

**BASIC DESIGN STUDY REPORT  
ON  
THE PROJECT  
FOR  
IMPROVEMENT OF EDUCATIONAL EQUIPMENT  
FOR  
THE FACULTY OF ENGINEERING  
UNIVERSITY OF MORATUWA  
IN  
DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA**

**MARCH 2002**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
SYSTEM SCIENCE CONSULTANTS INC.**

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CR (1)
02-052

## Preface

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct a basic design study on the Project for Improvement of Educational Equipment for the Faculty of Engineering, University of Moratuwa and entrusted the study to the Japan International Cooperation Agency (JICA).

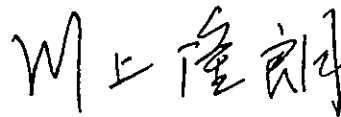
JICA sent to Sri Lanka a study team from September 17<sup>th</sup> to October 9<sup>th</sup> 2001.

The team held discussions with the officials concerned of the Government of Sri Lanka, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Sri Lanka, in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Democratic Socialist Republic of Sri Lanka for their close cooperation extended to the team.

March 2002

A handwritten signature in black ink, consisting of stylized Japanese characters, positioned above a horizontal line.

Takao Kawakami

President

Japan International Cooperation Agency



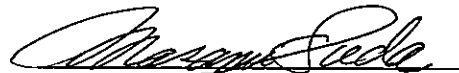
## Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improvement of Educational Equipment for the Faculty of Engineering, University of Moratuwa in the Democratic Socialist Republic of Sri Lanka.

This study was conducted by System Science Consultants Inc., under a contract to JICA, during the period from September, 2001 to March, 2002. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Sri Lanka and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



Masami SUDA  
Project Manager,  
Basic design study team on  
the Project for Improvement of  
Educational Equipment for  
the Faculty of Engineering,  
University of Moratuwa  
System Science Consultants Inc.



## LEGEND

- |  |                       |  |   |
|--|-----------------------|--|---|
|  | Province boundaries   |  | Capital                                 |
|  | Railway               |  | Main city                               |
|  | Trunk road            |  | Project site                            |
|  | International airport |  | Relevant university for the field study |

## LOCATION MAP OF THE PROJECT SITE



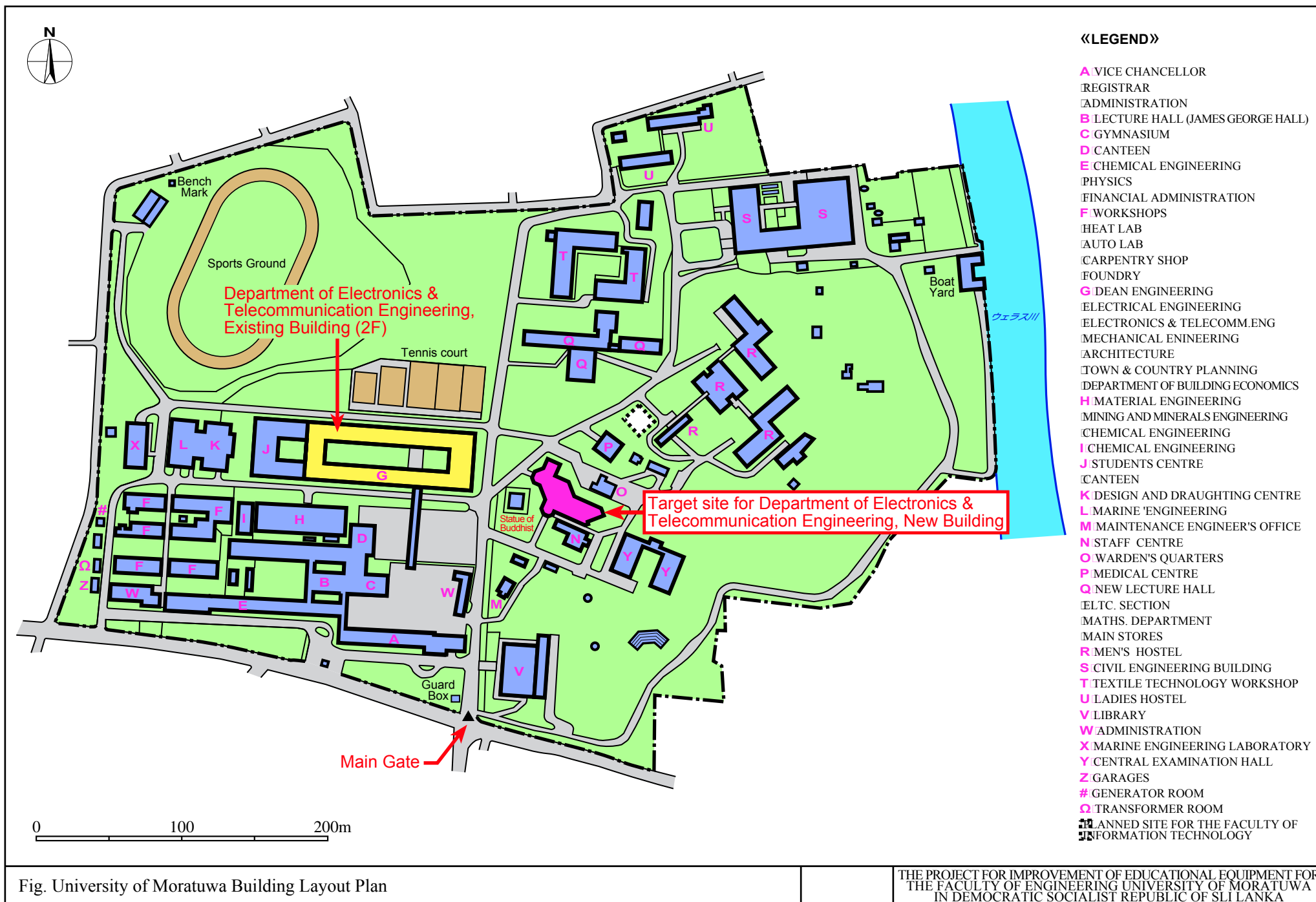


Fig. University of Moratuwa Building Layout Plan

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

## Photographies

### University of Moratuwa



Main gate of University of Moratuwa



Office for Vice Chairman



They way from the main gate towards the Faculty of Engineering



The statue of Budda and the construction site of new building for the Dept. of Electronics & Telecom Eng.



Information plate of the Faculty of Engineering, in front of the entrance



The exterior of the Faculty of Engineering



The exterior of the Dept. of Electro & Telecom. Eng.



Courtyard of the building for the Dept. of Electric Eng., of Computer Science, of Electro. & Telecom. Eng.



The Department of Electronics & Telecommunication Engineering,  
Laboratories



Digital Electronics Laboratory



Analog Electronics Laboratory



Telecommunication Laboratory



Microwave Laboratory



Post-Graduate Laboratory



Opto-Electronics Laboratory



Computer System Laboratory



Workshop



## Other related facilities in the other departments



CAD Laboratory (Dept. of Mechanical Engineering)



Data Communication Laboratory  
(Dept. of Computer Science)



Host Computer Room  
(in the Data Communication Laboratory)



## Construction site of the new building for the Dept. of Electro. and Telecom. Eng.



Construction site in September 2001



Construction site in October 2001



Construction site in December 2001





## Other Universities in Higher Engineering Education



University of Colombo, ICT Server



Current situation of computer use in the University of Colombo, ICT



University of Peladeniya, Dept. of Electric and Electronics Engineering



University of Peladeniya, Dept. of Computer Science



University of Rufuna, Faculty of Engineering



University of Rufuna Faculty of Engineering, Dept. of Electric & Information Eng.



Open University of Sri Lanka



Open University of Sri Lanka, Faculty of Engineering, Dept. of Electric Eng.



## Discussion with relevant organizations in the recipient country and International Institutions



Explanation and discussion with the Secretary of the Ministry of Education & Higher Education



Explanation and discussion with the Chairman of University Grants Commission



Discussion with Asian Development Bank



Explanation and discussion with Ministry of Finance & Planning, Dept. of External Resources



Presentation at University of Colombo, ICT



Discussion with Director of University of Colombo, ICT



Discussion and questionnaire with University of Peladeniya, Faculty of Engineering



## Discussion with University of Moratuwa



Explanation and discussion with Vice Chairman of University of Moratuwa



Discussion in the Dean's room of the Faculty of Engineering



Explanation to the relevant people to the project in the Faculty of Engineering



Discussion with the Dept. of Electronics & Telecommunication Engineering



Discussion regarding the construction plan of the new building for the Dept. of Electro. & Telecom. Eng. (October 2001)



Discussion regarding the construction plan of the new building for the Dept. of Electro & Telecom. Eng. (December 2001)



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## Abbreviations

ADB	Asian Development Bank
AMPS	Advanced Mobile Phone Service
AVR	Automatic Voltage Regulator
BOI	Board of Investment
BSc Eng.	Bachelor of Engineering
CAD	Computer-aided Design
CCD	Charge Coupled Device
CEB	Ceylon Electricity Board
CINTEC	Computer and Information Technology Council of Sri Lanka
CCC	Ceylon Chamber of Commerce
CD	Compact Disc
CEB	Ceylon Electricity Board
CSS	Computer Society of Sri Lanka
DFID	Department for International Development
DSCS	University of Colombo, Dept. of Statistics and Computer Science
DV	Digital Video
E&TE	University of Moratuwa, Faculty of Engineering, Dept. of Electronics and Telecommunication Engineering
E/N	Exchange of Note
ERD	Ministry of Finance and Planning, External Resource Department
FITS	Federation for Information Technology in Sri Lanka
F/U	Follow-up
GCEA/L	General Certificate of Education, Advanced Level Examination
GCEO/L	General Certificate of Education, Ordinary Level Examination
GDP	Gross Domestic Product
GNP	Gross National Product
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HNDE	Higher Degree of Post-Graduate Diploma in Industry Engineering
ICT	Institute of Computer Technology
ICT Group	Information and Communication Technology Group
IT	Information Technology
JICA	Japan International Cooperation Agency
LAN	Local Area Network
LEARN	Lanka Educational Academic and Research Network
MASc	Master of Engineering
MOEH	Ministry of Education and Higher Education

MOHEC	Ministry of Human Resources Development Education & Cultural Affairs
MOID	Ministry of Industrial Development
MOEST	Ministry of Economic Reform and Scientific Technology
NDES	Post-Graduate Diploma in Industrial Engineering)
NDT	National Diploma in Technology
NEC	National Education Commission
NIBM	National Institute of Business Management
NITESL	National Institute of Technical Education of Sri Lanka
NORAD	The Norwegian Agency for Development Cooperation
NSF	National Science Foundation
NTT	Nippon Telegraph and Telephone Corporation
OHP	Over Head Projector
OS	Operating System
PhD	Doctor of Engineering
RF	Radio Frequency
Rp	Sri Lanka Rupee
SIDA	Swedish International Development Agency
SLBFE	Sri Lanka Bureau of Foreign Employment
SLIATE	Sri Lanka Institute of Advanced Technical Education
SLIIT	Sri Lanka Institute of Information Technology
SLSI	Sri Lanka Standards Institution
SLT	Sri Lanka Telecom
SWR	Standing Wave Ratio
TASL	Telecommunication Authority of Sri Lanka
TCP/IP	Transmission Control Protocol / Internet Protocol
TRCSL	Telecommunications Regulatory Commission of Sri Lanka
TVEC	Technical Vocational Education Committee
UGC	University Grants Commission
UNDP	United Nations Development Programme
UOC	University of Colombo
UOM	University of Moratuwa
UOP	University of Peladeniya
UPS	Uninterruptible Power Supply
VCD	Video Compact Disc
VCR	Video Cassette Recorder
WAN	Wide Area Network
WBT	Web Based Training
WB	World Bank
WLL	Wireless Local Loop

## **Summary**

The industrial structure of the Democratic Socialist Republic of Sri Lanka (Sri Lanka) consists of food and beverages (21%), textile, wearing apparel and leather products (42%), chemical, petroleum, rubber and plastic products (19%), non metallic mineral products (8%), paper and wooden products (3%), and other processed products of raw materials.

Since the "New Industrialization Policy" in 1994, the government of Sri Lanka has implemented the nation wide economic reform in 10 years plan, such as, the institutional and organizational reform for encouraging private investments, the social-economic infrastructure development, the construction of Industrial Parks, the standardization, the human resource development in the management and production area. In addition to this reform, the foreign investment has contributed in the diversification of the Sri Lanka's industrial structure. The metallic industry, the electric, electronics, telecommunication industries as well as the software development industry have been strongly introduced, although their share in the whole industrial activity in Sri Lanka still remains low level.

In the new 10 years development plan "Vision 2010", Sri Lanka faces to the challenges for a significant economic transformation, which shall sustain 7 to 8 percent growth and an increase of a per capita income upto US\$2,500 that will be achieved through the urbanization, modernization of the financial system and logistics services, promotion of public investment, strengthening of the private sector, and the invigoration of rural area. Now, the improvement of socio-economic infrastructure, such as the power supply and communication network, is firstly needed for above objective. As matter of fact, however, the industrial structure of Sri Lanka mainly consists of traditional one, such as textile, food and beverages, the electronics, information, and telecommunication industries are still in the process of development. Thus, these industries have not produced the required engineers who shall be in charge of the policy making as well as designing, construction, operation and maintenance work, for expansion of nation wide infrastructure development and modernization of services. In this situation, the government of Sri Lanka recognizes that the human resource development in engineering is one of the most prioritised tasks, which shall generate these most promising industries to be developed as key industry in near future.

Meanwhile, the higher educational institution in engineering that bears to bring up skilled human resources for Sri Lanka's society, both in the governmental side and in the industries, faces to a handicap of its own stagnated educational environment. Its inflexible curriculum and syllabus, as well as limited laboratory equipment in quantity and in quality do not provide a sufficient educational opportunity to the young engineers candidates. Although, the electronics and telecommunication engineering among others become a essential technologies for every student in the Faculty of Engineering no matter which the sector and specialization chosen, the necessary basic experiments are not included enough in their syllabus. Besides, only 2% of population in same age could be admitted to the universities, due to limited capacity of University side. Thus, the current situation is that the higher education is not able to respond to the increasing demande of the industries for the graduates in the engineering.

Responding to this condition, the goverment of Sri Lanka, represented by the Ministry of Education and Higher Education, has made significant efforts towards an innovative and responsive education system. Since the "Higher Education Policy" in 1997, it has been emphasized on ① Expansion of opportunity in Higher Education ② Quality improvement of Higher education, especially in Science & Technological education.

The Faculty of Engineering of Moratuwa University, one of two largest universities in engineering education, decided to expand its enrollment capacity from 450 to 550, and to carry out the curriculum reform. The flexible curriculum reform allows all the students of faculty to select the some of lectures as well as experiments from the ones provided from the Department of Electronics and Telecommunication. Besides, the number of subjects in experiments have been much increased, in same time. However, the existing equipment in their laboratories does not correspond to the increase of the experiments, which is actually less than 5% of required quantity.

Targeting the "Higher Education Policy" in 1997, the objective of this project is to improve such situation in the University of Moratuwa, and to sustain its capacity of effective engineers education, in order to respond to the industrial needs. It consists of providing the experimental equipment to each laboratory of the Department of Electronics and Telecommunication. It enable to execute the necessary experiments under new curriculum, besides wide educational environment can be expected for all students of the Faculty of Engineering by mean of a flexible selection of the tutrial and practical course. Thus, it shall be considered as one of the most prioritised project in line



with the concept of human resource development for the future development of the country.

From the above mentioned circumstance, the Japanese government settled to carry out the basic design study on this project, and dispatched the relevant study mission by Japanese International Cooperation Agency (JICA) from September 17<sup>th</sup> to October 9<sup>th</sup> in 2001. During this basic design study, the field study has been focused mainly on the background and contents of the request, as well as, the current situation regarding the activities of the implementing organization, the higher education reform policy, the existing facilities and equipment, the operation performance of the supplied equipment under Japanese Grant Aid of the year 1987, the maintenance organization and its technical level, the current status of the industries and their needs, and the natural condition, electricity, telecommunication, relevant infrastructure and facilities condition.

After the field survey, further study has been carried out in Japan, for the analysis on the collected documents and information, and for the confirmation of the necessity and appropriateness of the project, including the acute selection of the equipment, in compliance with the experiment objective and frequency in use of the equipment, and the laboratory planning per year. This result was resumed in the draft final report of the basic design study. In order to give explanation of that report, the explanatory mission of was dispatched from December 17<sup>th</sup> to 24<sup>th</sup> in 2001 by JICA.

As for the equipment selection for the project, the planing has been carried out according to the basic policy as below, in order to take the national development plan of the recipient country, the function of the responsible and implementing agency, the current situation of the existing facility, of existing equipment, as well as technical level into consideration.

- The equipment that meets to the curriculum, and frequently used in the experiments is to be prioritized.
- The equipment plan will be based on the laboratory operation method, where different experiments are carried out in same time, so as to minimize the number of equipment of same kind.
- The appropriate quantity of equipment shall be planned that correspond to the outlook of the targeted students for each subjects.
- The wide use equipment being frequently requested from the laboratories will be supplied with a minimum quantitiy for common basis use.

- The equipment that is proven to have a short utility-life due to the rapid pace of technical progress will be minimized, while maintaining full benefit.
- The grade of equipment will be carefully selected, in order to facilitate the operation and maintenance of the users.
- The selected equipment shall not require a high cost for repair, robust for long-term use, easy for procurement of the spare parts and consumables, and must be suitable for local maintenance.

The outline of the planned equipment, from the result of examination based on the requested equipment list from the relevant country, and the consistency with the new curriculum, with targeted number of students, the existing equipment, the supplied equipment from other donors, or equipment to be procured by University itself by own financial resources, is shown below :

Name of Laboratory		Main equipment
1)	Publication	Personal Computer, Scanner, Digital printer etc 6 items
2)	Network	Central Switch, Server switch, Wireless access points etc 7 items
3)	Computer systems laboratory	Server, Unix base workstation etc 26 items
4)	Digital Electronics laboratory	Oscilloscope, Digital Electronics Trainer kit, and other common experiment equipments 31 items
5)	Analog Electronics laboratory	Digital storage oscilloscope etc common equipment 19 items
6)	Telecommunication laboratory	Pattern generator, DSP Trainer, Antenna design software etc 41 items
7)	Microwave laboratory	SWR meter, Microwave circuit design software etc 28 items
8)	Optoelectronics laboratory	Opto spectrum analyzer, computer etc common equipment 20 items
9)	Post graduate laboratory	High frequency spectrum analyser, field strength meter, RF generator etc 62 items
10)	Electronics Workshop	Oscilloscope, Electronics engineering tool etc, workshop common experiment 32 items
11)	CAD laboratory	Personal Computer, MATLAB, PCB design software etc 13 items
12)	General equipment	Power generator 1 item

The expected implementation period, based on the Grant Aid procedure, is 4.0 months upto the tender and construction contract, and 6.5 months for the equipment procurement and manufacturing.

Direct effect :

The expected beneficiaries are 2,200 students (550 students per year), and 40 post-graduate students.

- The practical course will be widened in its number of experiments in compliance with new curriculum in the department of Electronics and Telecommunication Engineering (from 11 to 98 subjects). Besides, the educational environment will be arranged, and the experiment time per student will be increased.
- Precisely, the experiment time per student for the department of Electronics and Telecommunication that used to be 33 hours for 4 years will be increased to 294 hours, its for the department of Electoric Engineering and of Computer Science that used to be 0 hour for 4 years will be 126 hours, and for the other department of the Faculty that used to be 0 hour will be 15 to 60 hours in same manner, according to the department.
- The number of graduates experienced in practicals in the electronics, information, and communication technology, in line with the industrial requirement, which used to be 50 will be increased to 550 after execution of the project.

Indirect effect :

The engineers will be secured as government officials, who are to be in charge of the central and regional policy making in the electronics, information, and communication technologies. Besides, following indirect effects are expected in the industrial sector in Sri Lanka :

Telecommunication industry :

The increase of personals, in charge of Technology development, Operation and Maintenance, will expand the telecommunication infrastructure (Telephone, Internet, Mobilephone network), and improve their performance.

Software development :

The increase of the engineers in charge of the software base system development will

contribute in the Information and communication technology development of governmental organization, Financial network development, long distance education, medical information system as well as long distance medicine etc.

#### Manufacturing :

The present situation of manufacturing sector is based on the sub-contracted manufacturing activities, however, the employment of the engineering faculty studying the electronics, information and telecommunication technology will bring a new technology that much facilitate the products innovation, to make cost down, to improve their quality control capacity, as well as to develop marketing and sales system.

