. Logic probes are provided corresponding to the number of trainees and on account of the number of existing equipment; for they are simple, cheap and equivalent to testers. As to the experimental laboratory work of microprocessors, the microprocessor training equipment selected for "Microprocessors and their applications" course shall be shared.</p>	
Electronics measurement and instrumentation	<p>Measuring equipment operation on field work, measuring methodology for various objectives, measuring equipment structure and measuring theory.</p>	<p>• 1 time /year • 2 weeks /time (30 hours/w) • 20 prsns /time (20 prsns/year)</p>	<p>(1) Function generator (5 sets) (2) Frequency counter (5 sets) (3) Digital multi-meter (5 sets) (4) Spectrum analyzer (1 set) (5) Q meter (1 set) (6) Vector impedance meter (1 set) (7) Selective level meter (1 set)</p>	<p>(6) (4) (13) (2) (1) (0) (2)</p>	<p>Using the equipment is the very objective in this course; consequently those which are generally and frequently used are provided in plurality, and the others are one set for each. Those for special use are omitted. The request for provision of oscilloscopes is rejected on account of NPI having eleven sets, though the equipment is used commonly and frequently.</p>	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Electronics Department (2)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Microprocessors and their applications	<p>Microprocessors are widely applied recently to telecommunications equipment, to various kinds of terminal equipment and to the control unit of measuring equipment.</p> <p>This course offers the study of fundamental technology and knowledge of microprocessor designing, application to input-output devices, application to memory chips (programming and data input-output); and the microprocessor structure and its theory.</p>	<p>• 2 times /year • 2 weeks /time (30 hours/w) • 20 prsns /time (40 prsns/year)</p>	<p>(1) 8-bit microprocessor training equipment (5 sets) (2) 16-bit microprocessor training equipment (5 sets) (3) Microprocessor system analyzer (8-bit) (1 set) (4) Microprocessor system analyzer (16-bit) (1 set) (5) Logic analyzer (2 set) (6) Microprocessor-based controller (2 sets) (7) EPROM programmer (2 sets)</p>	<p>(1 set) (1 set)</p>	<p>The selected measuring equipment is that which is necessary for the experimental work on microprocessor function evaluation, for obtaining application technology to input-output (I/O) devices, for performing simple processor designing by means of EPROM, and so on.</p>	
Basic communications	<p>Telecommunications fundamental technology covering the time and relationship between the time and the frequency factors of voice signals, the transmission parameters (attenuation, pulse delay, reflection, echo and noise) and their application steps, the various methods of modulation and multiplexing technology.</p>	<p>• 2 times /year • 2 weeks /time (30 hours/w) • 20 prsns /time (40 prsns/year)</p>	<p>(1) Artificial telephone line (1 set) (2) MODEM circuit experimental equipment (2 sets) (3) Pulse circuit experimental equipment (2 sets) (4) PCM generator/monitor/ noise generator (1 set) (5) PCM transmission measuring equipment (1 set)</p>	<p>None</p>	<p>The selection covered the measuring and the training equipment necessary for studying the fundamentals of telecommunications transmission technology. The requested spectrum analyzers are rejected for they can be substituted by those which are provided in the "Electronics measurement and instrumentation" courses. As to the practical equipment technology by means of a real telecommunications system, such as PCM multiplexers, it is arranged to be substituted by the equipment which is provided for the Transmission Department.</p>	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Electronics Department (3)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Digital signal processing	<ul style="list-style-type: none"> • 1 time /year • 2 weeks /time (30 hours/w) • 20 prsns /time (20 prsns/year) 	Digital signal processing technology including digital filter, Fourier transform as well as sampling theory and quantization theory	<ul style="list-style-type: none"> • 1 time /year • 2 weeks /time (30 hours/w) • 20 prsns /time (20 prsns/year) 	None	None	As training mostly comprises study through lecture and depends less on experimental work, the requested Fourier transform software and digital filters are rejected.
Measuring techniques in telecommunications	<ul style="list-style-type: none"> • 2 times /year • 2 weeks /time (30 hours/w) • 20 prsns /time (40 prsns/year) 	Technique and methodology for the evaluation of transmission characteristics of telecommunications systems and trouble shooting. main contents: equipment selection and measuring technique adequate to selected measuring section, noise measurement, attenuation measurement, cable trouble shooting, transmission distortion, PCM circuit measurement, etc.	<ul style="list-style-type: none"> • 2 times /year • 2 weeks /time (30 hours/w) • 20 prsns /time (40 prsns/year) 	(1) Frequency synthesizer (1 set) (2) Cable fault locator (1 set)	(1 set) (1 set)	Two kinds of measuring equipment are selected: one is a frequency synthesizer used for noise measurement experimental work and another is a detector for cable faults shooting. Regarding the other equipment requested, it is agreed to share the equipment selected for other course. Equipment to be shared: • Selective level meter • Artificial telephone line • PCM generator/monitor • PCM transmission measuring equipment Experiments on fault point detection and transmission characteristic measurement through a real system shall be performed in the telecommunication system for training.