On top of that, the implementation capacity of Sri Lanka counter part is, first of all, reliable in terms of the management personals as well as financial status. Such higher education improvement project related to the human resource development, shall be considered as urgent task of the governemnt, in view of the urbanization and basic infrastructure development, private sector service development through information and communication technology, the invigoration of rural area, economic development driven by private sector, as well as the long term investment for export oriented industrial promotion. Thus, the appropriateness of the project is quite high.

In other hands, the tasks shared by the relevant country below shall be also followed for the smooth implementation of the project.

- Proceed the new building construction, wiring work, telephone, as well as the connection to the LAN network, as scheduled
- Review the curriculum in regular basis, according to the current industrial needs.
- Secure of necessary personels and budget for the management of the practical courses, as well as operation and maintenance of the equipment.

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# **Chapter 1**

## **Chapter 1 Background of the Project**

### **1-1 Background of the Project**

As of the present, Sri Lanka requires human resources capable of applying sophisticated scientific knowledge as well as specialized technologies to real-life economic activities in the course of promoting a solid industrial base and robust socio-economic infrastructure development. Particularly, in line with national government efforts, considerable expectations have been directed at the development of the electronics, information and communication industries. However, sufficient talented people have not been domestically trained to achieve this objective. Furthermore, universities that provide higher engineering education are not able to offer ample opportunities for the practical and empirical training required of “hands-on” engineers currently in high demand within the industrial sector. This is the combined result of an ever more rigid curriculum and syllabus framework as well as a quantitative and qualitative lack of laboratory and experimental equipment. Especially with regard to the electronics and communication engineering fields, a broad range of basic technological training and ground laying for response to cutting edge technologies are urgently required.

In order to address the above described issues, the University of Moratuwa (one of the two largest universities for science and engineering related studies in Sri Lanka) is overhauling its curriculum. Specifically, the university’s Department of Electronics and Telecommunication Engineering has expanded its course offerings incorporating experimental themes from 11 to 98 focusing mainly on electronics, information and communication technologies. Nevertheless, the university’s current inventory of equipment to enable students to effectively pursue the subject experimental themes is only 5% of the quantity actually required.

### **1-2 Outline of the Request**

Against the above background, improvement in educational equipment in the following 3 categories has been requested.

- Improvement of the educational equipment for 8 laboratories within the Department of Electronics and Telecommunication.
- Improvement of the educational equipment for multimedia technologies within the Department of Electronics and Telecommunication, the Department of Electrical Engineering and the Department of Computer Science (Information and Communication Technology Group, hereinafter, called "ICT Group").
- Supply of spare parts for the maintenance and repair of the educational



equipment provided to the University of Moratuwa in the context of Grant Aid 1987.

The content of the requested equipment list is set out below.

(1) University of Moratuwa, Faculty of Engineering, Department of Electronics and Telecommunication Engineering

This consists of the experimental equipment for the 8 laboratories, as well as related equipment (for: textbook preparation, experiment report publishing, presentations, internal network, workshop, general equipment), based on the reformed curriculum. The main equipment is as described in Table 1-1.

Table 1-1 Equipment for the Department of Electronics and Telecommunication Engineering

<b>Laboratory Type</b>	<b>Equipment</b>
1) Office	Personal computer, laser printer, photocopier, etc. : 5 items
2) Publication Unit	Personal computer, scanner, laser printer, heavy duty printer etc. : 11 items
3) Audio-Visual Unit	Personal computer, VCR/VCD system, SLR camera, digital video camera, image processing and editing software, etc.: 12 items
4) Network Equipment	Central switch, server switch, wireless access point, etc. : 5 items
5) Computer System Laboratory	Server, computers, laser printer, plotter, software, computer table, etc.: 23 items
6) Digital Electronics Laboratory	Basic equipment (oscilloscope, etc.), regular laboratory use equipment (digital electronic trainer kit, etc.), special purpose equipment (electronic tool kit, etc.), common laboratory equipment (personal computer, etc.), etc. : 31 items
7) Analogue Electronics Laboratory	Basic equipment (dual power supply, etc.), special purpose equipment (digital storage oscilloscope, etc.), common laboratory equipment (personal computer, etc.), etc. : 22 items
8) Telecommunication Laboratory	Basic equipment (oscilloscope, etc.), regular laboratory equipment (pattern generator, etc.), special purpose equipment (GPS regular system), software (digital signal software etc.), common laboratory equipment (personal computer, etc.), etc. : 63 items
9) Microwave Laboratory	Regular laboratory equipment (SWR meter, etc.), software (antenna design software etc.), common laboratory equipment (personal computer, etc.), etc.: 33 items

10) Optoelectronics Laboratory	Basic equipment (oscilloscope, etc.), regular laboratory equipment (fiber optic educator kit, etc.), common laboratory equipment (personal computer, etc.), etc. : 92 items
11) Post Graduate Research Laboratory	Basic equipment (oscilloscope, etc.), laboratory equipment (RF generator, etc.), software (MATLAB, etc.), common laboratory equipment (personal computer, etc.), etc. : 92 items
12) Electronic Workshop	Basic equipment (oscilloscope, etc.), workshop equipment (electronics engineers tool kit, high-voltage probe, solder bath, etc., common laboratory equipment (personal computer, etc.), etc. : 45 items
13) Electronics CAD Laboratory	Hardware devices (plotter, computer, etc.), software (MATLAB, PCB design software, etc.), common laboratory equipment (personal computer table, etc.), etc. : 21 items
14) General Services	PABX, diesel power generator : 2 items

(2) University of Moratuwa, Faculty of Engineering

Experimental equipment for multimedia technology

Requested equipment is targeted primarily for the ICT Group (the Department of Electronics and Telecommunication Engineering, the Department of Electrical Engineering and the Department of Computer Science) in line with curriculum reform for practical multimedia technology courses. Specific technologies center on computer practical training, internet technology, video - audio editing, and desktop publishing. The main equipment is as set out in Table 1-2.

Table 1-2 Equipment for the Multimedia Facilities at the Faculty of Engineering

1) Image Processing and Training Laboratory	Personal computer, main control unit for teacher, booth box for students, main control system for student, scan converter, Monitor television, etc.: 23 items
2) Internet Production Training Laboratory	Personal computer system, scanner, CD player, monitor television, UPS, software (author ware, etc.), etc.: 15 items
3) 2D Graphic, Animation Laboratory	Personal computer, color display, color printer, UPS, 2D graphic and animation software for graphic use, table for personal computer : 6 items
4) Non-Linear Digital Video Editing Training Laboratory	Non-linear editing processor unit, digital video recorder, color display, video monitor, audio mixer, audio monitor, CD player, MD player : 10 items
5) Audio/Video Protection Laboratory	2/3 player inch 3CCD color video camera, video monitor TV for control room, studio lighting system, etc.: 31 items

6) Publishing Equipment Laboratory	Personal computer, display, color printer, scanner, ZIP drive, UPS, etc.: 10 items
7) Web outgoing Laboratory	Fire wall, Net server, Internet kit, etc.: 7 items
8) Network Equipment	Ethernet switch/hub and accessories, Ether network cable and accessory: 2 items

(3) University of Moratuwa, Faculty of Engineering

Spare parts for the supplied equipment for ICT Group, under Grant Aid 1987

This comprises spare parts for maintenance and repair of the equipment to be supplied to the ICT group among the departments under the Grant Aid of 1987. The main equipment is as described in Table 1-3.

Table 1-3 Spare parts for equipment within the ICT Group,  
as supplied under Grant Aid 1987

Spare Parts for equipment provided under the Grant Aid Program of 1987	Spare parts for pocket tachometer, oscilloscope, digital storage oscilloscope, etc.: 35 items
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## **Chapter 2**

## **Chapter 2 Contents of the Project**

### **2-1 Basic Concept of the Project**

#### **(1) Overall objective and Project perspective**

The Sri Lankan government has determined that the strengthening of science and engineering education is one of the priorities of the “National Policy on Higher Education”. Furthermore, the national policy “Vision 2010” establishes a foundation where the economic growth based on accumulation of capability (technical development, especially human resource development in the electronics, information, and communication technology fields) is one of the essential features of the policy. Under these circumstances, aiming to advance the above mentioned fields in the University of Moratuwa, the Project intends to strengthen the essential equipment required for the Department of Electronics and Telecommunication Engineering, Faculty of Engineering at the University of Moratuwa, the central Sri Lankan educational institution for science and engineering related studies.

#### **(2) Outline of the Project**

In order to achieve the above objectives, this Project is aimed at providing the necessary equipment suitable to the new curriculum that was introduced in 2000 in the University of Moratuwa. The equipment will be placed within the new building for the Department of Electronics and Telecommunication Engineering to be constructed by Sri Lanka using counterpart fund from the Grant Aid for Increased Food Production. Laboratory equipment will be provided to expand practical experiment opportunities for 100 students per academic year for the Department of Electronics and Telecommunication Engineering (total of 400 students over a four year period), plus 50 students each academic year for the Department of Electrical Engineering and the Department of Computer Science (total of 400 students over a four year period) thus giving enhanced empirical study availability to a total of 800 students over a four year period within the ICT group. In this way, a skilled pool of personnel with electronic, data processing and telecommunications related knowledge reinforced by hands-on laboratory and empirical experience will be created.

This student body is expected to fill the shortage of electronics, information and communication technology-related engineers in Sri Lanka, and thereby contribute to the development of ICT related industries within the country.

Furthermore, the Project is expected to increase knowledge of electronics,

information and communication technologies amongst the non-ICT major students within the Faculty of Engineering (four year course with 550 students per academic year, total 2,200 students for 4 years).

Within this framework, this Grant Aid program is aimed at strengthening the research and laboratory facilities of the Department of Electronics and Telecommunication Engineering, Faculty of Engineering at the University of Moratuwa.

## **2-2 Basic Design of the Requested Japanese Assistance**

### **2-2-1 Design Policy**

#### **(1) Basic concept**

##### **1) Project Area**

The selection criteria for choosing equipment, under mutual agreement with the government of Sri Lanka, including amendments, is listed below.

##### **Criteria for High Priority**

- A. In compliance with the curriculum, and frequency of equipment use for experiments
- B. University financial resources are inadequate for procurement
- C. The curriculum requires greater quantity or additional equipment installation
- D. Obsolete equipment requiring renewal
- E. Required for maintenance

##### **Non-Priority Equipment**

- A. Used only for specific areas of research by a limited number of faculty and students, and for which direct beneficiaries are limited
- B. For offices and editor or audiovisual rooms that are not directly involved in research
- C. Office equipment such as desks, chairs, racks or storage cases

##### **Equipment not of Significant Need**

- A. Large-scale facilities or equipment that requires expansion or rehabilitation
- B. Newly developed software that is not widely used
- C. Equipment expected to be supplied by other aid agencies
- D. Office equipment such as writing boards

##### **Particular Points of Concern**

- A. Common equipment such as personal computers, which are requested by a number of laboratories, will be carefully scrutinized focusing on

- integration and frequency of use. This type of equipment will be supplied
- B. with a minimum number of units while still aiming at achieving maximum efficiency.
  - C. The quantity of equipment is to comply with the predicted number of students.
  - D. Equipment that is proven to have a short utility-life due to the rapid pace of technical progress (such as personal computers and software) will be supplied with a minimum number of units, while still maintaining full benefit.
  - E. Equipment must be suitable for local maintenance, thus the selection shall be carefully carried out to avoid unnecessarily sophisticated devices, while the performance of the equipment will enable the technical education program to meet the requirements of the applicable industries.
  - F. The equipment will be selected for easy maintenance, robust for long-term use, and repair should be carried out locally.

In light of the above priority concerns, selection precedence will follow the guideline provided below.

Priority Ranking of Equipment to be Procured Under the Project
--

Equipment for digital, analogue electronics, and telecommunication laboratories will be given the highest priority. These laboratories engage in basic technologies for the entire ICT group and are the central laboratories under the “Principles of Electronics Engineering” course, which is obligatory to all engineering students.

Equipment for the computer laboratory will be given second preference, as this is crucial for a broad range of simulated experiments albeit quantity and variety may be limited.

Power generator and network equipment are also prioritized, as this is essential to many experiments required at the laboratories of the Department of Electronics and Telecommunication Engineering. Because the university is responsible for installation, only the equipment itself is to be supplied under the Project. The main server, mail server and file server are to support the Linux platform, providing maximum cost performance. Network architecture for the equipment will be finalized after examining the actual usage of the new and old lecture rooms and laboratories.

Workshop at the Department of Electronics and Telecommunication Engineering will be given priority. Currently there are two maintenance crews within the department. The technical skills of these crews are high, therefore, local maintenance administration will suffice. The equipment requested by this department is also appropriate for its role under the Project. Microwave and Optoelectronics are important areas for the data communication infrastructure and the information technology sectors, which are gaining momentum in Sri Lanka. The equipment requested under the Project is appropriate for the basic training of IT engineers, which are to be engaged in these sectors. However, the intended use of the equipment must be clarified and will be selected carefully.

Postgraduate laboratories are important in training senior executives and instructors in Sri Lanka. Nevertheless, the equipment must be carefully chosen focusing mainly on commonly used devices, as experiment themes are often broad-ranged and the usage frequency may tend to be low.

Within the national task-sharing scheme together with the other two universities of Colombo and Peradenia, the University of Moratuwa has been chosen to play a central role in CAD research. Accordingly, CAD related equipment is to be strengthened at the University of Moratuwa. However, only the equipment suitable to the objectives of the specific laboratories concerned will be selected, since there are only a limited number of curriculum themes.

Although additional equipment for the printing room is not categorized as experimental apparatus, equipment should be procured to produce textbooks and print-handouts, as this type of material is necessary for the work conducted at the laboratories and for other related research.

Equipment Not to be Procured Under the Project
--

The following equipment will not be included under the Project.

Office equipment for the Department of Electronics and Telecommunication Engineering: This type of office equipment does not directly contribute to laboratory investigation and research and is thus excluded from the scope of the Project.

Audiovisual related equipment for the Department of Electronics and Telecommunication Engineering: This type of equipment does not directly contribute to laboratory investigation and research. A significant part of the



Department's request is for OHP devices for use in auditorium presentations, which can be effectively procured under the university's budget.

Telephone exchanger under general use equipment: Although the Department of Electronics and Telecommunication Engineering may use this for Internet connection from laboratories, this equipment is mainly for general telephone use and therefore outside the scope of the Project.

Multimedia laboratory equipment :

The below mentioned equipment is considered unnecessary, due to overlap with other laboratory equipment, or due to the fact that it would not be subject to frequent use.

- Image processing and training laboratory equipment.
- Non-linear digital video editing training laboratory equipment.
- Audio/Video production laboratory equipment.
- Publishing equipment laboratory
- Network equipment (for multimedia laboratories).

Although useful for e-commerce development as well as application to remote education technology using a two-way communication based internet network, the below mentioned equipment will not be included under the Project since the groundwork preparation at the university side, such as the recruitment of tutors, etc., still remains to be sufficiently achieved.

- Internet production technology laboratory equipment.
- 2D graphics and animation laboratory equipment.
- Web outgoing laboratory equipment.

Spare parts for equipment originally procured under the Grant Aid Program of 1987 :

Some of the equipment from the Grant Aid Program of 1987 can be recycled with the supply of spare parts, and is still effective for laboratory use and research. However, manufacture of a significant portion of such equipment has been terminated. Moreover, spare parts for the applicable equipment have only a 10% availability as of the time of this investigation. Similarly, there is no guarantee that such stocks will be available at the time of tender. Hence, spare parts for these types of equipment are not included under the Project.

## 2) Scale

### A. Number of Students

The number of students to enroll in the Department of Electronics and

Telecommunication Engineering, Faculty of Engineering at the University of Moratuwa, must be determined based on the student/laboratory space ratio, and the equipment is to be selected in the same manner. The targeted numbers of student are described below.

Principally 20 tables (4 persons per table) for laboratories and experiments will be supplied, according to the past experience and space criteria at the Department of Electronics and Telecommunication Engineering, Faculty of Engineering. The maximum number of students for 1 laboratory session is fixed at 80 students. Empirical and practical study items under the Department of Electronics and Telecommunication Engineering, number of experimental themes, and number of targeted students are shown in Table 2-1.

Department of Electronics and Telecommunication Engineering, Faculty of Engineering enrolls 100 students per grade level. As for the other components of the ICT Group, i.e. the Department of Computer Science and the Department of Electrical Engineering, these enrol 50 students each per grade level. Overall, the entire Faculty of Engineering enrolls 550 students per grade level on average.


The Project has assumed 4 grades for the undergraduate level.

Essentially, the 6 batch system (currently being undertaken as an emergency measure) will not be taken into consideration under the Project.

Postgraduate students at the Department of Electronics and Telecommunication Engineering, Faculty of Engineering number 40 in total.

Semester	Subject with practical course	Subject code	Laboratory	Numbers of experiments		Targeted number of students										Total numbers of targeted students	Remark
				in old curriculum	in new curriculum	ICT Group			Faculty of Eng. I		Faculty of Engineering II						
						Elect & Telecom Eng.)	Electrical Eng. (50)	Computer Systems (50)	Civil Eng. (100)	Mechanical Eng. (60)	Chemical Eng. (50)	Textile Eng. (50)	Material Eng. (50)	Earth resource Eng. (40)			
1, 2	Introduction to Electronics Engineering	EN101	Digital Electronics		2	100	50	50	100	60	50	50	50	40	550		
		EN101	Analog Electronics		3	100	50	50	100	60	50	50	50	40	550		
3, 4	Principles of Electronics	EN201	Digital Electronics		6	100	50	50	10	20	10	10			250		
		EN201	Analog Electronics		3	100	50	50	10	20	10	10			250		
	Computer Organizations	EN202	Computer Systems	1	2	100									100		
	Introduction to Communication Systems	EN203	Telecommunication		5	100									100		
	Signals and Systems	EN204	Computer Systems	1	1	100	15	30							145		
		EN204	Telecommunication		2	100	15	30							145		
	Applied Electronics	EN205	Digital Electronics		(1)	100									100	* 2	
5, 6	Electronics Engineering	EN301	Digital Electronics		3	100	30	30							160		
		EN301	Analog Electronics		5	100									100		
	Control Theory	ME301	Dept. of Mechanical Engineering	1	(1)	100	50	50							200	* 1	
	Communications	EN302	Telecommunication	1	5	100	30	30	10	20	10	10			210		
	Electronic Measurement and Instrumentation	EN303	Computer Systems		1	100	30	30	30	30	25	25			270		
	Advanced Analog Electronics	EN304	Telecommunication		4	100	30	15							145	* 2	
		EN304	Analog Electronics		3	100	30	15							145		
	Digital System Design	EN305	Computer Systems		1	100	15	15							130		
	Physical Electronics	EN306	Digital Electronics		(1)	100									100	* 2	
		EN306	Analog Electronics		(1)	100									100	* 2	
	Optoelectronics	EN307	Opto-electronics		5	50									50		
	Communication Theory	EN308	Telecommunication		4	100									100		
	Antennas and Propagation	EN309	Computer Systems	5	5	100	30	15							145		
		EN309	Microwave		5	100									100		
	Electromagnetics	EN310	Computer Systems	1											0		
		EN310	Microwave		4	100									100		
	Information Theory and Coding	EN311	Computer Systems		1	100	30	15							145		
	Digital Signal Processing	EN312	Telecommunication		4	100									100		
7, 8	Broadcast Technologies	EN401	Telecommunication		3	50									50		
	Computer Aided Circuit Design	EN402	CAD		1	50	30	15							95		
	Image Processing	EN403	Telecommunication	1											0	* 3	
	Internet Technology	MT401	Multimedia		(7)	100	50	50							200	* 4	
	Industrial and Biomedical Electronics	EN404	Digital Electronics		2	50									50		
	Robotics	EN406	Dept. of Mechanical Engineering		1	50	30	15							95	* 1	
	Optical Communication	EN407	Opto-electronics		(2)	100									100	* 2	
	Microelectronics	EN408	Digital Electronics		2	100									100		
	Microwave Communication	EN409	Microwave		9	100									100		
	Telecomm. Transmission and Switching	EN410	Telecommunication		3	100									100		
	Wireless Communications	EN411	Telecommunication		3	50									50		

Number of experiment themes, targeted numbers of students

Remarks :  : Core subject for Dept. Elect.& Telecom

\* 1 : Practical course takes place at the Laboratories of the Department of Mechanical Engineering

\* 2 : Experiment is carried out during the tutorial course

\* 3 : MT401 replaces EN403 in old curriculum

\* 4 : under examination

Table2-1 Practical courses offered by the Department of Electronics & Telecommunication Engineering,  
Number of experiment themes, targeted numbers of students

## B. Equipment Quantity

In Sri Lanka, universities provide practical courses where related experiments are simultaneously carried out by all targeted students (referred to as the "all-in-once" experiment method). An advantage of this approach is that experiments can be provided to all students in line with the progress of lecture work up to that time. A drawback, however, is the fact that a large number of the same types of equipment are required.

Judging from the requested quantities, expensive equipment items have been quantitatively minimized by the Sri Lankan side within its request under this project. In this case, although the quantity and corresponding equipment expense is kept down, the reverse side of the coin is that the number of students who can individually participate in a particular experiment is likewise limited (number of experiment groups will be proportional to the amount of available equipment). In short, a large number of students will have to simultaneously share the experiment equipment.

To address this, equipment design is to be based on an alternative experiment execution method (referred to as the "round-robin" experiment method) whereby groups perform differing experiments within the same scheduling slot thereby enabling maximally efficient use of any equipment that needs to be shared. This method would be applied to each subject making use of the digital electronics, analog electronics, telecommunication, optoelectronics, and microwave laboratories. If the foregoing method is adopted, there may be some instances where some experiment groups may be carrying out their empirical work before having formally studied the related content in the corresponding lecture course. However, this will not cause a problem in terms of specific experiment execution given the fact that student experiment manuals will be well prepared.

With regard to the computer system laboratory and CAD laboratory, equipment planning will be based on the all-in-once method of experiment execution.

For post-graduate studies, the equipment planning is to be determined according to the research planning documentation indicated in the Annex -6-2 Post-graduate Laboratory Research Themes (1997~2000) of the Department of Electronics and Telecommunication Engineering". With regard to the quantities for workshop equipment, these have been determined by investigating the skill of the local engineers (2 persons) and the frequency of equipment use by these engineers.

## C. Method of determining equipment quantities under the Round-robin

### Approach

The methodology for determining the quantity of necessary equipment for each laboratory for undergraduate courses in the case of adopting the round-robin method of experiment execution is as set out below:

Example : “Principles of Electronic Engineering, Level 2”

Method of identifying the number of experiment teams, number of groups, and the experiment term under each practical course

a. Experiment themes are checked according to the “Laboratory Sheet” to attached to each practical subject.

In this case, 3 experiment units are included under the “Principles of Electronic Engineering” as shown in Figure 2-1 and confirmed from the new curriculum table indicated in Annex 6-1 "New Curriculum and Grade-wise Schedule of ICT Group, Faculty of Engineering, University of Moratuwa".

Level	Offered by	Priority		General		Semester	Course Code	Course	Hour/wk				Remarks
		Special-ization	Select	Students	Select				Lect.	Tutori-als	Practi-cals	Credits	
	EN&T				C	SS+SJ	EN201	Principles of Electronics	4		3	5	
					E		EN203	Introduction to Communication Systems	2	1.5		2.5	
							EN202	Computer Organizations	2	1.5		2.5	
							EN204	Signals and Systems	2	1.5		2.5	
					C		EN205	Applied Electronics	2	1.5		2.5	

Core subject to be chosen, apart from the Dept. of Earth Resources, Material Engineering

Common course for all students in Faculty of Engineering

Experiment is offered by Dept of Electronics and Telecommunication

Figure 2-1 Identification of practical training courses

b. Experiment themes related to each subject are checked

- Experiments themes for “Principles of Electronics Engineering” are checked. From the Figure 2-2, it is understood that the experiment themes comprise 6 themes in the Digital electronics laboratory, and 3 themes in the Analog electronics laboratory, which make 9 themes in total.
- The laboratory to be used is checked

It is understood that the laboratories used for this subject are the Digital electronics laboratory and the Analog electronics laboratory.

- The targeted students are checked

It is understood that the number of targeted students is 250 for the subject "Principle of the Electronics Engineering", which includes the students group below :

Dept. of Elect.&Telecom.	: 100
Dept. of Computer Science	: 50
Dept. of Electrical Eng.	: 50
<u>Other students in Facul. of Eng.</u>	<u>: 50</u>
<b>Total</b>	<b>250</b>

\*These numbers of students have been confirmed by the University of Moratuwa

Ne w	Subject	Experiment themes	Lab	Target No.stud ent	person per team	team	group	Sem ester	Time slots	Lab capa.
N	EN201	Principle of Electronics	ENE (Digital Elect.)	250	4	3	12	2	1	288
		EN201-1 Introduction to computer		250	4	3	12	2	1	288
		EN201-2 Combinational logic circuits		250	4	3	12	2	1	288
		EN201-3 Sequential Logic Circuits		250	4	3	12	2	1	288
		EN201-4 Logic families		250	4	3	12	2	1	288
		EN201-5 Introduction to PLD		250	4	3	12	2	1	288
		EN201-6 Synchronous and asynchronous		250	4	3	12	2	1	288
		EN201-7 Transistor Characteristics	(Analogue Elect.)	250	4	3	12	2	1	288
		EN201-8 Clipping & Clamping Circuits		250	4	3	12	2	1	288
		EN201-9 Introduction to Operational		250	4	3	12	2	1	288

Figure 2-2 Identifying experiment themes, relevant laboratories and targeted students

- c. Factors determining experiment term, number of experiment teams and number of groups are clarified

- Basic fixed values in this regard are as follows:

Number of experiment table for each laboratory :  
The number of experiment table for Digital and Analog Electronics Laboratories are 20.

Numbers of students using experiment table :  
4 students for 1 experiment table

Numbers of weeks for 1 semester : 14 weeks

Numbers of semesters per year :  
2 semesters, with semester1 and semester2

- The round robin method basically carries out all experiment themes for 1 subject at once. In this example, 9 experiment themes are carried out simultaneously. As shown in Figure 2-3, the experiment program within the Digital Electronics laboratory in effect determines the number of experiment teams for both the Digital and Analog electronics laboratories, since the number of experiments (6 themes) carried out under the Digital

Electronics laboratory curriculum is more than that (3 themes) for the analog electronics laboratory.

- There are 20 tables for the digital electronics laboratory, meaning that the maximum number of experiment teams, which can simultaneously engage in laboratory work is 3 experiment teams (tables), based on the following calculation:

$$3 \text{ experiment teams} \times 6 \text{ themes} = 18 < 20$$

$$4 \text{ experiment teams} \times 6 \text{ themes} = 24 > 20$$

- If the experiments of Principle of the Electronic Engineering are carried out in Round Robin method, total 9 themes from Digital Electronics and Analog Electronics laboratory are taken place in same time. Besides, the number of teams that proceed the same experiment amounts 3 teams, thus it makes 108 students in total who carry out the experiment same time.

$$9 \text{ (themes)} \times 3 \text{ (teams)} \times 4 \text{ (students per team)} = 108 \text{ students}$$

In total 9 weeks are needed, so that all students accomplish all 9 experiments, in condition that 3 teams who carry out the same experiment are considered one group, and the numbers of group are fixed at 9 groups, same as the number of experiment themes 9.

On the other hand, the total number of expected students is 250 for the experiments related to the Principle of the Electronic Engineering.

Even if the studying period is separated in semester 1 and 2, total 216 students will be able to carry out the related experiments, if the available number of students in 1 semester amounts 108. Thus, 34 students can not accomplish all the experiments.

In consequence, the number shall be increased, in order to increase the number of expected students, based on 14 weeks available for practical course in 1 semester. There will be some weeks where no experiments are taken place, and it will be used for the self-learning of experiments sheet, experiment report making etc.

In the practical course related to Principle of the Electronic Engineering, it shall be needed to fix more than 11 groups (expected number of students in practical course, 264 students).

- As the targeted numbers of students for this practical course is fixed at

250, it is obvious from the above calculation that it is not possible to provide all the experiments for all the students in 1 semester. (This is unless 2 slots of practical course per week can be planned. In such case, it would then be needed to coordinate the laboratory schedule with other subjects). In consequence, 2 semesters are needed, and more than 11 groups are necessary.

- Finally, the possible experiment planning for the "Principles of Electronics Engineering" would be as follows :

Numbers of experiment teams : 3  
 Number of experiment groups : 12  
 Term : 2 semesters (semester 1 and 2)  
 Expected number of students : 288 students

New	Subject	Experiment themes	Lab	Targeted no. of students	Person per team	Team	Group	Semester	Time slots	Lab capa.	
N	EN201	Principles of Electronics	EN201-1 Introduction to computer arithmetic	ENE (Digital Elect.)	250	4	3	12	2	1	288
		EN201-2 Combinational logic circuits	250		4	3	12	2	1	288	
		EN201-3 Sequential Logic Circuits	250		4	3	12	2	1	288	
		EN201-4 Logic families	250		4	3	12	2	1	288	
		EN201-5 Introduction to PLD	250		4	3	12	2	1	288	
		EN201-6 Synchronous and asynchronous	250	4	3	12	2	1	288		
		EN201-7 Transistor characteristics	EN201-8 Clipping & clamping circuits EN201-9 Introduction to operational amplifier	(Analogue Elect.)	250	4	3	12	2	1	288
		250			4	3	12	2	1	288	
		250			4	3	12	2	1	288	

Figure 2-3 Number of experiment teams, number of experiment groups and experiment period

#### d. Proposed annual experiment schedule

- Based on the above study results, the proposed annual experiment schedule for the "Principles of Electronics Engineering" course is as indicated in Figure 2-4.

Level 2		EN201-1,2,3,4,5,6: Digital Elect.					EN201-7,8,9: Analog Elect.									
Sep.	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remark	
Group-1	EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9							
Group-2	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1				
Group-3	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3			
Group-4	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5		
Group-5	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	
Group-6	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	
Group-7	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9	
Group-8	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9		
Group-9	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9			
Group-10				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				
Group-11			EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9					
Group-12		EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9						

Jan.	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remark	
Group-1	EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9							
Group-2	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1				
Group-3	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3			
Group-4	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5		
Group-5	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	
Group-6	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	
Group-7	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9	
Group-8	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9		
Group-9	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9			
Group-10				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				
Group-11			EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9					
Group-12		EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9						

Figure 2-4 Proposed annual experiment schedule for the "Principles of Electronics Engineering" course



Determining the quantities of required equipment

- a. The type and quantities of necessary equipment are checked on an experiment themes basis

Seven kinds of experimental equipment are needed for experimental themes under “Principles of Electronics Engineering” and “Introduction to Computer” as shown below in Figure 2-5:

Ne w	Subject		Practical		Lab	Required Equipments	Lab team	Requir ed	Plan
N	EN201	Principle of Electronics	EN201-1	Introduction to computer arithmetic using ALU	ENE Digital	Logic probe	3	1	3
						PC	3	1	3
						B <sup>2</sup> logic software	3	1	3
						DC power supply	3	1	3
						Proto board	3	1	3
						Basic Lab bench	3	1	3
						Stool	3	4	12

Figure 2-5 Necessary equipment for the experiment Introduction to computer arithmetic using ALU under the subject Principle of Electronics Engineering, and their number

- b. The maximum number of shared equipment by subject is checked

The total numbers of equipment for the 6 themes (among the experimental themes under “Principles of Electronics Engineering”) are confirmed on the basis of Figure 2-6:

Ne w	Subject		Practical		Lab	Target No.stud ent	person per team	team	group	Sem ester	Time slots	Lab capa.	Required Equipments	Lab team	Requir ed	Plan
N	EN201	Principle of Electronics	EN201-1	Introduction to computer arithmetic using ALU	ENE Digital	CC 250	4	3	12	2	1	288	Logic probe	3	1	3
													PC	3	1	3
													B <sup>2</sup> logic software	3	1	3
													DC power supply	3	1	3
													Proto board	3	1	3
													Basic Lab bench	3	1	3
													Stool	3	4	12
N	EN201	Principle of Electronics	EN201-2	Combinational logic circuits	ENE Digital	CE 250	4	3	12	2	1	288	Logic probe	3	1	3
													Oscilloscope	3	1	3
													Oscillator circuit panel	3	1	3
													Multimeter	3	1	3
													Digital IC Tester	3	1	3
													Digital electronics trainer kit	3	1	3
													PC	3	1	3
													B <sup>2</sup> logic software	3	1	3
													Proto board	3	1	3
													Basic Lab bench	3	1	3
													Stool	3	4	12
N	EN201	Principle of Electronics	EN201-3	Sequential Logic Circuits	ENE Digital	CE 250	4	3	12	2	1	288	Storage Oscilloscope	3	1	3
													Logic probe	3	1	3
													Pulse generator	3	1	3
													Rheostat	3	1	3
													DC power supply	3	1	3
													Proto board	3	1	3
													Basic Lab bench	3	1	3
													Stool	3	4	12
													Basic Lab bench	3	1	3
													Stool	3	4	12
N	EN201	Principle of Electronics	EN201-6	Synchronous and asynchronous	ENE Digital	CE 250	4	3	12	2	1	288	Oscilloscope	3	1	3
													Pulse generator	3	1	3
													DC power supply	3	1	3
													Basic Lab bench	3	1	3
													Stool	3	4	12
													Proto board	3	1	3

Figure 2-6 List of equipment used for experiments under “Principles of Electronics Engineering”

As shown in the Figure 2-6, in case of the logic probe, this is required for 3 themes out of 6 themes, with the total number of maximum shared

equipment for these items concluded to be 9 units.

The experiment plan under the round-robin method is indicated in Annex-6-4. Annex 6-5 shows the equipment plan in compliance with the experiments schedule.

#### D. Calculation Categories for Equipment Quantities

The necessary equipment quantities are calculated from the above procedure. There is some equipment that should be used per 2 experimental tables, or that can effectively administered at a quantity of 1 or 2 units per laboratory. In consequence, the equipment selection criteria is determined as shown in Table 2-2 :

Table 2-2 Equipment categories for quantity calculation

<b>Table</b>	Four students use one table for experiments. All four students use the same equipment in this category. Two students share one PC. In the case of graduate students, one or two graduate student(s) can use one table.
<b>Desk<sup>2</sup></b>	A total of two tables will be used for one unit of equipment. Eight students will use one unit. One equipment unit per one laboratory Two equipment units per one laboratory
<b>SpecI</b>	In the case of equipment such as multi-purpose machines and computer software, number of supply is determined by laboratory demand.

On the other hand, the equipment for the Post-graduate laboratory is to be determined from the previous research themes according to the list from 1997 to 2000. The theme list for 1997~2000 is shown in Annex-6-2.

#### E. Quantity Calculation Method

The required equipment quantity is calculated from the above examination, less the number of existing useable/applicable number of equipment units.

#### F. Existing Equipment

The existing equipment for use in each applicable laboratory will be incorporated into the Project upon confirmation of its continued usefulness. The Department of Electronics and Telecommunication Engineering, Faculty of Engineering stores a number of equipment units provided under the UNDP in

1974. The existing equipment recorded in the ledger has been confirmed through interview survey with lecturers and engineers, and are categorized below into 4 use conditions.

- Usable  
Applicable for continued use.
- Possible short-term use  
May be becoming obsolete, but still useful. May include personal computers that are only useful for keyboard entry exercises, due to outdated.
- Repair possible  
Equipment can be used, despite some broken parts such as missing dials, broken plugs, or un-jacketed solders. In case the spare parts are obsolete but the broken parts are rather unimportant, the equipment is listed in this category.
- Cannot be repaired or spare parts are obsolete  
The equipment cannot be used nor can it be repaired due to obsolete spare parts supply.

Under the process of determining equipment quantities, the equipment categorized as “to be repaired”, “cannot be repaired” or “spare parts required” are designated as “obsolete equipment requiring renewal” and are subsequently not included within “existing equipment” quantities. Additionally, amongst “usable” equipment, that which proves difficult to use on a continued, long-term basis due to rapid obsolescence (such as Personal computers), or that for which screen performance degrades (oscilloscope, etc.) are also to be categorized as “obsolete equipment requiring renewal”. Similarly, this equipment will not be included within the Project. Under the Project the precise definition of “obsolete equipment requiring renewal” is given in the Table 2-3.

Table 2-3 Categories for obsolete equipment requiring renewal

<b>“Obsolete equipment requiring renewal”</b>	
1.	Category "Repair possible" equipment.
2.	Category "Can not be repaired or spare parts are obsolete" equipment.
3.	Personal computer with 486 CPU or before and unable to operate with Windows 98 or later version.
4.	Computer peripheral units (modem, scanner, printer) that do not contain Windows 98 or later version driver or have a significant inferior speed or performance.
5.	Equipment with CRT or LCD in use for 10 years or more and repair parts are obsolete. Equipment such as TV or oscilloscope may be qualified in this category.
6.	Equipment used 20 years or more. This equipment should be examined for continuance of use. For example, a manual camera has a service life of 30 years or more. On the other hand, while monochrome video may still have an operable service life, it is not used due to the low graphic performance and the scarcity of the videotape.

#### G. Spare Parts and Consumables

The University of Moratuwa has established a domestic route for the procurement of spare parts and consumables. Furthermore, it would take about 1 year preparation time to investigate and prepare a new route for the procurement of spare parts under this Project. Therefore, it is planned to include spare parts and consumables for 1 year maintenance with each equipment item.

#### **(2) Guideline for Climatic Conditions of Sri Lanka**

Sri Lanka climate condition is hot and wet for a good portion of the year. Accordingly, servers and other important computers must be installed in air-conditioned rooms.

#### **(3) Guideline for Socio-economic and Infrastructure Conditions**

- 1) Demands from the industry for engineers in the electronics and telecommunication fields

Based on the results of the questionnaire and interview survey, equipment planning is to incorporate selection of equipment items such that the basics of advanced technologies can be acquired by students in addition to strengthening the capacity for foundation training in electronics and telecommunications engineering. Equipment selection is also to reflect the current status of equipment on hand at the university as well as the technical level of instructors.

## 2) Access Conditions

The University of Moratuwa is located along a relatively broad road of 2 lanes approximately 1km after turnoff from Galle Road (which in turn is a major thoroughfare from Colombo harbor). Access by even 40ft trailers, planned for equipment transport under the Project, is not hindered. Also, the university owns a spacious campus and temporary parking lots which will facilitate transport logistics.

## 3) Electricity

The local electricity standard is 230 voltage single phase, and 400 voltage three phase, 50Hz. Commercial electricity supply is often hindered by planned or unplanned electricity outages, thus each personal computer must be equipped with a UPS (uninterrupted power supply) unit to protect the computer and its data. Also, an electrical generator should be considered, as electricity outages may be excessively long. Some equipment must be equipped with an AVR (automatic voltage regulator) unit to adjust the voltage fluctuation.

## **(4) Guideline for Operation and Maintenance Capacity of the Executing Agency**

The equipment supplied under the Grant Aid program of 1987 has been well maintained, and much of this equipment is still in operation after more than a decade. This verifies the high management skill of local executing agencies. The equipment supplied under the Project is also expected to be well maintained by the concerned executing agency, if spare parts and consumables are adequately and timely supplied. The Project accordingly includes the necessary spare parts and consumables within the procurement package of equipment.

Also, the survey report on the existing equipment for the Faculty of Engineering, as well as each laboratory attached to the Department of Electronics and Telecommunication Engineering, including the procured equipment under the Grant Aid of the year 1987, are shown in Annex-6-7 and 6-8.

## **(5) Guideline for determining Equipment Grades**

The Project will mainly supply basic electronic equipment due to its inherent focus on electronics and telecommunications engineering. A small number of cutting-edge devices, however, have been requested. The University of Moratuwa comprises a high quality team of professors and instructors, good research programs, and a well managed administration. Local industries also have a strong desire to employ those with an education based on new technologies. Therefore,

in this case the grade of the equipment should be at the same or better level as that used at the typical electronics / telecommunication engineering department of a university.

### 2-2-2 Basic Plan

A flow chart of equipment selection is shown in Figure 2-7.