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Electronics Department (4)
 TRAINING PROGRAM NAME: ARENTO Special Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Digital electronics	Same as the course in Continuing Education Program	. 1 time /year . 3 months/time (50 hours/3mon.) . 40 prsns /time (40 prsns/year)	(evening course)	To be shared with the Continuing Education Program courses	Same as the left	As stated in the Continuing Education Program courses.
Microprocessors and their applications	ditto	ditto	ditto	ditto	ditto	ditto

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Electronics Department (5)
 TRAINING PROGRAM NAME: Telecommunications Diploma

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Communication and information theory (Common core course)	<p>Telecommunications fundamental theory as well as each technology which form a system, international standard, dominant factors of transmission characteristics, etc.</p> <p>In other words ,</p> <p>1) a theoretical approach to transmission and its fundamental technology, the kinds of transmission media and their characteristics, modulation systems, dominant elements of characteristics of transmission including noise and jitter.</p> <p>2) bit error rate measurement, analysis and measurement of noise, signal modulation making use of training kits and measuring equipment</p>	<p>1 time /year 30 weeks/year 2 hours/week 20 persons X4 courses/year</p> <p>4 courses: • Transmission system technology • Exchange system technology • Network planning and management course • Telecommunications equipment course</p>	<p>(1) Audio analyzer (1 set) (2) Dynamic signal analyzer (1 set) (3) Portable instrumentation tape recorder (1 set) (4) Band-pass filter (1 set)</p>	Non	<p>The selected equipment is only for voice signal characteristics evaluation. As to the following equipment, it is agreed to be shared with that selected in other courses.</p> <ul style="list-style-type: none"> • Function generator • Spectrum analyzer • MOD/DEM experimental equipment • Pulse circuit experimental equipment • Oscilloscope • Noise generator 	
Communication electronics and circuits (Common core course)	<p>The contents include those of the courses "Digital Electronics" and "Microprocessors and their Applications"</p>	ditto	To be shared with other course	Same as the left	<p>It is agreed that the following equipment shall be shared with that selected to other courses.</p> <ul style="list-style-type: none"> • Semiconductor element experimental equipment • Electronic circuit experimental equipment • Analog/digital conversion experimental equipment • IC training, trouble shooting equipment • 8- and 16-bit microprocessor training equipment • Microprocessor system analyzers • Logic analyzers • Logic probes 	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Electronics Department (6)
 TRAINING PROGRAM NAME: Telecommunications Diploma