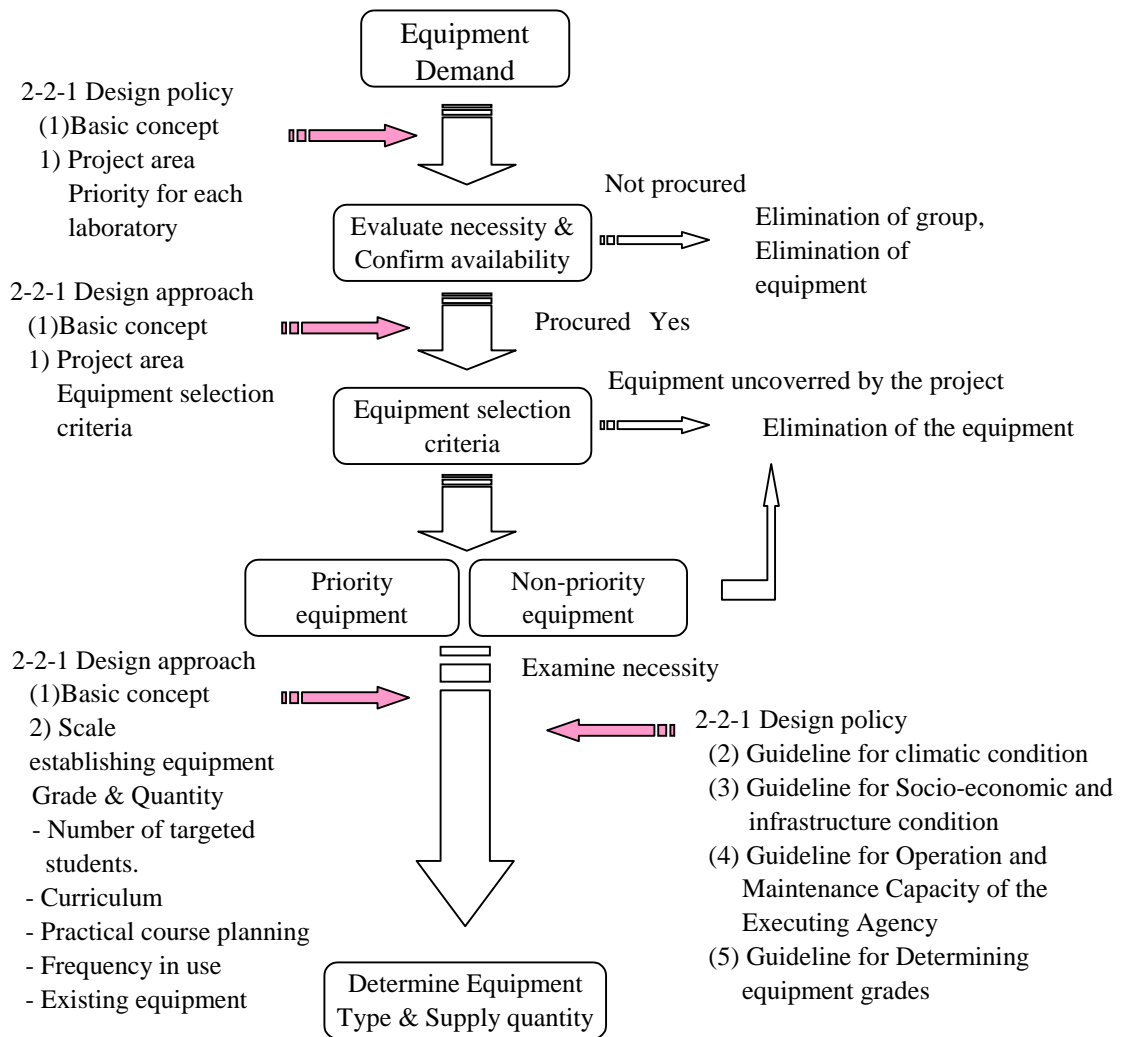


Figure 2-7 Flow Chart for Equipment Planning

#### (1) Equipment calculation table

Amongst the result of examination based on the above flow Figure, the equipment selection criteria, according to the priority of the equipment, required quantity, priority of the university, the equipment calculation principles shown in table 2-2, necessary number of equipment, existing equipment, planned equipment are detailed in the table 2-4.

Furthermore, the experimental equipment in Digital Electronics, Analog Electronics, Telecommunication, Optoelectronics, as well as Microwave Laboratory, have been calculated from the related laboratory sheet, based on the Round Robin method. As for the equipment for Computer Systems as well as for CAD Laboratory, their quantities have been examined according to the laboratory sheet, and based on the All-in-once-method. This calculation was also based on the number of user per equipment. The equipment for Post-graduate Laboratory has been designed, according to the research themes from 1997 to 2000, as well as the necessity of each equipment. The equipment for Workshop is based on the 2 engineers working plan.

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo	
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned		
I . Office																							
OFF01	Personal Computers	for Administration	×							○						2	A	—	0	0	0	Procured by University	
OFF03	Dot Matrix Printer	for Administration	×							○						1	B	—	0	1	0	Procured by University	
OFF04	Laser Printer	for Administration	×							○						1	B	—	0	2	0	Procured by University	
OFF05	Heavy duty photocopier	for Text making	×							○								—	0	0	0	Transfer to Publishing Unit	
OFF06	Photocopier	for Administration	×							○						1	B	—	0	3	0	Procured by University	
OFF07	Paper cutter	for Administration	×							○						1	A	—	0	1	0	Procured by University	

**II . Publication**

<b>Hardware</b>																							
PUB01-1	Personal Computer A	for Text making	●							○							2	A	Spec1	1	0	1	for text making
PUB01-2	UPS	for Text making	●							○							—			1	0	1	for PUB01-1
PUB02	Scanner	for Text making	●							○							1	A	Spec1	1	0	1	for text making
PUB03	Heavy Duty Printer	for Text making	×							○							1	A	—	0	0	0	for text making
PUB04	Laser printer (B&W)	for Text making	●							○							1	B	Spec1	1	0	1	for text making
PUB05	Laser printer (Color)	for Text making	×							○							1	A	—	0	0	0	High maintenance fee
PUB06	Paper cutter	for Text making	×							○							1	B	—	0	0	0	Procured by University
PUB07	Laminator	for Text making	×							○							1	B	—	0	0	0	Procured by University
PUB08	Book binder	for Text making	×							○							1	B	—	0	0	0	Procured by University
PUB09	Heavy duty photocopier	for Text making	●							○							1	A	Spec1	1	0	1	for text making
PUB10	Photocopier	for Text making	×							○							1	A	Spec1	0	0	0	Procured by University
<b>Software</b>																							
PUBS01	Desktop publishing software package	for Text making	×							○							1	B	—	0	0	0	for text making

**III. Audiovisual**

<b>Hardware</b>																							
AVU01	PC	for Auditorium room	×							○							1	A	—	0	0	0	Procured by University
AVU02	Laptop computer	for Auditorium room	×							○							1	A	—	0	0	0	Procured by University
AVU03	High Quality AM-FM Stereo Set	for Auditorium room	×							○							1	A	—	0	0	0	Procured by University
AVU04	VCR/VCD System	for Auditorium room	×							○							1	A	—	0	0	0	Procured by University
AVU05	Multimedia Projector	for Auditorium room	×							○							2	A	—	0	0	0	Procured by University
AVU06	Overhead Projector	for Auditorium room	×							○							8	A	—	0	1	0	Procured by University
AVU07	Projection screens	for Auditorium room	×							○							8	A	—	0	1	0	Procured by University
AVU08	TV Receiver	for Auditorium room	×							○							2	B	—	0	0	0	Procured by University
AVU09	Public Address System	for Auditorium room	×							○							5	A	—	0	0	0	Procured by University
AVU10	SLR Camera	for Documents preparation	×							○							2	A	—	0	0	0	Procured by University
AVU11	Digital Video Camera	for Documents preparation	×							○							2	A	—	0	0	0	Procured by University
<b>Software</b>																							
AVUS01	Video/Image processing and editing	for Documents preparation	×							○							1	A	—	0	0	0	Procured by University

**IV. Network equipment**

NET01	Central Switch	for E/Tel Department Network	●			○											1	A	Spec1	1	0	1	for Network system
NET02	Server switch	for E/Tel Department Network	●			○											1	A	Spec1	1	0	1	for Network system
NET03	CAD switch	for E/Tel Department Network	●			○											1	A	Spec1	1	0	1	for Network system
NET04-1	Switch for each floor A	for E/Tel Department Network	●			○											17	A	Spec1	1	0	1	for Network system
NET04-2	Switch for each floor B	for E/Tel Department Network	●			○												A	Spec1	11	0	11	for Network system
NET05	Wireless access switch	for E/Tel Department Network	●			○											7	A	Spec1	6	0	6	for Network system
NET06	Additional switch	for E/Tel Department Network	●			○											2	A	Spec1	3	0	3	for Network system

**V. Computer system Laboratory**

<b>Hardware</b>																							
CSH01	Main Server	for E/Tel Department Network	●			○											1	A	①	1	0	1	for Network system
CSH02	Mail Server	for E/Tel Department Network	●			○											1	A	①	1	0	1	for Network system



No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	
CSH03	File Server	for E/Tel Department Network	●			○										1	A	①	1	0	1	for Network system
CSH04	Personal Computer A	Practice for students	●	○												60	A	Spec1	30	0	30	1 unit / 2 students
CSH05	Laser Printer	for report printing	●	○												3	A	Spec1	3	0	3	1 unit / 10 computers
CSH06	Dot Matrix Printer	for draft report printing	●	○												12	A	Spec1	6	0	6	1 unit / 5 computers
CSH07	Plotter	for drawings printing	●	○												1	A	①	1	0	1	-
CSH08	UPS	for Main server and computer	●	○												10	A	Spec1	3	0	3	350W x 30unit x 1.2/5KVA = 3unit
CSH09	Protocol Analyzer	for internet protocol	●	○												11	A	②	2	0	2	-
CSH10	GPIO Interface Card	Measuring device	×													28	A	-	0	0	0	Including computer
CSH11	Zip drive	for data storage	●	○												2	A	②	2	0	2	-
CSH12	Unix-based workstations	for Unix practice	●	○												4	A	①	1	0	1	-
CSH13	Computer network experimental set-up	for Network practice	●	○												1	A	①	1	0	1	-
CSH14	Removable CD writer	for data storage	×													2	A	—	0	0	0	Including computer
<b>Software</b>																						
CSS01	Windows NT	for CSH04	×	○												1	A	Spec1	0	0	0	Including computer
CSS02	MS Office	for CSH04	×	○												1	A	Spec1	0	0	0	Including computer
CSS03	Visual Developer Studio	for CSH04	●	○												1	A	Spec1	10	0	10	Install to 10 computers
CSS04	Cadence SPICE	for CSH04	●	○												1	A	Spec1	10	0	10	Install to 10 computers
<b>Common Laboratory Equipment</b>																						
CSL01	Computer Table	for CSH04	●								○					30	B	Spec1	3	0	3	1 table / 20 students
CSL02	Computer Chairs	for CSH04	●								○					60	B	Spec1	60	0	60	for all laboratory students
CSL03	White Board	for Instruction	×												○	2	B	—	0	0	0	Procured by University
CSL04	Display Board	for Instruction	×												○	2	B	—	0	0	0	Procured by University
CSL05	Storage Cupboard	for Equipment storage	●								○					2	B	②	2	0	2	-
<b>VI. Digital Electronics Laboratory</b>																						
<b>Basic Instrument</b>																						
BDE01	Oscilloscope	General measuring instrument	●	○			○									20	A	Table	20	0	20	1 unit / 1 table
BDE02	Digital Multimeter	General measuring instrument	●	○		○	○									20	A	Table	20	2	18	1 unit / 1 table
BDE03	Proto board	for practical circuit	●	○												40	A	Spec1	40	0	40	2 units / 1 table
BDE04	Logic Probe	for measuring voltage	●	○												20	A	Table	20	0	20	1 unit / 1 table
BDE05	Pulse Generator	for circuit test	●	○												20	A	Table	10	0	10	10 units / laboratory
BDE06	Logic pulser	for gate circuit making	●	○			○									20	A	Spec1	20	0	20	for NDT students, 1 unit / 1 table
<b>Equipment for Regular Laboratory Use</b>																						
DEH01	Digital Electronics Trainer Kit	for Logic circuit training	●	○												20	A	Table	6	0	6	6 units / laboratory
DEH02	Microprocessor Trainer Kit	for microprocessor monitoring	●	○												4	A	Table	4	0	4	4 units / laboratory
DEH03	Microcontroller Trainer Kit	for microcontroller monitoring	●	○												4	A	Table	4	0	4	4 units / laboratory
DEH04	PLD Trainer Kit	for PLD system training	●	○												4	A	Table	3	0	3	3 units / laboratory
DEH05	PLC Trainer Kit	for traffic signal system training	●	○												4	A	②	2	0	2	-
DEH06	Logic Dart	for traffic signal system training	●	○												4	B	②	2	0	2	-
DEH07	Digital IC Tester	for Logic circuit training	●	○												2	A	Table	3	0	3	3 units / laboratory
DEH08	PLD Programmer	for PLD system training	×													2	A	-	0	0	0	No Practical plan
DEH09	Microprocessor Emulator	for microprocessor monitoring	●	○												4	A	Table	4	0	4	4 units / laboratory
DEH10	Single-board computers	for circuit program training	●	○												10	B	②	2	0	2	-
<b>Special Purpose Equipment</b>																						
DEH11	Electronic Tool Kit (without Multimeter)	for assembling	×													1	A	-	0	0	0	Using DEL06
DEH12	Handheld Digital Multimeter	Measuring device	●	○												5	B	Spec1	4	0	4	Use as required
DEH13	Dual Power Supply	digital circuit training	●	○		○										10	A	Table	9	2	7	9 units / laboratory
DEH14	Digital Storage Oscilloscope (Low cost)	logic circuit training	●	○												2	A	Table	3	0	3	3 units / laboratory
DEH15	Logic Analyzer (Low cost)	for circuit program training	●	○												2	A	②	2	0	2	-
DEH16	Function Generator	for circuit training	×	○		○										5	A	Table	3	3	0	3 units / laboratory
<b>Common Laboratory Equipment</b>																						
DEL01-1	Lab Bench Computer	for analysis	●	○		○	○									20	A	Table	6	0	6	3 units / laboratory
DEL01-2	UPS	for DEL01-1	●	○												0	A	①	1	0	1	350W x 6units x 1.2/3KVA = 1 unit

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	
DEL02	Dot Matrix printer	for draft report printing	●	○												5	A	①	1	0	1	-
DEL03	Basic Lab Bench	for practice	●								○					20	B	Spec1	20	0	20	1 table / 4 students
DEL04	Stools	for practice	●								○					80	B	Spec1	80	0	80	for all students
DEL05	First Aid Panel	for first aid	×												○	1	B	—	0	0	0	Procured by University
DEL06	Tool kit for students	for assembling	●					○								2	A	②	2	0	2	-
DEL07	Storage Cupboards	for Equipment storage	●								○					2	B	②	2	0	2	-
DEL08	White Board	for Instruction	×												○	2	B	—	0	0	0	Procured by University
DEL09	Display Board	for Instruction	×												○	2	B	—	0	0	0	Procured by University

## VII. Analog Electronics Laboratory

### Basic Instrument

BAE01	Dual Power Supply	for amplifier and frequency analysis	●	○		○										20	A	Table	20	10	10	Provide 20 tables
BAE02	Oscilloscope	General measuring instrument	●	○			○									20	A	Table	20	0	20	Provide 20 tables
BAE03	Analog Multimeter	General measuring instrument	×	○												20	A	—	20	27	0	Provide 20 tables
BAE04	Protoboard	logic circuit training	●	○												40	A	Spec1	40	0	40	1table / 2 units
BAE05	Function Generator	for feedback amplifier training	●	○		○										20	A	Table	10	3	7	Provide 10 tables

### Special Purpose Equipment

AEH01	Electronic Thermometer	General measuring instrument	●	○												2	A	②	2	0	2	-
AEH02	Clip-On Current Meter (ac/dc)	General measuring instrument	●	○												5	A	②	2	0	2	-
AEH03	Variable Frequency LCR Meter	General measuring instrument	●	○												2	A	Table	3	0	3	3 units / laboratory
AEH04	Low Frequency Spectrum Analyzer	for filtering training	●	○												2	A	Table	3	0	3	3 units / laboratory
AEH05	Digital Storage Oscilloscope (Low cost)	for filtering training	●	○												2	A	Table	3	0	3	3 units / laboratory
AEH06	Audio signal generator	for BJT amplifier training	●	○		○										5	A	Table	10	5	5	10 units / laboratory
AEH07	Digital Multimeter	for multi amplifier and frequency training	●	○												2	A	②	2	0	2	-
AEH08	Variacs	Oscillator training	●	○												5	A	Table	5	0	5	Use as required

### Common Laboratory Equipment

AEL01-1	Lab Bench Computer	for analysis	●	○	○											20	A	Table	8	1	7	7 units / laboratory
AEL01-2	UPS	for AEL01-1	●	○												0	A	①	1	0	1	350W x 2units x 1.2/1KVA = 1 unit
AEL02	Dot Matrix printer	for draft report printing	●	○												5	A	①	1	0	1	Use as required
AEL03	Basic Lab bench	for practice	●								○					20	B	Spec1	20	0	20	1 table / 4 students
AEL04	Stools	for practice	●								○					80	B	Spec1	80	0	80	for all students
AEL05	First Aid Panel	for first aid	×												○	1	B	—	0	0	0	Procured by University
AEL06	Tool kit for students	for assembling	●	○				○								2	A	②	2	0	2	Use as required
AEL07	White Board	for Instruction	×												○	2	B	—	0	0	0	Procured by University
AEL08	Storage Cupboards and Racks	for Equipment storage	●								○					2	B	②	2	0	2	—
AEL09	Display Boards	for Instruction	×												○	2	B	—	0	0	0	Procured by University

## VIII. Telecommunication Laboratory

### Basic Instrument

BTC01	Dual Power Supply	for PAM, PWM, PPM, PCM training	●	○			○									20	A	Table	10	0	10	General equipment, use as required
BTC02	Oscilloscope	Signal analysis	●	○			○									20	A	Table	7	0	7	7 units / laboratory
BTC03	Multimeter	TV training	●	○			○									20	A	Table	7	0	7	for NDT students, 1 unit / 7 tables
BTC04	High Frequency Signal Generator/ AM,FM Modulator/ Function Generator Unit	Analog filter training	●	○	○											20	A	Table	5	0	5	5 units / laboratory
BTC05	Audio Signal Generator	AM/ FM tone training	×	○												20	A	Table	6	8	0	Use existing equipment
BTC06	Frequency Counter	Noise measuring	●	○												20	A	Spec1	3	2	1	Provide 3 tables
BTC07	Protoboard	General measuring instrument	●	○												40	A	Spec1	40	0	40	Use as required

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Q'ty requested	University's Priority	Category	Qty calculation			Memo
				Curric ula	No finance	Lack	Old	Mainte nance	Low benefit	Office	Desk	Modifi cation	Not familia r	Other donors	Board				Necessary Q'ty	Existing	Q'ty Planned	
Common Laboratory Equipment																						
TCH01	ASK/PSK/FSK Modulator	Digital modulator training	●	○												5	A	Desk2	4	0	4	4 units / 8 tables
TCH02	Signal Amplifier	Digital modulator training	●	○		○										8	A	Table	4	0	4	4 units / laboratory
TCH03	Spectrum Analyser	Tone modulation effect measuring	●	○												8	A	Table	10	0	10	10 units / laboratory
TCH04	Pattern Generator	TV system training	×													3	A	Spec1	0	0	0	Duplicate as below
TCH05	LCR Meter	Analog filter training	●	○												2	A	②	2	0	2	-
TCH06	Colour TV trainer panel	PAL TV training	●	○												4	A	Table	4	0	4	4 units / laboratory
TCH07	Black & White TV trainer panel	BG TV system training	×													0	A	—	0	0	0	Low priority
TCH08	Colour TV receiver	PAL TV training	●	○												5	A	Table	4	1	3	4 units / laboratory
TCH09	Black & White TV receiver	BG TV system training	×	○												5	A	—	0	0	0	Use color TV
TCH10	dB Meter	Spectrum analyzer	●	○												2	A	②	2	0	2	-
TCH11	Pseudo Random Sequence Generator	Signal analysis training	×													2	A	—	0	0	0	No curriculum
TCH12	Random Noise Generator	CW modulation noise analysis	●	○		○										8	A	Table	6	4	2	6 units / laboratory
TCH13	Frequency Meter	Analog signal noise analysis	●	○		○										2	A	Spec1	4	2	2	Use as required
TCH14	Small Telephony switch	Telephone switch training	●	○												1	A	Table	4	1	3	4 units / laboratory
TCH15	Telephone line simulator	Telephone switch training	●	○												2	A	②	2	0	2	-
Special Purpose Equipment																						
TCH16	Measuring Receiver	CM signal measuring	●	○		○										2	A	Table	4	1	3	4 units / laboratory
TCH17	GPS Receiver System	Transmittal signal measuring	●	○												1	A	Spec1	3	0	3	3 units / 6 tables
TCH18	DSP Trainer Kit	DSP filter training	●	○	○											5	A	Table	2	0	2	2 Units / laboratory
TCH19	Modulation Domain Analyzer	Modulation analyzer training	●	○												1	A	Desk2	2	0	2	2 units / 4 tables
TCH20	BER Tester	Digital signal process training	×													2	B	—	0	0	0	No curriculum
TCH21	Digital Video Generator	PAL TV training	●	○												1	A	Table	4	0	4	4 units / laboratory
TCH22	High Frequency Storage Oscilloscope	Analog, digital signal transmission system training	●	○												2	A	Table	4	0	4	4 units / laboratory
TCH23	High Frequency Spectrum Analyzer	Satellite signal analysis	●	○												2	A	②	2	0	2	-
TCH24	Video Signal Analyzer	Color TV system training	●	○												1	A	Desk2	2	0	2	2 units / 4 table
TCH25	Transmission line measurement kit	Transmittal signal measuring	●	○												1	A	②	2	0	2	-
TCH26	Error Control Coding test kit	Error control coding training	●	○												1	A	Desk2	2	0	2	2 units / 4 table
TCH27	TV Pattern Generator	Color TV system training	●	○												1	A	②	2	0	2	-
TCH28	FM/AM Modulator Demodulator Trainer	FM/AM modulation training	●	○												1	A	Table	4	0	4	4 units / laboratory
TCH29	PAM/PWM/PPM/PCM Trainer Panel	Digital transmission training	●	○												1	A	②	2	0	2	-
TCH30	ASK/PSK/FSK Modulator-Demodulator	Digital signal transmission analysis	●	○												1	A	Desk2	4	0	4	8 units / 4 tables
TCH31	MPEG Generating Equipment	Digital signal transmission analysis	●													1	A	②	2	0	2	-
TCH32	MPEG Analyzer	Digital signal transmission analysis	●													1	A	②	2	0	2	-
Special Purpose Equipment																						
TCS01	Antenna Studies Software	Signal process training	●	○												1	A	②	2	0	2	-
TCS02	Filter Design Software	Filter design training	●	○												1	A	②	2	0	2	-
TCS03	Digital Signal Processing Software	Digital signal process training	●	○												1	A	②	2	0	2	-
Common Laboratory Equipment																						
TCL01-1	Personal Computer	Design practice	●	○		○	○									6	A	Table	6	0	6	6 units / laboratory
TCL01-2	UPS	for TCL01-1	●	○												0	A	①	1	0	1	350W x 4units x 1.2/3KVA = 1 unit
TCL02	Dot Matrix Printer	for draft report printing	●	○												1	A	①	1	0	1	-
TCL03	Basic Lab bench	for practice	●								○					20	B	Spec1	20	0	20	1 table / 4 students
TCL04	Stools	for practice	●								○					80	B	Spec1	80	0	80	for all students
TCL05	First Aid Panel	for first aid	×												○	1	B	—	0	0	0	Procured by University
TCL06	White Board	for Instruction	×												○	2	B	—	0	0	0	Procured by University
TCL07	Display Boards	for Instruction	×												○	2	B	—	0	0	0	Procured by University
TCL08	Storage Cupboards and Racks	for Equipment storage	●								○					2	B	②	2	0	2	—

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	

**IX. Microwave Laboratory****Equipment for Regular Laboratory Use**

MWH01	Klystron, Power Supply and Waveguide Components	Klystron training	×														3	A	—	0	0	0	No curriculum
MWH02	Magnetron	Microwave oven design training	●	○													2	A	②	2	0	2	—
MWH03	Gunn Oscillator, Power supply and	Wavelength, insulator training	●	○		○											3	A	Table	4	1	3	4 units / laboratory
MWH04	Spectrum Analyzer	Antenna making	●	○													1	A	Table	4	0	4	4 units / laboratory
MWH05	Synthesized Sweep Signal Generator	Microwave link training	●	○													2	A	②	2	0	2	—
MWH06	Frequency Counter	Wavelength, insulator training	×	○													2	A	—	3	3	0	Use existing equipment
MWH07	SWR Meter	Wavelength, insulator training	●	○													2	A	Table	3	0	3	3 units / laboratory
MWH08	Microwave Tx. and Rx. System with	Microwave transmission training	●	○													1	A	①	1	0	1	—
MWH09	Antenna Design Trainer Kit	Antenna making	●	○	○												2	A	①	1	0	1	Use as required
MWH10	Satellite Receiver System	Satellite signal analysis	●	○													1	A	Table	1	0	1	—
MWH11	Field Strength Meter	X-band antenna making	●	○													2	A	Table	4	0	4	4 units / laboratory
MWH12	Experimental Radar kit	Rader system training	●	○													1	A	Table	1	0	1	—
MWH13	Microwave Transistors - Maximum	X-band antenna making	●	○													10	A	Spec1	10	0	10	Use as required
MWH14	Microwave Transistors - Maximum	X-band antenna making	●	○													10	A	Spec1	10	0	10	Use as required
MWH15	Zero bias Schottky Detector Diodes	X-band antenna making	●	○													10	A	Spec1	10	0	10	Use as required
MWH16	PIN Diodes	Microwave system training	●	○													5	A	Spec1	5	0	5	Use as required
MWH17	Impedance Bridge	Microwave system training	●	○													1	A	①	1	0	1	—
MWH18	Cable Connectors : N(m) to BNC(f)	Microwave system training	●	○													5	A	Spec1	5	0	5	Use as required
MWH19	Cable Connectors : K(m) to BNC(f)	Microwave system training	●	○													5	A	Spec1	5	0	5	Use as required
MWH20	Cable Connectors : N(f) to BNC(m)	Microwave system training	●	○													5	A	Spec1	5	0	5	Use as required
MWH21	Cable Connectors : K(f) to BNC(m)	Microwave system training	●	○													5	A	Spec1	5	0	5	Use as required
MWH22	Cable Connectors : BNC(m) to BNC(f)	Microwave system training	●	○													5	A	Spec1	5	0	5	Use as required

**Software**

MWS01	Antenna Design		●	○													1	A	②	1	0	1	install 1 computer
MWS02	Microwave Circuit Design	Microwave system training	●	○													1	A	①	1	0	1	Install 1 computers
MWS03	Radar Cross Section	Rader cross section training	●	○													1	A	①	1	0	1	Install 1 computers

**Common Laboratory Equipment**

MWL01-1	Personal Computer	for analysis	●	○		○											4	A	Table	8	1	7	8 units / laboratory
MWL01-2	UPS	for MWL01-1	●	○													0	A	①	1	0	1	350W x 4units x 1.2/1.5KVA = 1 unit
MWL02	Dot Matrix Printer	for draft report printing	●	○													1	A	①	1	0	1	—
MWL03	Basic Lab Bench	for practice	●								○						10	B	Spec1	16	0	16	1 table / 4 students
MWL04	Stools	for practice	●								○						40	B	Spec1	64	0	64	for all students
MWL05	First Aid Panel	for first aid	×														1	B	—	0	0	0	Procured by University
MWL06	White Board	for Instruction	×												○		1	B	—	0	0	0	Procured by University
MWL07	Display Boards	for Instruction	×												○		1	B	—	0	0	0	Procured by University
MWL08	Storage Cabinets and Racks	for Equipment storage	●								○						1	B	①	1	0	1	—

**X. Optoelectronics Laboratory****Basic Instrument**

BOP01	Dual Power Supply	Transistor, opt-transmission training	●	○		○											8	A	Spec1	8	0	8	Provide all table
BOP02	Oscilloscope	Opt-transmission system measuring	●	○		○	○										8	A	Table	1	1	0	1 unit / Laboratory
BOP03	Multimeter	Opt-transmission project	●	○		○	○										8	A	Table	2	1	1	2 units / Laboratory
BOP04	Logic Probe	Opt-transmission project	●	○		○											8	A	Table	2	1	1	2 units / Laboratory
BOP05	Audio Signal Generator	Opt-transmission project	×	○													8	A	—	1	2	0	Use existing equipment
BOP06	Protoboard	Phototransistor, Opt-insulator training	●	○													16	A	Spec1	16	0	16	Use as required

**Equipment for Regular Laboratory Use**

OPH01	Laser Pointer	Opt-transmission project	×	○													10	B	—	1	12	0	Use existing equipment
OPH02	Fibre Optic Educator Kit	Fiber optic training	●	○													5	A	Table	1	0	1	1 unit / Laboratory
OPH03	Fibre Optic Monitor Kit	Fiber optic training	●	○													5	A	Table	1	0	1	—

No	Description	Purpose	Decision	Priority Equip.					Non-Priority				Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board	Necessary Qty				Existing	Qty Planned		
OPH04	Fibre Optic Power Meter	Transmission laser training	●	○			○									1	A	Table	2	0	2	—	
OPH05	LCD (Liquid Crystal Display) Panel	Display training	●	○												2	A	Table	2	0	2	—	
OPH06	Laser Diodes	Parts	×	○												20	A	—	0	0	0	for security reasons	
OPH07	LDR (Light Dependent Resistor)	Parts	●	○												50	B	Spec1	50	0	50	Use as required	
OPH08	Photo Diodes	Parts	●	○												20	B	Spec1	20	0	20	Use as required	
OPH09	Optocouplers	Parts	●	○												20	B	Spec1	20	0	20	Use as required	
OPH10	Ellipsometer	Opt-transmission project	×													2	A	—	0	0	0	No curriculum	
OPH11	Lux Meter	Opt-transmission project	●	○												2	A	①	1	0	1	—	
OPH12	Optical spectrum analyzer	Transmission laser training	●	○												1	A	Table	2	0	2	2 units / Laboratory	
OPH13	Erbium doped fibre amplifier	Erbium fiber amplifier training	●	○												1	A	Table	1	0	1	1 unit / Laboratory	
OPH14	1550nm DFB (Distributed Feedback)	Erbium fiber amplifier training	×	○												2	A	—	0	0	0	with OPH13	
OPH15	1310nm FP (Fabri Perot) laser	Erbium fiber amplifier training	×	○												2	A	—	0	0	0	with OPH13	

#### Common Laboratory Equipment

OPL01	Basic Lab Bench	for practice	●								○					8	B	Spec1	8	0	8	1 table / 4 students
OPL02	Stools	for practice	●								○					32	B	Spec1	32	0	32	1 table / 4 chairs
OPL03-1	Personal Computer	for analysis	●	○												4	A	Table	2	0	2	—
OPL03-2	UPS	for OPL03-1	●	○												0	A	①	1	0	1	350W x 4units x 1.2/3KVA = 1unit
OPL04	Dot Matrix Printer	for draft report printing	●	○												1	A	①	1	0	1	—
OPL05	First Aid Panel	for practice	×												○	1	B	—	0	0	0	Procured by University
OPL06	White Board	for practice	×												○	1	B	—	0	0	0	Procured by University
OPL07	Display Boards	for first aid	×												○	1	B	—	0	0	0	Procured by University
OPL08	Storage Cupboard and Racks	for Equipment storage	●								○					1	B	①	1	0	1	—

#### XI. Postgraduate

##### Basic Instrument

BPG01	Dual Power Supply	General instrument	●	○			○									20	A	Table	20	0	20	1 unit / 1 table
BPG02	Oscilloscope	General measuring instrument	●	○			○	○								20	A	Table	20	6	14	2 existing equipment (ADB)
BPG03	Multimeter	General measuring instrument	●	○			○									20	A	Spec1	10	0	10	Use as required
BPG04	Protoboard	General instrument	●	○												40	A	Spec1	40	0	40	1 table / 2 units
BPG05	Logic Probe	General instrument	●	○												20	A	Spec1	20	0	20	1 table / 1 unit
BPG06	Audio Signal Generator	General instrument	●	○			○	○								20	A	Spec1	10	1	9	Use as required, One existing equipment (ADB)
BPG07	Pulse Generator	General instrument	×	○												20	A	—	0	0	0	Use function generator
BPG08	Function Generator	General instrument	●	○			○									20	A	Spec1	10	4	6	Use as required, One existing equipment (ADB)

##### Equipment for Regular Laboratory Use

PGH01	Personal Computers	for PGPRJ-01,PGPRJ-05,PGPRJ-07 etc	●	○			○	○								6	A	Table	6	1	5	Provide as group number
PGH02	Laser Printer	for report printing	●	○												1	A	①	1	0	1	1 unit / 6 computers
PGH03	Dot Matrix Printer	for draft report printing	×													1	B	—	0	0	0	No need draft printing
PGH04	Plotter	for drawings printing	×													1	A	—	1	1	0	Use existing equipment
PGH05	Scanner	for drawings scanning	●	○												1	B	①	1	0	1	-
PGH06	Digital Storage Oscilloscope	for PGPRJ-06	●	○			○									2	A	②	2	1	1	-
PGH07	High Frequency Oscilloscope	for PGPRJ-22	●	○												2	A	②	2	0	2	-
PGH08	Digital Frequency Synthesizer	for PGPRJ-06	●	○												1	A	①	1	0	1	-
PGH09	ASK/PSK/FSK Modulator	for PGPRJ-19	×													2	A	—	0	0	0	-
PGH10	Pseudo Random Signal Generator with	General instrument	●	○												2	A	②	2	0	2	-
PGH11	dB Meter	General measuring instrument	●	○												3	A	②	2	0	2	-
PGH12	Audio Generator	for PGPRJ-08	×													10	A	-	0	0	0	Use RF generator
PGH13	RF Generator	for PGPRJ-19, PGPRJ-22	●	○												10	A	②	2	0	2	-
PGH14	Microwave Frequency Meter	for PGPRJ-06	●	○			○								○	1	A	②	2	1	1	One existing equipment (ADB)
PGH15	Video Camera	for PGPRJ-09, PGPRJ-23	×													1	B	—	0	0	0	Procured by University
PGH16	TV Receiver	for PGPRJ-09	×													1	B	—	0	0	0	Procured by University
PGH17	Video Recorder	for PGPRJ-09	×													1	B	—	0	0	0	Procured by University

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Q'ty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Q'ty Planned	
PGH18	Digital TV Receiver for Research	for PGPRJ-35	×													2	A	—	0	0	0	Procured by University
PGH19	Audio Tape Recorder	for PGPRJ-08	×													2	B	—	0	0	0	Procured by University
PGH20	Microwave Tx. And Rx. Unit with	for Microwave practice	×													1	A	—	0	0	0	Use equipment installed in Microwave
PGH21	SWR Meter	Wavelength, insulator training	×													1	A	—	0	0	0	Use equipment installed in Microwave
PGH22	TMS320 family DSP Development System	for PGPRJ-09, PGPRJ-24, PGPRJ-42, PGPRJ-73, PGPRJ-76	×													1	A	—	0	0	0	Use equipment installed in Telecommunication Dep.
PGH23	Small Experimental ISDN Phone and	for PGPRJ-PGPRJ-38	●	○	○											1	A	①	1	0	1	Use as required
PGH24	Logic Analyzer	for PGPRJ-06, PGPRJ-07, PGRJ-18, PGPRJ-21, PGPRJ-23	●	○		○										2	A	②	2	1	1	-
PGH25	Low cost Spectrum Analyzer	for PGPRJ-08, PGPRJ-22	●	○												2	A	②	2	0	2	-
PGH26	Pulse Generator	for PGPRJ-07	×													10	A	-	0	0	0	Use BPG07
PGH27	Logic Probe	for PGPRJ-06, PGPRJ-07, PGPRJ-18, PGPRJ-21, PGPRJ-23	×													12	A	-	0	0	0	Use BPG05
PGH28	Logic Pulser	for PGPRJ-06, PGPRJ-07, PGPRJ-18, PGPRJ-21, PGPRJ-23	●	○												12	A	Spec1	5	0	5	Use as required
PGH29	Logic Clip	for PGPRJ-06, PGPRJ-07, PGPRJ-18, PGPRJ-21, PGPRJ-23	●	○												3	A	Spec1	3	0	3	Use as required
PGH30	PLD Programmer	for PGPRJ-04, PGPRJ-07, PGPRJ-18	×													1	A	—	0	0	0	Use equipment installed in Digital Electric
PGH31	EPROM Eraser	for PGPRJ-04, PGPRJ-07, PGPRJ-18, PGPRJ-23	×													1	A	—	0	0	0	Use equipment installed in Digital Electric
PGH32	Broadband RF Front End	for PGPRJ-25	×													1	A	—	0	0	0	Use equipment installed in Digital Electric
PGH33	Broadcast TV Analyzer	for rPGPRJ-25	×													1	A	—	0	0	0	Use equipment installed in Digital Electric
PGH34	Network Analyzer	for PGPRJ-10, PGPRJ-13, PGPRJ-34	●	○												1	A	①	1	0	1	-
PGH35	Wireless Mobile and Base Station Test set	for PGPRJ-02, PGPRJ-11, PGPRJ-16, PGPRJ-31, PGPRJ-55	●	○												1	A	①	1	0	1	-
PGH36	Basic Network Experiment kit	Sharing equipment	×													1	A	—	0	0	0	No need
PGH37	Parameter Analyzer	General equipment	×													1	A	—	0	0	0	No need
PGH38	Antenna Tester HF, VHF and UHF	for PGPRJ-19, PGPRJ-65	×											○		1	A	①	1	1	0	One existing equipment (ADB)
PGH39	Wide Bandwidth RF Receiver	for PGPRJ-19, PGPRJ-65,PGPRJ-76	●	○												1	A	①	1	0	1	-
PGH40	Programmable Step Attenuator	for PGPRJ-19	●	○												1	A	①	1	0	1	-
PGH41	S-Parameter Test bed	for PGPRJ-19	×													1	A	—	0	0	0	Low cost performance
PGH42	Synthesized RF Signal Generator	for PGPRJ-19, PGPRJ-65	●	○												1	A	①	1	0	1	-
PGH43	RF Power Meter	for PGPRJ-19, PGPRJ-65	●	○												5	A	②	2	0	2	-
PGH44	Quick response RF power monitor	for PGPRJ-19, PGPRJ-65	×											○		1	A	①	1	1	0	One existing equipment (ADB)
PGH45	RF Terminations	for PGPRJ-19	●	○												1	A	①	1	0	1	-
PGH46	RF Power Dividers/ Combiners	for PGPRJ-19	●	○												1	A	①	1	0	1	-
PGH47	RF Amplifier (0.1 MHz - 400MHz)	General equipment	×											○		1	A	①	1	1	0	One existing equipment (ADB)
PGH48	RF Amplifier (100kHz - 1.3 GHz)	General equipment	●	○												1	A	①	1	0	1	-
PGH49	Field Strength Meter	PGPRJ-15, PGPRJ-19, PGPRJ-65	●	○												1	A	①	1	0	1	-
PGH50	Microwave Noise Tubes and Noise Sources	PGPRJ-15, PGPRJ-19	●	○												1	A	①	1	0	1	-
PGH51	Erbium Doped Fiber	for PGPRJ-03, PGPRJ-36	●	○												1	A	①	1	0	1	-
PGH52	Optical Source	for PGPRJ-03, PGPRJ-36	●	○												1	A	①	1	0	1	-
PGH53	Optical Power Meter	for PGPRJ-03, PGPRJ-36	●	○												1	A	①	1	0	1	-
PGH54	Fiber Optic Loss Test Kit	for PGPRJ-03	●	○												5	A	②	2	0	2	-
PGH55	Single Mode Variable Attenuator	for PGPRJ-03	●	○												1	A	①	1	0	1	-
PGH56	Optical Fiber Scope	for PGPRJ-03	●	○												1	A	①	1	0	1	-
PGH57	Optical Time Domain Reflectometer	for PGPRJ-03	●	○												1	A	①	1	0	1	-
PGH58	Test and Measurement Hardware for	for PGPRJ-21	●	○												1	A	①	1	0	1	-
PGH59	GPIB Programmer	for PGPRJ-21	●	○												1	A	①	1	0	1	-