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Microprocessors and digital technique (Communication systems equipment course)	Advanced courses "Digital Electronics" and "Microprocessors and their Applications" of Continuing Education Program. This course offers further study of microprocessor design, development methods, and application technology to various control equipment as well as instruction on trial manufacturing of electronic circuits through experimental work with enough hours.	<ul style="list-style-type: none"> • 1 time/year • 2 hours/week • 30 weeks/year • 20 prsns/year 	(1) CAD sytem (2 sets) (2) Printed circuit fabrication equipment (1 system)	None	The electronic design and manufacturing equipment is selected. The rest of the requested equipment is as follows. It is agreed that the following shall be shared with the equipment selected to other courses. <ul style="list-style-type: none"> • Semiconductor element experimental equipment • Electronic circuit experimental equipment • Analog/digital conversion experimental equipment • IC training, trouble shooting equipment • 8- and 16-bit microprocessors training equipment • Microprocessor system analyzers • Microprocessor-based controllers • EPROM programmers • Logic analyzers 	
Measurement techniques (Communication systems equipment course)	Advanced courses of Continuing Education Program, which offer voltage and level measurement, noise measurement, loss measurement, analog signals measurement, digital signals measurement, PCM measurement.	<ul style="list-style-type: none"> • 1 time/year • 2 hours/week • 30 weeks/year • 20 prsns/year 	To be shared with the Continuing Education Program courses	Same as the left	It is agreed to share the equipment selected in other courses.	
			(1) On-line personal computers (1 set)	None	To be used for accessing NTI data base, electronics/mathematics calculation, software creation and development, etc.	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Computer and Systems Department (1)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Fundamentals of computer system	Introductory course of computer (1) Computer system architecture (2) Hardware and software (3) Operation of computer and peripheral equipment	• 2 times /year • 2 weeks /time (24 hours/w) • 20 prsns/time (40 prsns/year) (Practice:16 hs)	(1) Center computer system (1 sys.) ① Peripheral equipment (1 set) ② Graphic terminal(1 set) ③ X.25 Gateway equipment (1 unit) ④ Operating system and utilities (1 set) (2) On-line personal computer (for training) ① Trainees use : 20MB HDD (20 sets) ② Instructors use : 40MB HDD (1 set) (3) On-line personal computer (for staff) ① Staff use : 40MB HDD (4 sets) ② Page printer (1 set) (4) Local area network(LAN) (3 segments)	(1) Micro-mini-computer (1 sys.) (2) Operating system and utilities (1 set) (3) On-line personal computer(for training and staff) (4 sets) (4) Uninterruptible power supply unit (1 unit)	(1) The machine type of center computer is selected not only within main frame types but also including super mini types in consideration of the amount of processing work and the necessary performance. And also the machine type should be excellent in expandability, maintainability, new technology adoption, cost, training effect, operability, etc. (2) In order to minimize the system scale, the center computer system selects a simplex configuration on condition that the introduced computer can be maintained in Egypt sufficiently, and the training work has the first priority at the heavy load time. (3) To cope with the wide training and research needs from personal computers to on-line computer systems commonly and economically, the terminal equipment should not be of an exclusive type but a general-purpose type, therefore an on-line personal computer is selected as a terminal equipment and can be used as a stand-alone personal computer system (4) One set of graphic terminal is selected because of the necessity of precise graphics making at graphics training and system development.	
BASIC programming (BASIC: general purpose simple language, mainly for personal computers)	Programming techniques using BASIC language (1) Introduction to programming (2) Fundamentals of BASIC language (3) Commands of BASIC language (4) Programming techniques	• 2 times /year • 2 weeks /time (24 hours/w) • 20 prsns/time (40 prsns/year) (Practice:24 hs)	(1) Trainees use : 20MB HDD (20 sets) ② Instructors use : 40MB HDD (1 set)	(1) Micro-mini-computer (1 sys.) (2) Operating system and utilities (1 set) (3) On-line personal computer(for training and staff) (4 sets) (4) Uninterruptible power supply unit (1 unit)	(1) The machine type of center computer is selected not only within main frame types but also including super mini types in consideration of the amount of processing work and the necessary performance. And also the machine type should be excellent in expandability, maintainability, new technology adoption, cost, training effect, operability, etc. (2) In order to minimize the system scale, the center computer system selects a simplex configuration on condition that the introduced computer can be maintained in Egypt sufficiently, and the training work has the first priority at the heavy load time. (3) To cope with the wide training and research needs from personal computers to on-line computer systems commonly and economically, the terminal equipment should not be of an exclusive type but a general-purpose type, therefore an on-line personal computer is selected as a terminal equipment and can be used as a stand-alone personal computer system (4) One set of graphic terminal is selected because of the necessity of precise graphics making at graphics training and system development.	
PASCAL programming fundamental course (PASCAL: high level general purpose language for use of business and science & technology calculation)	Programming introductory course using PASCAL language (1) Flow-chart making techniques (2) PASCAL language and commands (3) Programming techniques	• 2 times /year • 2 weeks /time (24 hours/w) • 20 prsns/time (40 prsns/year) (Practice:24 hs)	(1) Staff use : 40MB HDD (4 sets) ② Page printer (1 set) (4) Local area network(LAN) (3 segments)	(1) Micro-mini-computer (1 sys.) (2) Operating system and utilities (1 set) (3) On-line personal computer(for training and staff) (4 sets) (4) Uninterruptible power supply unit (1 unit)	(1) The machine type of center computer is selected not only within main frame types but also including super mini types in consideration of the amount of processing work and the necessary performance. And also the machine type should be excellent in expandability, maintainability, new technology adoption, cost, training effect, operability, etc. (2) In order to minimize the system scale, the center computer system selects a simplex configuration on condition that the introduced computer can be maintained in Egypt sufficiently, and the training work has the first priority at the heavy load time. (3) To cope with the wide training and research needs from personal computers to on-line computer systems commonly and economically, the terminal equipment should not be of an exclusive type but a general-purpose type, therefore an on-line personal computer is selected as a terminal equipment and can be used as a stand-alone personal computer system (4) One set of graphic terminal is selected because of the necessity of precise graphics making at graphics training and system development.	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Computer and Systems Department (2)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing Similar equipment	Arrangement and selection reason
Course name						
PASCAL programming advanced course	Practical programming techniques using PASCAL language (1) Using methods of various commands (2) High-level programming techniques.	ditto	(5) Uninterruptible power supply unit ① for center computer (1 unit) ② for on-line personal computers (14 units)	ditto	(5) X.25 Gateway equipment is selected for packet switching network training. (6) For simple graphics training and making, on-line personal computers have additional graphic boards in consideration of economical system design. (7) In order to output relatively large amount of data at teaching materials production and programs development by staff, one page printer is selected. (8) For the connection between the center computer and the on-line personal computers, a LAN (Local area network) system is installed in consideration of the following. ① Training for the engineers to plan, design, and construct LAN systems ② Ease of installation; simple and economical connection methods (MODEMs are not required) ③ Ease of future expansion of the number of terminals by NTI (9) The number of installed terminals (on-line personal computers) and uses of them are as follows. ① Trainees use: 20 sets Instructors use: 1 set Various computer training	
Operating system (OS)	Operating systems types, basic structure, functions and using method (1) Fundamental knowledge (2) Memory management methods (3) Processor management methods (4) File management techniques (5) System generation techniques (6) On-line processing techniques	. 2 times /year . 2 weeks /time (24 hours/w) . 20 prsns/time (40 prsns/year) (Practice:12 hs)	(6) Spare parts (1 lot) (7) Maintenance tools (1 lot) (8) Installation material (1 lot) (9) Documentation (1 set) (10) Articles for consumption (1 lot)			
COBOL programming fundamental course (COBOL: high level general purpose language for use of business calculation)	Programming introductory course using COBOL language (1) Flow-chart making techniques (2) COBOL language and commands (3) Programming techniques	. 2 times /year . 2 weeks /time (24 hours/w) . 20 prsns/time (40 prsns/year) (Practice:24 hs)				