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	
PGH60	Waveform Monitor	Sharing equipment	●	○												1	A	①	1	0	1	-
PGH61	Vectorscope	CL305-01,CL305-03	●	○												1	A	①	1	0	1	-
PGH62	Video Signal Generator	for PGPRJ-36	●	○												1	A	①	1	0	1	-
PGH63	Audio Analyzer	for PGPRJ-08	●	○												1	A	①	1	0	1	-
PGH64	Audio Distortion Meter	for PGPRJ-65	●	○												1	A	①	1	0	1	-
PGH65	Audio Jitter Meter	for PGPRJ-65	●	○												1	A	①	1	0	1	-
PGH66	Audio Signal Level Meter	for PGPRJ-65	●	○												1	A	①	1	0	1	-
PGH67	NTSC/PAL Color Picture Monitor	for PGPRJ-46	●	○												1	A	①	1	0	1	-

**Software**

PGS01	Image Processing System	for PGPRJ-09	●	○												1	A	Spec1	2	0	2	Install 2 computers
PGS02	MATLAB	for sharing computer	●	○												1	A	Spec1	2	0	2	Install 2 computers
PGS03	Cellular Network Simulation/ Design and Planning Software	for PGPRJ-02, PGPRJ-11, PGPRJ-16, PGPRJ-31, PGPRJ-55, PGPRJ-66	●	○												1	A	Spec1	1	0	1	Install 1 computer
PGS04	Microwave System Design and Planning Software	for PGPRJ-01, PGPRJ-02, PGPRJ-19, PGPRJ-67	×										○			1	A	—	0	0	0	-
PGS05	LAN Network Simulation, Monitoring , Planning and Design Software	for PGPRJ-13, PGPRJ-26, PGPRJ-62	●	○												1	A	①	1	0	1	install 1 computer
PGS06	OPNET Software Package	for PGPRJ-16, PGPRJ-25	×										○			1	A	②	0	0	0	-
PGS07	LABVIEW	for PGPRJ-21	●	○												1	A	Spec1	6	0	6	install 6 computers
PGS08	Mathematica	for PGPRJ-05	●	○												1	B	②	2	0	2	install 1 computer
PGS09	NEC- Numeric Electronic Code	Sharing equipment	×										○			1	A	—	0	0	0	-
PGS10	Workstation emulation software for PC	for PGPRJ-04	×										○			1	A	—	0	0	0	-

**Common Laboratory Equipment**

PGL01	Basic Lab Bench	for practice	●							○						20	B	Spec1	20	0	20	20 tables / laboratory
PGL02	Stools	for practice	●							○						40	B	Spec1	40	0	40	2 chairs / 1 table
PGL03	Dot Matrix Printer	for draft report printing	●	○												2	B	②	2	0	2	-
PGL04	Laser Printer	for report printing	●	○												1	B	①	1	0	1	-
PGL05	First Aid Panel	for first aid	×													1	B	①	0	0	0	Procured by University
PGL06	White Board	for Instruction	×							○						4	B	—	0	0	0	-
PGL07	Display Boards	for Instruction	×							○						2	B	—	0	0	0	-
PGL08	Storage Cupboards and Racks	for Equipment storage	●							○						3	B	Spec1	3	0	3	3 units / laboratory
PGL09-1	Personal Computers	for analysis	●	○												6	A	Spec1	6	0	6	
PGL09-2	UPS	for PGL09-1 and PGH01	●	○												0	A	①	1	0	1	

**XII. Electronic Workshop****Basic Instrument**

BWS01	Dual Power Supply	Performance check	●				○	○								9	A	②	2	0	2	1 unit / 1 engineer
BWS02	Oscilloscope	Performance check	●				○	○								9	A	②	2	0	2	1 unit / 1 engineer
BWS03	Multimeter	Performance check	●				○	○								9	A	②	2	0	2	1 unit / 1 engineer
BWS04	Protoboard	Performance check	●					○								18	A	Spec1	4	0	4	1 unit / 1 engineer
BWS05	Logic Probe	Performance check	●					○								9	A	②	2	0	2	1 unit / 1 engineer
BWS06	Function Generator	Performance check	●				○	○								9	A	②	2	0	2	1 unit / 1 engineer

**Equipment for Regular Laboratory Use**

WS01	PCB Drilling Machine	for drilling	●					○								1	A	①	1	0	1	1 unit / 2 engineers
WS02	Solder Station	for fixing solder	●					○								1	A	①	1	0	1	1 unit / 2 engineers
WS03	Desoldering Station	for removing IC and diode	●					○								1	A	①	1	0	1	1 unit / 2 engineers
WS04	Energy Analyzer	for measuring watt	●					○								1	A	①	1	0	1	1 unit / 2 engineers
WS05	Digital Light Meter	for measuring brightness	●					○								1	A	①	1	0	1	1 unit / 2 engineers
WS06	Digital Sound Level Meter	Audio sound level measuring	●					○								1	A	①	1	0	1	1 unit / 2 engineers
WS07	Digital Humidity and Temperature Meter	Humidity and temperature measuring	●					○								1	A	①	1	0	1	1 unit / 2 engineers
WS08	Hand Held Digital Multimeter	Performance check	×					○								1	A	①	1	1	0	Use existing equipment
WS09	Mixed Signal Oscilloscope	Mix signal check	×					○								1	A	①	1	1	0	Use existing equipment

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Q'ty requested	University's Priority	Category	Qty calculation			Memo	
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Q'ty	Existing	Q'ty Planned		
WS10	Electronic Labeling Machine	Repair log tag	●					○								1	A	①	1	0	1	1 unit / 2 engineers	
WS11	Electronics Engineers Tool Set	for maintenance	●					○								2	A	②	2	0	2	1 unit / 1 engineer	
WS12	First Aid Panel	for first aid	×					○								1	A	-	0	0	0	Procured by University	
WS13	Fluorescent Magnifier	for small parts check	●					○								1	A	①	1	0	1	1 unit / 2 engineers	
WS14	Scroll Saw	for case making	●					○								1	A	①	1	0	1	1 unit / 2 engineers	
WS15	Electric Fretsaw	for case cutting	●					○								1	A	①	1	0	1	1 unit / 2 engineers	
WS16	Drill Bit Set	for drilling	●					○								2	A	②	2	0	2	1 unit / 1 engineer	
WS17	Spanner Set	for assembling	●					○								2	A	②	2	0	2	1 unit / 1 engineer	
WS18	Portable Workstand	for assembling	●					○								2	A	②	2	0	2	1 unit / 1 engineer	
WS19	Device Viewer System	—	×													1	A	—	0	0	0	No need for maintenance works	
WS20	Active Probe for SMDs	—	×													2	A	-	0	0	0	No need for maintenance works	
WS21	High Voltage Probe	for high voltage	●					○								2	A	②	2	0	2	2 prove	
WS22	Differential Probe	for maintenance	●					○								2	A	②	2	0	2	2 prove	
WS23	AC/DC Current Probe	AC/DC current measuring	●					○								2	A	②	2	0	2	2 prove	
WS24	RF Frequency Counter	RF frequency measuring	●					○								1	A	①	1	0	1	1 unit / 2 engineers	
WS25	RF Connector Kit	RF connector	●					○								1	A	①	1	0	1	1 unit / 2 engineers	
WS26	Stacking Type Parts Storage Cabinets	Parts storage	●								○					15	A	②	2	0	2	1 unit / 1 engineer	
WS27	Solder Bath	for large scale maintenance	×													1	A	—	0	0	0	No need for maintenance works	
WS28	Multi Layer PCB Development System	for large scale maintenance	×													1	A	—	0	0	0	No need for maintenance works	
WS29	Tachometer	for round speed measuring	×					○								1	A	①	1	1	0	Use existing equipment	
WS30	UV Exposure Unit	EP ROM making	×													1	A	—	0	0	0	No need for maintenance works	
Common Laboratory Equipment																							
WSL01	Basic Lab bench	for maintenance	●							○						9	B	Spec1	2	0	2	1 unit / 1 engineer	
WSL02	Stools	for maintenance	●							○						18	B	Spec1	2	0	2	1 unit / 1 engineer	
WSL03-1	Personal Computer	for analysis	●					○								4	B	②	2	0	2	1 unit / 1 engineer	
WSL03-2	UPS	for WSL03-1	●					○								0	A	①	1	0	1	350W x 2units x 1.2/1KVA = 1unit	
WSL04	Dot Matrix Printer	for draft report printing	×													1	B	-	0	0	0	No need for maintenance works	
WSL05	Laser Printer	for report printing	●					○								1	B	①	1	0	1	1 unit / 2 engineers	
WSL06	First Aid Panel	for first aid	×					○								1	B	-	0	0	0	Procured by University	
WSL07	White Board	for maintenance instruction	×												○	2	B	-	0	0	0	Procured by University	
WSL08	Display Boards	for maintenance instruction	×												○	1	B	-	0	0	0	Procured by University	
WSL09	Storage Cabinets and Racks	for Equipment storage	●								○					3	B	②	2	0	2	for Maintenance equipment storage	

### XIII. Electronic CAD Laboratory

#### Hardware

ECH01	Plotter	General equipment	●	○												1	A	①	1	1	0	—
ECH02-1	Personal Computer	for practice	●	○												8	A	Table	8	0	8	8 units / laboratory
ECH02-2	UPS	for ECH02-1	●													0	A	①	1	0	1	350W x 4units x 1.2/ 3.5 or 4KVA = 1unit
ECH03	RISC Station Running UNIX	for practice	×										○			10	A	—	0	0	0	No need UNIX machine

#### Software

ECS01	IC Design for UNIX Platform(a) VLSI	for IC training	×										○			2	A	—	0	0	0	No need UNIX machine
ECS02	IC Design Tool for PC	for IC training	●	○												2	A	Spec1	8	0	8	Install to 8 computers
ECS03	MATLAB for PC	for IC training	●	○												2	A	②	2	0	2	Install to 2 computers



No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	
ECS04	Digital and analog circuit design and simulation software	Digital and analog circuit design training	●	○												1	A	②	2	0	2	Install to 2 computers
ECS05	PCB design software	PCB design training	●	○												1	A	②	2	0	2	Install 2 computers
ECS06	Antenna Design Software for PC	Antenna making training	×										○			1	A	—	0	0	0	High cost
ECS07	Image Processing and Computer Graphics design software for UNIX platform	Circuit design training	×										○			1	A	—	0	0	0	No need UNIX machine
ECS08	Labview	Circuit design training	●	○												1	A	②	2	0	2	Install to 2 computers
ECS09	Mathematica	Circuit design training	●	○												1	B	②	2	0	2	Install to 2 computers
ECS10	NEC - Numeric Electronic Code	Numeric control training	×										○			1	A	—	0	0	0	No need
ECS11	Mathcad for PC	Circuit design training	×										○			1	A	—	0	0	0	No need
ECS12	RF design and simulation software	Radio design training	×										○			1	A	—	0	0	0	Specific software
ECS13	Optical System/Network Design	Opt-system network training	●	○												1	A	②	2	0	2	Install to 2 computers

**Common Laboratory Equipment**

ECL01	Computer Table	for practice	●							○						18	B	Spec1	16	0	16	1 table / 2 students
ECL02	Chairs	for practice	●							○						40	B	Spec1	32	0	32	for all students
ECL03	White Board	for Instruction	×												○	1	B	—	0	0	0	Procured by University
ECL04	Display Board	for Instruction	×												○	1	B	—	0	0	0	Procured by University
ECL05	Storage Cupboard and Racks	for Equipment storage	●							○						2	B	②	2	0	2	—

**XIII. Multimedia Laboratory****Image Processing**

MLT01	Personal Computer System for Teacher	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT02	17" Display	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT03	Main Control Unit for Teacher	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT04	Main Control System for Teacher	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT05	Head Set Box for Teacher	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT06	Main Control Console for Teacher	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT07	Monitor Television for Teacher	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT08	Personal Computer System for Student	for computer training	×	○												16	B	—	0	0	0	Use Normal computer
MLT09	17" Display	for computer training	×	○												16	B	—	0	0	0	Use Normal computer
MLT10	Booth Box for Student	for computer training	×	○												16	B	—	0	0	0	Use Normal computer
MLT11	Main Control System for Student	for computer training	×	○												16	B	—	0	0	0	Use Normal computer
MLT12	Main Control Console for Student	for computer training	×	○												8	B	—	0	0	0	Use Normal computer
MLT13	Monitor Television for Student	for computer training	×	○												8	B	—	0	0	0	Use Normal computer
MLT14	Intercom System	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT15	Scan Converter	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT16	Audio Video Control Console	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT17	Video Distribution Amplifier	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT18	DC Cam Recorder	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT19	Monitor Television	for computer training	×	○												4	B	—	0	0	0	Use Normal computer
MLT20	Video Presentation Stand	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT21	Wireless Microphone System	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT22	Public Address System	for computer training	×	○												1	B	—	0	0	0	Use Normal computer
MLT23	UPS 7.5kVA backup time: 10 minutes	for computer training	×	○												1	B	—	0	0	0	Use Normal computer

**Internet Technology**

MLT24	Personal Computer System	for internet technology training	×	○												16	B	—	0	0	0	No curriculum
MLT25	17" Display	for internet technology training	×	○												16	B	—	0	0	0	No curriculum
MLT26	Color Printer	for internet technology training	×	○												4	B	—	0	0	0	No curriculum
MLT27	Scanner	for internet technology training	×	○												2	B	—	0	0	0	No curriculum
MLT28	MO Drive Unit	for internet technology training	×													4	B	—	0	0	0	No curriculum
MLT29	Digital Video Cassette Player	for internet technology training	×	○												4	B	—	0	0	0	No curriculum
MLT30	VHS Cassette Recorder	for internet technology training	×													4	B	—	0	0	0	No curriculum
MLT31	Input Matrix Selector	for internet technology training	×													4	B	—	0	0	0	No curriculum

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo	
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned		
MLT32	CD Player	for internet technology training	×													4	B	—	0	0	0	No curriculum	
MLT33	MD Player	for internet technology training	×	○												4	B	—	0	0	0	No curriculum	
MLT34	Monitor Television	for internet technology training	×	○												4	B	—	0	0	0	No curriculum	
MLT35-1	Table for Personal Computer / Chairs	for internet technology training	×								○					16	B	—	0	0	0	No curriculum	
MLT35-2		for internet technology training	×								○					—		—	0	0	0	No curriculum	
MLT36	System Rack for AV Equipment	for internet technology training	×												○	4	B	—	0	0	0	No curriculum	
MLT37	UPS 7.5kVA Backup Time : 10 minutes	for internet technology training	×	○												1	B	—	0	0	0	No curriculum	
MLT38	Software : Macromedia Authorware	for internet technology training	×	○												16	B	—	0	0	0	No curriculum	
2D Graphic and Animation																							
MLT39	Personal Computer System for Graphics	for CG training	×													5	B	—	0	0	0	No need	
MLT40	21" Color Display	for CG training	×													5	B	—	0	0	0	No need	
MLT41	Color Printer	for CG training	×													2	B	—	0	0	0	No need	
MLT42	UPS 5kVA Backup time : 10 minutes	for CG training	×													1	B	—	0	0	0	No need	
MLT43	Software : 2D Graphic & Animation softw	for CG training	×	○												5	B	—	0	0	0	No need	
MLT44	Software : Picture and sound libraries	for CG training	×													5	B	—	0	0	0	No need	
MLT45	Table for PC / Chairs	for CG training	×													5	B	—	0	0	0	No need	
Non-Linear Digital Video Editing																							
MLT46	Non-liner Editing Processor Unit	for Video editing	×	○												4	B	—	0	0	0	Low priority	
MLT47	Digital Video Recorder	for Video editing	×	○												4	B	—	0	0	0	Low priority	
MLT48	21" Color Display	for Video editing	×	○												4	B	—	0	0	0	Low priority	
MLT49	Video Monitor	for Video editing	×	○												4	B	—	0	0	0	Low priority	
MLT50	Audio Mixer	for Video editing	×	○												4	B	—	0	0	0	Low priority	
MLT51	Audio Monitor	for Video editing	×	○												4	B	—	0	0	0	Low priority	
MLT52	CD Player	for Video editing	×	○												4	B	—	0	0	0	Low priority	
MLT53	MD Player	for Video editing	×	○												4	B	—	0	0	0	Low priority	
MLT54	Operation Desk / Chairs	for Video editing	×								○					4	B	—	0	0	0	Low priority	
MLT55	UPS 7 kVA Backup time : 10 minutes	for Video editing	×	○												1	B	—	0	0	0	Low priority	
Audio / Video																							
MLT56	2/3" 3CCD Color Video Camera	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT57	Camera Tools	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT58	Camera Control Unit	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT59	5" View Finder	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT60	Camera Cable	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT61	Zoom Lens	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT62	Tri-pods	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT63	Video Monitor TV for Studio Floor	for studio audio video editing	×	○												2	B	—	0	0	0	Low priority	
MLT64	Audio Monitor Speaker for Studio Floor	for studio audio video editing	×	○												2	B	—	0	0	0	Low priority	
MLT65	Clip-on Wireless Microphone	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT66	Hand Held Dynamic Microphone	for studio audio video editing	×	○												2	B	—	0	0	0	Low priority	
MLT67	8-input Video Mixer with Digital Effect	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT68	8-input Audio Mixer	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT69	Character Generator	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT70	Digital Video Recorder	for studio audio video editing	×	○												3	B	—	0	0	0	Low priority	
MLT71	VHS VTR	for studio audio video editing	×	○												2	B	—	0	0	0	Low priority	
MLT72	Video Monitor TV for Control Room	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT73	Audio Monitor System for Control Room	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT74	Video Distribution Amplifier	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT75	Audio Distribution Amplifier	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT76	Wave Form Monitor	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT77	Vector Scope	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	
MLT78	X-Y Scope	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority	

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	
MLT79	Sync Generator	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority
MLT80	CD Player	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority
MLT81	MD Player	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority
MLT82	Studio Lighting System	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority
MLT83	Operation Console	for studio audio video editing	×								○					1	B	—	0	0	0	Low priority
MLT84	System Rack	for studio audio video editing	×								○					3	B	—	0	0	0	Low priority
MLT85	Monitor Rack	for studio audio video editing	×								○					1	B	—	0	0	0	Low priority
MLT86	UPS 7 kVA Backup time : 10 minutes	for studio audio video editing	×	○												1	B	—	0	0	0	Low priority

**DTP**

MLT87	Personal Computer	DTP making	×	○												4	B	—	0	0	0	No need
MLT88	21" Display	DTP making	×	○												4	B	—	0	0	0	No need
MLT89	Color Printer	DTP making	×	○												4	B	—	0	0	0	No need
MLT90	Scanner	DTP making	×	○												4	B	—	0	0	0	No need
MLT91	MO Drive Unit	DTP making	×	○												4	B	—	0	0	0	No need
MLT92	UPS 3 kVA Backup time : 10 minutes	DTP making	×	○												1	B	—	0	0	0	No need
MLT93	Table for Personal Computer	DTP making	×								○					4	B	—	0	0	0	No need
MLT94	Software : Page Maker 6.5	DTP making	×	○												4	B	—	0	0	0	No need
MLT95	Software : Acrobat	DTP making	×	○												4	B	—	0	0	0	No need
MLT96	Digital Video Camera	DTP making	×	○												4	B	—	0	0	0	No need

**Web**

MLT97	Fire Wall	illegal access protection technology	×	○												1	A	—	0	0	0	No need
MLT98	Net Server for Internet Connection	Illegal access protection technology	×	○												1	A	—	0	0	0	No need
MLT99	Internet Kit	Illegal access protection technology	×	○												1	A	—	0	0	0	No need
MLT100	Filtering Soft	Illegal access protection technology	×													1	A	—	0	0	0	No need
MLT101	17" Display	Illegal access protection technology	×													2	A	—	0	0	0	No need
MLT102	UPS 2 kVA Backup time : 10 minutes	Illegal access protection technology	×													1	A	—	0	0	0	No need
MLT103	Table for PC	Illegal access protection technology	×								○					1	A	—	0	0	0	No need

**Network**

MLT104	Ethernet Switches / Hub and Accessories	for LAN	×	○												1	A	—	0	0	0	Use existing equipment
MLT105	Ether network Cable and Accessories	for LAN	×	○												1	A	—	0	0	0	Use existing equipment

**XIV. General Equipment**

GSH01	PABX	for Network	×		○											1	A	Spec1	0	0	0	No need
GSH02	Diesel Power Generator	for standby power	●		○											1	A	Spec1	1	0	1	for standby

**XV. Spare parts for equipment under Grant Aid 1987**

EE11	Pocket Tachometer	Reflection tape	×	○												2	C	—	0	0	0	
EE12	Pocket Tachometer	Reflection tape	×	○												2	C	—	0	0	0	
EE13	Pocket Tachometer	Rubber chip	×	○												2	C	—	0	0	0	
EE20	Analog Multimeter	Register rock	×	○												3	C	—	0	0	0	Discontinued
EE23	Analog Multimeter	Service manual	×	○												1	C	—	0	0	0	Discontinued
		Prove	×	○												6	C	—	0	0	0	Discontinued
EE24	Digital Storage Oscilloscope	Service manual	×	○												1	C	—	0	0	0	Discontinued
		Prove	×	○												2	C	—	0	0	0	Discontinued
EE25	Insulated Terminals	Black terminal	×	○												200	C	—	0	0	0	Discontinued
		Red terminal	×	○												200	C	—	0	0	0	Discontinued
		Yellow terminal	×	○												200	C	—	0	0	0	Discontinued

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	
		Blue terminal	×	○												200	C	—	0	0	0	Discontinued
		Green terminal	×	○												200	C	—	0	0	0	Discontinued
		White terminal	×	○												200	C	—	0	0	0	Discontinued
EE37	Thyristor Trainer For fundamental exercise to study the operation principle of thyristor circuit	U-link	×	○												5	C	—	0	0	0	Discontinued
		AS-4PB code	×	○												12	C	—	0	0	0	Discontinued
		Code with plug	×	○												3	C	—	0	0	0	Discontinued
		Code with plug	×	○												3	C	—	0	0	0	Discontinued
		Code with plug	×	○												10	C	—	0	0	0	Discontinued
		Code with plug	×	○												4	C	—	0	0	0	Discontinued
		Code with plug	×	○												4	C	—	0	0	0	Discontinued
		Fuse	×	○												10	C	—	0	0	0	Discontinued
		Photo transistor	×	○												4	C	—	0	0	0	Discontinued
		U-link	×	○												4	C	—	0	0	0	Discontinued
		Fuse	×	○												5	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Lamp	×	○												2	C	—	0	0	0	Discontinued
		Small lamp	×	○												2	C	—	0	0	0	Discontinued
		Switch	×	○												2	C	—	0	0	0	Discontinued
		Switch	×	○												2	C	—	0	0	0	Discontinued
		Relay	×	○												2	C	—	0	0	0	Discontinued
	For non-contact switching exercise of DC and AC circuits	Cylista	×	○												2	C	—	0	0	0	Discontinued
		Transistor	×	○												2	C	—	0	0	0	Discontinued
		Code with plug	×	○												2	C	—	0	0	0	Discontinued
		Code with plug	×	○												2	C	—	0	0	0	Discontinued
		Code with plug	×	○												2	C	—	0	0	0	Discontinued
		Code with plug	×	○												6	C	—	0	0	0	Discontinued
		Code with plug	×	○												6	C	—	0	0	0	Discontinued
		Code with plug	×	○												6	C	—	0	0	0	Discontinued
		Lamp remover	×	○												1	C	—	0	0	0	Discontinued
		U-link	×	○												4	C	—	0	0	0	Discontinued
		Fuse	×	○												10	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												4	C	—	0	0	0	Discontinued
		Diode	×	○												4	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Lamp	×	○												2	C	—	0	0	0	Discontinued
		Pilot lamp	×	○												2	C	—	0	0	0	Discontinued
		Pilot lamp	×	○												6	C	—	0	0	0	Discontinued
		Cylista	×	○												2	C	—	0	0	0	Discontinued
	For thyristor inverter exercise	Transistor	×	○												2	C	—	0	0	0	Discontinued
		Transistor	×	○												2	C	—	0	0	0	Discontinued
		Code with plug	×	○												2	C	—	0	0	0	Discontinued
		Code with plug	×	○												2	C	—	0	0	0	Discontinued
		Code with plug	×	○												6	C	—	0	0	0	Discontinued
		Code with plug	×	○												8	C	—	0	0	0	Discontinued
		Code with plug	×	○												8	C	—	0	0	0	Discontinued
		U-link	×	○												3	C	—	0	0	0	Discontinued

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	
		Fuse	×	○												10	C	—	0	0	0	Discontinued
		Fuse	×	○												10	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												4	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Diode	×	○												2	C	—	0	0	0	Discontinued
		Pilot lump	×	○												2	C	—	0	0	0	Discontinued
		Cylista	×	○												2	C	—	0	0	0	Discontinued
		Cylista	×	○												2	C	—	0	0	0	Discontinued
		Transistor	×	○												2	C	—	0	0	0	Discontinued
		Transistor	×	○												2	C	—	0	0	0	Discontinued
		Transistor	×	○												2	C	—	0	0	0	Discontinued
EE39	Thyristor Leonard Experiment System	Fuse	×	○												6	C	—	0	0	0	Discontinued
		Cylista	×	○												4	C	—	0	0	0	Discontinued
EE41	Chpper Driven DC Motor	Rabbit fuse	×	○												6	C	—	0	0	0	Discontinued
		Cylista	×	○												4	C	—	0	0	0	Discontinued
EE-42/43	Thyristor Inverter System Trainer	Cylista	×	○												4	C	—	0	0	0	Discontinued
		Digital Multimeter	×	○												2	C	—	0	0	0	Discontinued
		Shillistare	×	○												10	C	—	0	0	0	Discontinued
		Diode	×	○												5	C	—	0	0	0	Discontinued
		Fuse	×	○												20	C	—	0	0	0	Discontinued
EE48	Uninterruptible Powe Supply	Circuit board	×	○												10	C	—	0	0	0	Discontinued
		Circuit board	×	○												1	C	—	0	0	0	Discontinued
		Circuit board	×	○												1	C	—	0	0	0	Discontinued
		Circuite board	×	○												1	C	—	0	0	0	Discontinued
		Battery	×	○												5	C	—	0	0	0	Discontinued
EE24	Digital Storage Oscilloscope	Circuit board	×	○												1	C	—	0	0	0	Discontinued
		Circuit board	×	○												1	C	—	0	0	0	Discontinued
		Circuit board	×	○												1	C	—	0	0	0	Discontinued
		Prove	×	○												2	C	—	0	0	0	Discontinued
EE1	Clip on AC Power Meter		×	○												1	C	—	0	0	0	Discontinued
EE8	Galvanometer		×	○												1	C	—	0	0	0	Discontinued
EE4	Flum Meter	Search coil	×	○												1	C	—	0	0	0	Discontinued
		Search coil	×	○												1	C	—	0	0	0	Discontinued
		Search coil	×	○												1	C	—	0	0	0	Discontinued
		Service manual	×	○												1	C	—	0	0	0	Discontinued
EE18	Portable Lux Meter		×	○												1	C	—	0	0	0	Discontinued
EE19	Portable Whetstone Bridge	Service manual	×	○												1	C	—	0	0	0	Discontinued
EE10	Precision Double Bridge	Code with plug	×	○												1	C	—	0	0	0	
		Service manual	×	○												1	C	—	0	0	0	Discontinued
EE23	Oscilloscope	Prove	×	○												3	C	—	0	0	0	Discontinued
EE2	Gauss Meter	Flat Prove	×	○												1	C	—	0	0	0	Discontinued
		Flat Prove	×	○												1	C	—	0	0	0	Discontinued
		Actual Prove	×	○												1	C	—	0	0	0	Discontinued
		Service manual	×	○												1	C	—	0	0	0	Discontinued
EE22	Function Generator	Service manual	×	○												1	C	—	0	0	0	Discontinued
EE38	Plastic Coated White Steel Morning Board		×	○												1	C	—	0	0	0	Discontinued
EET-33	LCR Meter	PCB	×	○												1	C	—	0	0	0	Discontinued
		PCB	×	○												1	C	—	0	0	0	Discontinued
		PCB	×	○												1	C	—	0	0	0	Discontinued

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planned	
EET-34, EET-41	Oscilloscope	Prove	×	○												10	C	—	0	0	0	Discontinued
		Knob	×	○												30	C	—	0	0	0	Discontinued
		Knob	×	○												5	C	—	0	0	0	Discontinued
		Knob	×	○												10	C	—	0	0	0	Discontinued
		Power source	×	○												4	C	—	0	0	0	Discontinued
		Sweeve	×	○												2	C	—	0	0	0	Discontinued
		Sweeve	×	○												2	C	—	0	0	0	Discontinued
		CRT control	×	○												2	C	—	0	0	0	Discontinued
		Switch	×	○												2	C	—	0	0	0	Discontinued
		CRT connector	×	○												3	C	—	0	0	0	Discontinued
		Switch	×	○												10	C	—	0	0	0	Discontinued
EET-57	Oscilloscope	Prove	×	○												2	C	—	0	0	0	Discontinued
		Power source	×	○												1	C	—	0	0	0	Discontinued
		Switch	×	○												10	C	—	0	0	0	Discontinued
		Relay	×	○												4	C	—	0	0	0	Discontinued
		Control knob	×	○												10	C	—	0	0	0	Discontinued
EET-60	CR Oscillator	Power switch	×	○												4	C	—	0	0	0	Discontinued
EET-73	Precision Digital Multimeter, DC Voltage, Resistance and AC Voltage	Prove	×	○												1	C	—	0	0	0	Discontinued
EET-26	DC/AC Voltage, Current, Ohm Calibrator	Prove	×	○												1	C	—	0	0	0	Discontinued
EET-57	Digital Hi Tester	Mother board	×	○												5	C	—	0	0	0	Discontinued
EET-59	Digital Hi Tester	Test prove	×	○												5	C	—	0	0	0	Discontinued
EET-66	Microwave Frequency Counter	IC	×	○												8	C	—	0	0	0	Discontinued
		IC	×	○												12	C	—	0	0	0	Discontinued
		IC	×	○												8	C	—	0	0	0	Discontinued
		IC	×	○												6	C	—	0	0	0	Discontinued
		IC	×	○												10	C	—	0	0	0	Discontinued
		IC	×	○												12	C	—	0	0	0	Discontinued
		IC	×	○												10	C	—	0	0	0	Discontinued
		IC	×	○												8	C	—	0	0	0	Discontinued
		IC	×	○												6	C	—	0	0	0	Discontinued
EET-26	Modulation Demodulation Trainer	Transistor	×	○												12	C	—	0	0	0	Discontinued
		Transistor	×	○												12	C	—	0	0	0	Discontinued
		Transistor	×	○												12	C	—	0	0	0	Discontinued
EET-62	FM/AM Standard Signal Generator	IC	×	○												6	C	—	0	0	0	Discontinued
		IC	×	○												10	C	—	0	0	0	Discontinued
		IC	×	○												12	C	—	0	0	0	Discontinued
		IC	×	○												10	C	—	0	0	0	Discontinued
		ROM	×	○												12	C	—	0	0	0	Discontinued
		Transistor	×	○												10	C	—	0	0	0	Discontinued
EET-19	Digital System Trainer (2Nos)	Chip code	×	○												24	C	—	0	0	0	Discontinued
		Chip code	×	○												24	C	—	0	0	0	Discontinued
		Chip code	×	○												24	C	—	0	0	0	Discontinued
		Chip code	×	○												24	C	—	0	0	0	Discontinued
		Chip code	×	○												24	C	—	0	0	0	Discontinued
		Chip code	×	○												24	C	—	0	0	0	Discontinued
		Chip code	×	○												24	C	—	0	0	0	Discontinued
		Chip code	×	○												24	C	—	0	0	0	Discontinued
		Power code	×	○												2	C	—	0	0	0	Discontinued
		Fuse	×	○												10	C	—	0	0	0	Discontinued
		Fuse	×	○												10	C	—	0	0	0	Discontinued

No	Description	Purpose	Decision	Priority Equip.					Non-Priority			Non-Procured				Qty requested	University's Priority	Category	Qty calculation			Memo
				Curricula	No finance	Lack	Old	Maintenance	Low benefit	Office	Desk	Modification	Not familiar	Other donors	Board				Necessary Qty	Existing	Qty Planed	
EET-3	Model Computer System	Chip code	×	○												10	C	—	0	0	0	Discontinued
		Chip code	×	○												10	C	—	0	0	0	Discontinued
		Chip code	×	○												10	C	—	0	0	0	Discontinued
		Chip code	×	○												10	C	—	0	0	0	Discontinued
		Connector	×	○												1	C	—	0	0	0	Discontinued
		Lamp	×	○												25	C	—	0	0	0	Discontinued
		Diode	×	○												20	C	—	0	0	0	Discontinued
		Diode	×	○												10	C	—	0	0	0	Discontinued
		Diode	×	○												10	C	—	0	0	0	Discontinued
		Power code with plug	×	○												1	C	—	0	0	0	Discontinued
		Regulator	×	○												10	C	—	0	0	0	Discontinued

**(2) Planned equipment list**

The planned equipment list according to the Table 2-4 Equipment selection criteria is shown in the Table 2-5.



Table 2-5 Planed Equipment

Item No.	Description	Specifications	Q'ty	Purpose
<b>Publication Unit</b>				
<b>Hardware</b>				
PUB01-1	Personal Computer A	Pentium 4, 256MB, 40GB	1	for Text making
PUB01-2	UPS	1 kVA	1	for computer 1 unit
PUB02	Scanner	A4	1	for Text making
PUB04	Laser printer (B&W)	A3	1	for Text making
PUB09	Heavy duty printer	A3, 400dpi	1	for Text making
<b>Network</b>				
NET01	Central Switch	12 ports, 24Gbps capacity	1	for Network of Dept. of Elect. & Telecom. Eng.
NET02	Server switch	24 ports, 1Gbps	1	for Network of Dept. of Elect. & Telecom. Eng.
NET03	CAD switch	24 ports, 1Gbps	1	for Network of Dept. of Elect. & Telecom. Eng.
NET04-1	Switch for each floor A	24 ports, 1Gbps	1	for Network of Dept. of Elect. & Telecom. Eng.
NET04-2	Switch for each floor B	24 ports, 1Gbps	11	for Network of Dept. of Elect. & Telecom. Eng.
NET05	Wireless access switch	11 Mbps	6	for Network of Dept. of Elect. & Telecom. Eng.
NET06	Additional switch	16 ports	3	for Network of Dept. of Elect. & Telecom. Eng.
<b>Computer system laboratory</b>				
<b>Hardware</b>				
CSH01	Main Server	Dual processor, 36GB x 4	1	for Network of Dept. of Elect. & Telecom. Eng.
CSH02	Mail Server	Dual processor, 36GB x 4	1	for Network of Dept. of Elect. & Telecom. Eng.
CSH03	File Server	Dual processor, 36GB x 4	1	for Network of Dept. of Elect. & Telecom. Eng.
CSH04	Personal Computer A	Pentium 4, 256MB, 40GB	30	Practice for students
CSH05	Laser Printer	A3	3	for report printing
CSH06	Dot Matrix Printer	160dpi, 106 figures	6	for draft report printing
CSH07	Plotter	914mm, 600dpi	1	for drawings printing
CSH08	UPS	5kVA	3	for Main server and computer
CSH09	Protocol Analyzer	64kbps	2	for internet protocol
CSH11	Zip drive	250MB	2	for data storage
CSH12	Unix-based workstations	Dual processor, 1GHz, RISC	1	for Unix practice
CSH13	Computer network experimental set-up	for LAN and Internet	1	for Network practice
<b>Software</b>				
CSS03	Visual Developer Studio	English version	10	for CSH04
CSS04	Cadence SPICE	Pspice	10	for CSH04
<b>Common Laboratory Equipment</b>				
CSL01	Computer Table	8,000×1,800×750mm	3	for CSH04
CSL02	Computer Chairs	with oil dump, 600 x 600mm, square or round seat	60	for CSH04
CSL05	Storage Cupboard	1,800×600 x 1,800mm	2	for Equipment storage
<b>Digital Electric Laboratory</b>				
<b>Basic Instrument</b>				
BDE01	Oscilloscope	100MHz, 2 channel, GPIB	20	General measuring instrument
BDE02	Digital Multimeter	DCV, ACV, Ohm, DCA, ACA	18	General measuring instrument
BDE03	Proto board	6 connector pin type	40	for practical circuit
BDE04	Logic Probe	120k Ohm, 10 $\mu$ s	20	for measuring voltage
BDE05	Pulse Generator	0.1 ~ 1 MHz	10	for circuit test
BDE06	Logic pulser	1M Ohm, 10 $\mu$ s	20	for gate circuit making
<b>Equipment for Regular Laboratory Use</b>				
DEH01	Digital Electronics Trainer Kit	NOT, ANT, OR, EX-OR, NAND, NOR logic	6	for Logic circuit training
DEH02	Microprocessor Trainer Kit	16bit, 32kB RAM, ROM	4	for microprocessor monitoring
DEH03	Microcontroller Trainer Kit	LCD or LED display	4	for microcontroller monitoring
DEH04	PLD Trainer Kit	PLA, PAL, GAL, LCA	3	for PLD system training
DEH05	PLC Trainer Kit	Output 16, Input 16	2	for traffic signal system training
DEH06	Logic Dart	1M Ohm, 30 $\mu$ s	2	for traffic signal system training
DEH07	Digital IC Tester	24 pin, IC socket	3	for Logic circuit training
DEH09	Microprocessor Emulator	32 bit, 7 figures LED	4	for microprocessor monitoring
DEH10	Single-board computers	EPROM	2	for circuit program training
<b>Special Purpose Equipment</b>				
DEH12	Handheld Digital Multimeter	DCV, ACV, DCA, ACA	4	Measuring device
DEH13	Dual Power Supply	0 ~ 30V	7	digital circuit training
DEH14	Digital Storage Oscilloscope (Low cost)	100MHz, 2 channels, GPIB	3	logic circuit training
DEH15	Logic Analyzer (Low cost)	100MHz, 16 channels	2	for circuit program training
<b>Common Laboratory Equipment</b>				
DEL01-1	Lab Bench Computer	Pentium 4, 256MB 40GB	6	for analysis
DEL01-2	UPS	3kVA	1	for DEL01-1
DEL02	Dot Matrix printer	160dpi, 106 figures	1	for draft report printing
DEL03	Basic Lab Bench	2,400 x 900 x 900 mm	20	for practice

Table 2-5 Planed Equipment

Item No.	Description	Specifications	Q'ty	Purpose
DEL04	Stools	300 x 300mm, square or round seat	<b>80</b>	for practice
DEL06	Tool kit for students	33 kinds or more	<b>2</b>	for assembling
DEL07	Storage Cupboards	1,800 x 600 x 1,800mm	<b>2</b>	for Equipment storage

**Analog Electronics Laboratory****Basic Laboratory Equipment**

BAE01	Dual Power Supply	0 ~ ±15V	<b>10</b>	for amplifier and frequency analysis
BAE02	Oscilloscope	50MHz, 2 channels	<b>20</b>	General measuring instrument
BAE04	Protoboard	6 connector pin type	<b>40</b>	logic circuit training
BAE05	Function Generator	0.1Hz ~ 1MHz	<b>7</b>	for feedback amplifier training

**Special Purpose Equipment**

AEH01	Electronic Thermometer	-50 ~ 200	<b>2</b>	General measuring instrument
AEH02	Clip-On Current Meter (ac/dc)	DCA, ACA, DCV, ACV	<b>2</b>	General measuring instrument
AEH03	Variable Frequency LCR Meter	42kHz ~ 1MHz	<b>3</b>	General measuring instrument
AEH04	Low Frequency Spectrum Analyzer	9kHz ~ 3GHz	<b>3</b>	for filtering training
AEH05	Digital Storage Oscilloscope (Low cost)	100MHz, 2 channels, GPIB	<b>3</b>	for filtering training
AEH06	Audio signal generator	40Hz ~ 10kHz	<b>5</b>	for BJT amplifier training
AEH07	Digital Multimeter	DCV, ACV, Ohm, DCA, ACA	<b>2</b>	for multi amplifier and frequency training
AEH08	Variacs	Rotary type	<b>5</b>	Oscillator training

**Common Laboratory Equipment**

AEL01-1	Lab Bench Computer	Pentium 4, 256MB, 40GB	<b>7</b>	for analysis
AEL01-2	UPS	1 kVA	<b>1</b>	for AEL01-1
AEL02	Dot Matrix printer	160dpi, 106 figures	<b>1</b>	for draft report printing
AEL03	Basic Lab bench	2,400 x 900 x 900 mm	<b>20</b>	for practice
AEL04	Stools	300 x 300mm, square or round seat	<b>80</b>	for practice
AEL06	Tool kit for students	33 kinds or more	<b>2</b>	for assembling
AEL08	Storage Cupboards and Racks	1,800 x 600 x 1,800mm	<b>2</b>	for Equipment storage