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Computer and Systems Department (3)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
COBOL programming advanced course	Operating systems types, basic structure, functions and using method (1) Fundamental knowledge (2) Memory management methods (3) Processor management methods (4) File management techniques	• 2 times /year • 2 weeks /time (24 hours/w) • 20 prsns/time (40 prsns/year) (Practice:24 hs)	ditto	ditto	② Staff use: 4 sets • Training programs development • Teaching materials production • Consultation, research - Office automation systems development - Information Center data base system development - Computer network development - Expert systems development • Department work processing • NTI data base access	
FORTAN programming fundamental course (FORTAN: high level general purpose language for use of science & technology calculation)	Programming introductory course using FORTRAN language (1) Flow-chart making techniques (2) COBOL language and commands (3) Programming techniques	• 2 times /year • 2 weeks /time (24 hours/w) • 20 prsns/time (40 prsns/year) (Practice:24 hs)			(9) The number of installed terminals (on-line personal computers) and uses of them in the other departments are as follows. (The following are described also in the columns of the other departments) ① Switching and Traffic Dept. a. Department use: 1 set • NTI data base access • Data base system maintenance and operation support system development (cooperated with ARENTO) ② Network Planning Dept. a. training : 4 sets • Data base training at the Diploma Course • Network design training	
FORTAN programming advanced course	Practical programming techniques using FORTRAN language (1) Using methods of various commands (2) High level programming techniques	• 2 times /year • 2 weeks /time (24 hours/w) • 20 prsns/time (40 prsns/year) (Practice:24 hs)				

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Computer and Systems Department (4)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Data base management system	Understanding data base management systems (relational type, network type, and hierarchical type), and mastering necessary knowledge and techniques of data base construction and operation (1) Data base design methods (2) Data base making and operation (3) Data base design practice (4) Case studies	• 2 times /year • 2 weeks /time (36 hours/w) • 20 prsns/time (40 prsns/year) (Practice:24 hs)	ditto	ditto	b. Network design use: 4 set • Network data base (subscriber data, geographic data, switches data, cost data, etc.) making and management • Department work processing • NII data base access ③ Electronics Dept. a. Department use: 1 set • NII data base access • Electric/electronics mathematical model calculation • Department use software development ④ Transmission Dept. a. Department use: 1 set • Fading experiment data base making and management • Software development for consultation and research work • NII data base access ⑤ Administration and Support Dept. a. NII administration work use: 1 set • Equipment data base • Training management • Personnel, salaries management etc. b. Telecommunications information data base use: 1 set • Information Center data base access • Library data base access	
Local area network (LAN)	Mastering fundamental knowledge and construction techniques to design data communications systems using LAN. (1) Basic techniques of LAN (2) LAN system configuration and application systems (3) LAN system construction methods (4) Design exercise, practice	• 2 times /year • 2 weeks /time (36 hours/w) • 20 prsns/time (40 prsns/year) (Practice:24 hs)				

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Computer and Systems Department (5)
 TRAINING PROGRAM NAME: Continuing Education Program

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Software engineering	Mastering knowledge and techniques about software engineering fundamentals, system design procedure, system development, and project management. (1) System analysis (2) System design procedure and work contents (3) Communications processing techniques (4) Reliability design (5) Software production techniques (6) System operation techniques (7) Project management (8) System design exercise, practice	• 2 times /year • 2 weeks /time (36 hours/w) • 20 prsns/time (40 prsns/year) (Practice:24 hs)	ditto	ditto	ditto	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Computer and Systems Department (6)
 TRAINING PROGRAM NAME: ARENTO Special Training Program

As of the fiscal year 1991/1992

Training course		Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name	Subject/contents			
Computer engineer	Giving necessary computer techniques to the senior engineers who will lead the development and design of computer systems in the telecommunications fields. (1) Fundamentals of computer system . Refer to the course of Continuing Education Program (2) High-level language . Refer to the course of BASIC programming of Continuing Education Program (3) Assembly language programming switching systems. . Assembly language and commands . Programming techniques (4) Operating system (OS) . Refer to the course of continuing Education Program (5) Data base management systems . Refer to the course of Continuing Education Program (6) Software engineering . Refer to the course of Continuing Education Program	ditto	ditto	ditto
	Term/capacity			
	. 1 time /year . 34 weeks /time (312 hours) . 40 prsns/time (40 prsns/year) (Practice:78 hs)			

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Computer and Systems Department (7)
 TRAINING PROGRAM NAME: Diploma Course

As of the fiscal year 1991/1992

Training course		Subject/contents	Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name						
Computer and communications	<p>Long-term training course to train senior special engineers who will lead to design and construct on-line systems integrating computer and communications technologies.</p> <p>(1) Fundamentals of computer system . Refer to the course of Continuing Education Program</p> <p>(2) Digital techniques . Analog/digital conversion techniques . Logic circuits, logic switches techniques . Digital communications techniques . Digital modulation techniques . Digital networks</p> <p>(3) Software engineering . Refer to the course of Continuing Education Program</p> <p>(4) High-level language (C language) . Flow-chart making techniques . C language and commands . Programming techniques</p> <p>(5) Artificial intelligence (AI) language (LISP or Prolog) . AI language . Programming techniques</p>	<p>. 1 time /year . 14 weeks /time (600 hours) . 20 prsns/time (20 prsns/year) (Practice:270hs)</p>	ditto	ditto	ditto	

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Computer and Systems Department (8)
 TRAINING PROGRAM NAME: Diploma Course

As of the fiscal year 1991/1992

Training course		Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name	Subject/contents			
ditto	(6) Expert system in the telecommunications fields • Expert system construction Practice • Case studies of expert systems in telecommunications fields (7) Computer-aided design (CAD) and simulation techniques • Fundamentals of graphic terminals • Graphics making techniques • Graphics making exercise, practice • Simulation package using techniques (8) Local area network (LAN) • Refer to the course of Continuing Education Program (9) Data base management system • Refer to the course of Continuing Education Program (10) Design, constructing and evaluating computer systems in the telecommunications fields	ditto	ditto	ditto

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Administration and Support Department (1)

As of the fiscal year 1991/1992

Training course		Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name	Subject/contents				
	(1) Leveling the trainees in the courses of Continuing Education Program and ARENTO Special Program.		(1) CAL (computer-aided learning) system ① CAL terminal (4 sets) ② Teaching materials making system (1 set) ③ CAL teaching materials (9 courses) <ul style="list-style-type: none"> • Outline of network design techniques • Outline of traffic theory • Basic techniques of digital switching • Optical fiber transmission basic techniques • Digital transmission techniques • Digital microwave transmission theory • Data transmission control procedure • Basic electronic circuits • Advanced electronic circuits ④ Uninterruptible power supply unit (2 units)	None	(1) CAL system Especially the courses of Continuing Education Program have different levels of trainees because participants are from governmental and private sectors and neighboring countries. Therefore, in order to equalize the trainees' level by their own learning, CAL systems are selected. A teaching materials making system is installed to make materials of NII's own developing besides the 9 selected materials.

TRAINING COURSES AND NECESSARY EQUIPMENT

DEPARTMENT: Administration and Support Department (2)

As of the fiscal year 1991/1992

Training course		Term/capacity	Selected equipment	Existing similar equipment	Arrangement and selection reason
Course name	Subject/contents				
	(2) NTI administration work such as management of equipment, personnel, salaries, and library and data base access about various telecommunications information		(2) On-line personal computer system ① On-line personal computer (2 sets) ② Uninterruptible power supply unit (1 unit)	ditto	(2) On-line personal computer system One set is used for NTI administration work such as management of equipment, personnel, salaries, and training. And the other set is used for retrieving the NTI's telecommunications information data base including the library to fulfill the role of Information Center which is determined by the Presidential Decree.