**Telecommunication Laboratory****Basic Laboratory Equipment**

BTC01	Dual Power Supply	0 ~ ±15V	<b>10</b>	for PAM, PWM, PPM, PCM training
BTC02	Oscilloscope	100MHz, 2 Channels, GPIB	<b>7</b>	Signal analysis
BTC03	Multimeter	DCV, ACV, Ohm, DCA, ACA	<b>7</b>	TV training
BTC04	High Frequency Signal Generator/ AM,FM Modulator/ Function Generator Unit	10KHz ~ 280MHz	<b>5</b>	Analog filter training
BTC06	Frequency Counter	5Hz ~ 10MHz	<b>1</b>	Noise measuring
BTC07	Protoboard	6 connectors pin type	<b>40</b>	General measuring instrument

**Equipment for Regular Laboratory Use**

TCH01	ASK/PSK/FSK Modulator	ASK, FSK, PSK	<b>4</b>	Digital modulator training
TCH02	Signal Amplifier	100kHz ~ 2GHz	<b>4</b>	Digital modulator training
TCH03	Spectrum Analyser	9kHz ~ 3GHz	<b>10</b>	Tone modulation effect measuring
TCH05	LCR Meter	42kHz ~ 1MHz	<b>2</b>	Analog filter training
TCH06	Colour TV trainer panel	PAL System	<b>4</b>	PAL TV training
TCH08	Colour TV receiver	29 inch	<b>3</b>	PAL TV training
TCH10	dB Meter	50µV ~ 150V	<b>2</b>	Spectrum analyzer
TCH12	Random Noise Generator	40Hz ~ 1.2MHz	<b>2</b>	CW modulation noise analysis
TCH13	Frequency Meter	10Hz ~ 20GHz	<b>2</b>	Analog signal noise analysis
TCH14	Small Telephony switch	Telephone exchanger, Telephone x 2	<b>3</b>	Telephone switch training
TCH15	Telephone line simulator	UTI-T	<b>2</b>	Telephone switch training

**Special Purpose Equipment**

TCH16	Measuring Receiver	25MHz ~ 950MHz	<b>3</b>	CM signal measuring
TCH17	GPS Receiver System	12 channels	<b>3</b>	Transmittal signal measuring
TCH18	DSP Trainer Kit	40MHz	<b>2</b>	Filter training for digital signal process
TCH19	Modulation Domain Analyzer	DC to 100MHz	<b>2</b>	Modulation analyzer training
TCH21	Digital Video Generator	PAL, Output 3	<b>4</b>	PAL TV training
TCH22	High Frequency Storage Oscilloscope	0 ~ 400MHz	<b>4</b>	Analog, digital signal transmission system training
TCH23	High Frequency Spectrum Analyzer	9kHz ~ 26GHz	<b>2</b>	Satellite signal analysis
TCH24	Video Signal Analyzer	NTSC / PAL	<b>2</b>	Color TV system training
TCH25	Transmission line measurement kit	2 ways step	<b>2</b>	Transmittal signal measuring
TCH26	Error Control Coding test kit	10KHz ~ 200MHz	<b>2</b>	Error control coding training
TCH27	TV Pattern Generator	16 x 20 dots	<b>2</b>	Color TV system training
TCH28	FM/AM Modulator Demodulator Trainer Panel	AM500 ~ 1,600kHz, FM20Hz ~ 15kHz	<b>4</b>	FM/AM modulation training
TCH29	PAM/PWM/PPM/PCM Trainer Panel	PAM, PWM, PPM, PCM	<b>2</b>	Digital transmission training
TCH30	ASK/PSK/FSK Modulator-Demodulator	ASK, PSK, FSK	<b>4</b>	Digital signal transmission analysis
TCH31	MPEG Board	MPEG card	<b>2</b>	for MPEG training
TCH32	MPEG Software	MPEG software	<b>2</b>	for MPEG training

**Software**

TCS01	Antenna Studies Software	MATLAB	<b>2</b>	Signal process training
TCS02	Filter Design Software	MATLAB, Toolbox, Filter design	<b>2</b>	Filter design training
TCS03	Digital Signal Processing Software	MATLAB, DSP	<b>2</b>	Digital signal process training

Table 2-5 Planed Equipment

Item No.	Description	Specifications	Q'ty	Purpose
<b>Common Laboratory Equipment</b>				
TCL01-1	Personal Computer	Pentium 4, 256MB, 40GB	6	Design practice
TCL01-2	UPS	3 kVA	1	for TCL01-1
TCL02	Dot Matrix Printer	160dpi, 106 figures	1	for draft report printing
TCL03	Basic Lab bench	2,400 x 900 x 900 mm	20	for practice
TCL04	Stools	300 x 300mm, square or round type	80	for practice
TCL08	Storage Cupboards and Racks	1,800 x 600 x 1,800mm	2	for Equipment storage

**Microwave Laboratory****Equipment for Regular Laboratory Use**

MWH02	Magnetron	3GHz	2	Microwave oven design training
MWH03	Gunn Oscillator, Power supply and	10 GHz	3	Wavelength, insulator training
MWH04	Spectrum Analyzer	10kHz ~ 25GHz	4	Antenna making
MWH05	Synthesized Sweep Signal Generator	125kHz ~ 2GHz	2	Microwave link training
MWH07	SWR Meter	12 ~ 18GHz	3	Wavelength, insulator training
MWH08	Microwave Tx. and Rx. System with	X and Ku band	1	Microwave transmission training
MWH09	Antenna Design Trainer kit	Yagi, D-Pole, Log antenna	1	Digital Signal processing training
MWH10	Satellite Receiver System	Parabolla antenna, IF input, RF output	1	Satellite signal analysis
MWH11	Field Strength Meter	300kHz ~ 3GHz	4	X-bang antenna making
MWH12	Experimental Radar kit	200m ~ 7km	1	Rader system training
MWH13	Microwave Transistors - Maximum	900MHz	10	X-bang antenna making
MWH14	Microwave Transistors - Maximum	10 GHz	10	X-bang antenna making
MWH15	Zero bias Schottky Detector Diodes	2GHz	10	X-bang antenna making
MWH16	PIN Diodes	1GHz	5	Microwave system training
MWH17	Impedance Bridge	0 ~ 15GHz	1	Microwave system training
MWH18	Cable Connectors : N(m) to BNC(f)	N(m) ~ BNC(f), P-J, J-J	5	Microwave system training
MWH19	Cable Connectors : K(m) to BNC(f)	K(m) ~ N(f), P-J, J-J	5	Microwave system training
MWH20	Cable Connectors : N(f) to BNC(m)	N(f) ~ BNC(m), P-J, J-J	5	Microwave system training
MWH21	Cable Connectors : K(f) to BNC(m)	K(f) ~ N(m), P-J, J-J	5	Microwave system training
MWH22	Cable Connectors : BNC(m) to BNC(f)	BNC(m) ~ BNC(f), P-J, J-J	5	Microwave system training

**Software**

MWS01	Antenna Design	MATLAB, Toolbox	1	Antenna making training
MWS02	Microwave Circuit Design	Fidelity	1	Microwave system training
MWS03	Radar Cross Section	LINMIC+	1	Rader cross section training

**Common Laboratory Equipment**

MWL01-1	Personal Computer	Pentium 4, 256MB, 40GB	7	for analysis
MWL01-2	UPS	2kVA	1	for MWL01-1
MWL02	Dot Matrix Printer	160dpi, 106 figures	1	for draft report printing
MWL03	Basic Lab Bench	1,800 x 900 x 900mm	16	for practice
MWL04	Stools	300 x 300mm, square and round seat	64	for practice
MWL08	Storage Cabinets and Racks	1,800 x 600 x 1,800mm	1	for Equipment storage

**Optoelectronics Laboratory****Basic Laboratory Equipment**

BOP01	Dual Power Supply	0 ~ ±15V	8	Transistor, opt-transmission training
BOP03	Multimeter	DCV, ACV, Ohm, DCA, ACA	1	Opt-transmission project
BOP04	Logic Probe	120k Ohm, 10ns	1	Opt-transmission project
BOP06	Protoboard	6 connector pin type	16	Phototransistor, Opt-insulator training

**Equipment for Regular Laboratory Use**

OPH02	Fibre Optic Educator Kit	1,310nm, 1,550nm	1	Fiber optic training
OPH03	Fibre Optic Monitor Kit	1,310nm, 1,550nm	1	Fiber optic training
OPH04	Fibre Optic Power Meter	1,310nm, 1,550nm	2	Transmission laser training
OPH05	LCD (Liquid Crystal Display) Panel	2 line, 20 figures	2	Display training
OPH07	LDR (Light Dependent Resistor)	1,310nm, 1,550nm	50	Parts
OPH08	Photo Diodes	840nm	20	Parts
OPH09	Optocouplers	840nm, 1,310nm, 1,550nm	20	Parts
OPH11	Lux Meter	20 ~ 200,000 lux	1	Opt-transmission project
OPH12	Optical spectrum analyzer	600 ~ 1,750nm	2	Transmission laser training
OPH13	Erbium doped fibre amplifier	1,480nm or 1,550nm	1	Erbium fiber amplifier training

**Common Laboratory Equipment**

OPL01	Basic Lab Bench	2,400 x 900 x 900 mm	8	for practice
OPL02	Stools	300 x 300mm, square or round seat	32	for practice
OPL03-1	Personal Computer	Pentium 4, 256MB, 40GB	2	for analysis
OPL03-2	UPS	2kVA	1	for OPL03-1
OPL04	Dot Matrix Printer	160dpi, 106 figures	1	for draft report printing
OPL08	Storage Cupboard and Racks	1,800 x 600 x 1,800mm	1	for Equipment storage

**Postgraduate Research Laboratory****Basic Laboratory Equipment**

BPG01	Dual Power Supply	0 ~ ±15V	20	General instrument
BPG02	Oscilloscope	50MHz, 2 channels	14	General measuring instrument

Table 2-5 Planed Equipment

Item No.	Description	Specifications	Q'ty	Purpose
BPG03	Multimeter	DCV, ACV, Ohm, DCA, ACA	10	General measuring instrument
BPG04	Protoboard	6 connector pin type	40	General instrument
BPG05	Logic Probe	120k ohm, 10ns	20	General instrument
BPG06	Audio Signal Generator	40Hz ~ 10KHz	9	General instrument
BPG08	Function Generator	0.1Hz ~ 1MHz	6	General instrument
<b>Laboratory Equipment</b>				
PGH01	Personal Computers	Pentium 4, 256MB, 40GB	5	for PGPRJ-01,PGPRJ-05,PGPRJ-07 etc
PGH02	Laser Printer	A3	1	for report printing
PGH05	Scanner	A4	1	for drawings scanning
PGH06	Digital Storage Oscilloscope	100 MHz, 2 channels, GPIB	1	for PGPRJ-06
PGH07	High Frequency Oscilloscope	DC ~ 250MHz	2	for PGPRJ-22
PGH08	Digital Frequency Synthesizer	125Hz ~ 2GHz	1	for PGPRJ-06
PGH10	Pseudo Random Signal Generator with	100Hz ~ 10MHz	2	General instrument
PGH11	dB Meter	50 $\mu$ V ~ 150V	2	General measuring instrument
PGH13	RF Generator	10Hz ~ 20MHz	2	for PGPRJ-19, PGPRJ-22
PGH14	Microwave Frequency Meter	600MHz ~ 20GHz	1	for PGPRJ-06
PGH23	Small Experimental ISDN Phone and	ISDN Telephone exchanger, Telephone	1	for PGPRJ-PGPRJ-38
PGH24	Logic Analyzer	100MHz, 16 channels	1	for PGPRJ-06, PGPRJ-07, PGRJ-18, PGPRJ-21, PGPRJ-23
PGH25	Low cost Spectrum Analyzer	10kHz ~ 25GHz	2	for PGPRJ-08, PGPRJ-22
PGH28	Logic Pulser	1 M Ohm, 10 $\mu$ s	5	for PGPRJ-06, PGPRJ-07, PGPRJ-18, PGPRJ-21, PGPRJ-23
PGH29	Logic Clip	20, 40pin	3	for PGPRJ-06, PGPRJ-07, PGPRJ-18, PGPRJ-21, PGPRJ-23
PGH34	Network Analyzer	10Hz ~ 300MHz	1	for PGPRJ-10, PGPRJ-13, PGPRJ-34
PGH35	Wireless Mobile and Base Station Test set	148 ~ 174MHz	1	for PGPRJ-02, PGPRJ-11, PGPRJ-16, PGPRJ-31, PGPRJ-55
PGH39	Wide Bandwidth RF Receiver	0.1 ~ 2,500MHz	1	for PGPRJ-19, PGPRJ-65, PGPRJ-76
PGH40	Programmable Step Attenuator	DC ~ 2GHz	1	for PGPRJ-19
PGH42	Synthesized RF Signal Generator	125Hz ~ 2GHz	1	for PGPRJ-19, PGPRJ-65
PGH43	RF Power Meter	10MHz ~ 20GHz	2	for PGPRJ-19, PGPRJ-65
PGH45	RF Terminations	DC ~ 80GHz	1	for PGPRJ-19
PGH46	RF Power Dividers/ Combiners	DC ~ 26.5 and 40GHz	1	for PGPRJ-19
PGH48	RF Amplifier (100kHz - 1.3 GHz)	100kHz ~ 2GHz	1	General equipment
PGH49	Field Strength Meter	300kHz ~ 3GHz	1	PGPRJ-15, PGPRJ-19, PGPRJ-65
PGH50	Microwave Noise Tubes and Noise Sources	10MHz ~ 3GHz	1	PGPRJ-15, PGPRJ-19
PGH51	Erbium Doped Fiber	0.5dB/km	1	for PGPRJ-03, PGPRJ-36
PGH52	Optical Source	1,310nm, 1,550nm	1	for PGPRJ-03, PGPRJ-36
PGH53	Optical Power Meter	1,310nm, 1,550nm	1	for PGPRJ-03, PGPRJ-36
PGH54	Fiber Optic Loss Test Kit	850nm, 1,310nm, 1,550nm	2	for PGPRJ-03
PGH55	Single Mode Variable Attenuator	GI Cable	1	for PGPRJ-03
PGH56	Optical Fiber Scope	0.25 ~ 1.2mm dia	1	for PGPRJ-03
PGH57	Optical Time Domain Reflectometer	45dB, 1.31nm	1	for PGPRJ-03
PGH58	Test and Measurement Hardware for	80MB/sec	1	for PGPRJ-21
PGH59	GPIB Programmer	IEEE-488	1	for PGPRJ-21
PGH60	Waveform Monitor	16.5kV	1	Sharing equipment
PGH61	Vectorscope	150mm rectangle wave, 16.5kV	1	CL305-01, CL305-03
PGH62	Video Signal Generator	PAL, 625 interace	1	for PGPRJ-36
PGH63	Audio Analyzer	10Hz ~ 150kHz	1	for PGPRJ-08
PGH64	Audio Distortion Meter	400Hz ~ 1kHz	1	for PGPRJ-65
PGH65	Audio Jitter Meter	EFM signal	1	for PGPRJ-65
PGH66	Audio Signal Level Meter	300 $\mu$ V ~ 100V	1	for PGPRJ-65
PGH67	NTSC/PAL Color Picture Monitor	PAL / NTSC	1	for PGPRJ-46
<b>Software</b>				
PGS01	Image Processing System	MATLAB, Toolbox	2	for PGPRJ-09
PGS02	MATLAB	MATLAB	2	for sharing computer
PGS03	Cellular Network Simulation/ Design and Planning Software	MATLAB complier, C/C++	1	for PGPRJ-02, PGPRJ-11, PGPRJ-16, PGPRJ-31, PGPRJ-55, PGPRJ-66
PGS05	LAN Network Simulation, Monitoring , Planning and Design Software	IEEE-802.3, Hub, LAN simulator	1	for PGPRJ-13, PGPRJ-26, PGPRJ-62
PGS07	LABVIEW	LABVIEW	6	for PGPRJ-21
PGS08	Mathematica	MATHEMATICA	2	for PGPRJ-05
<b>Common Laboratory Equipment</b>				
PGL01	Basic Lab Bench	1,600 x 900 x 900mm	20	for practice
PGL02	Stools	300 x 300mm, square or round seat	40	for practice
PGL03	Dot Matrix Printer	160dpi, 106 figures	2	for draft report printing
PGL04	Laser Printer	A3	1	for report printing
PGL08	Storage Cupboards and Racks	1,800 x 600 x 1,800mm	3	for Equipment storage
PGL09-1	Personal Computers	Pentium 4, 256MB, 40GB	6	for analysis
PGL09-2	UPS	5kVA	1	for PGL09-1 and PGH01

Table 2-5 Planed Equipment

Item No.	Description	Specifications	Q'ty	Purpose
<b>Electronic Workshop</b>				
<b>Basic Laboratory Equipment</b>				
BWS01	Dual Power Supply	0 ~ ±15V	2	Performance check
BWS02	Oscilloscope	50MHz, 2 channels	2	Performance check
BWS03	Multimeter	DCV, ACV, Ohm, DCA, ACA	2	Performance check
BWS04	Protoboard	6 connector type	4	Performance check
BWS05	Logic Probe	120k ohm, 10 $\mu$ s	2	Performance check
BWS06	Function Generator	0.1Hz ~ 1MHz	2	Performance check
<b>Equipment for Regular Laboratory Use</b>				
WS01	PCB Drilling Machine	0.5 ~ 6.5mm	1	for drilling
WS02	Solder Station	SMD type	1	for fixing solder
WS03	Desoldering Station	SM type	1	for removing IC and diode
WS04	Energy Analyzer	V, A, W	1	for measuring watt
WS05	Digital Light Meter	20 ~ 200,000 lux	1	for measuring brightness
WS06	Digital Sound Level Meter	28 ~ 130dB	1	Audio sound level measuring
WS07	Digital Humidity and Temperature Meter	-10 ~ 60 °C, 20 ~ 99.9%	1	Humidity and temperature measuring
WS10	Electronic Labeling Machine	Tape size, 6~24mm	1	Repair log tag
WS11	Electronics Engineers Tool Set	more than 19 types	2	for maintenance
WS13	Fluorescent Magnifier	fluorescent lamp 130mm, 20W	1	for small parts check
WS14	Scroll Saw	60mm	1	for case making
WS15	Electric Fretsaw	15mm stroke	1	for case cutting
WS16	Drill Bit Set	1 ~ 10mm	2	for drilling
WS17	Spanner Set	more than 8 types	2	for assembling
WS18	Portable Workstand	700 x 500mm	2	for assembling
WS21	High Voltage Probe	2.5kV	2	for high voltage
WS22	Differential Probe	for Oscilloscope	2	for maintenance
WS23	AC/DC Current Probe	15A	2	AC/DC current measuring
WS24	RF Frequency Counter	80MHz ~ 2GHz	1	RF frequency measuring
WS25	RF Connector Kit	N, M, SMA, J-J(N), J-P(N), P-J(N)	1	RF connector
WS26	Stacking Type Parts Storage Cabinets	60 or more drawers	2	Parts storage
<b>Common Laboratory Equipment</b>				
WSL01	Basic Lab bench	1,600 x 900 x 900mm	2	for maintenance
WSL02	Stools	300 x 300mm, square or round seat	2	for maintenance
WSL03-1	Personal Computer	Pentium 4, 256MB, 40GB	2	for analysis
WSL03-2	UPS	1kVA	1	for WSL03-1
WSL05	Laser Printer	A3	1	for report printing
WSL09	Storage Cabinets and Racks	1,800 x 600 x 1,800mm	2	for Equipment storage
<b>Electronic CAD Laboratory</b>				
<b>Hardware</b>				
ECH02-1	Personal Computer	Dual processor, 1.5GHz, 512MB, 80GB	8	for practice
ECH02-2	UPS	5kVA	1	for ECH02-1
<b>Software</b>				
ECS02	IC Design Tool for PC(a) Schematic	Pspice, A/D, Capture	8	for IC training
ECS03	MATLAB for PC	MATLAB	2	for IC training
ECS04	Digital and analog circuit design and simulation software	Pspice, A/D, Basic	2	Digital and analog circuit design training
ECS05	PCB design software	Capture, Layout	2	PCB design training
ECS08	Labview	LABVIEW	2	Circuit design training
ECS09	Mathematica	MATHEMATICA	2	Circuit design training
ECS13	Optical System/Network Design Software	OPNET Modeler	2	Opt-system network training
<b>Common Laboratory Equipment</b>				
ECL01	Computer Table	1,600 x 900 x 900mm	16	for practice
ECL02	Chairs	600 x 600mm	32	for practice
ECL05	Storage Cupboard and Racks	1,800 x 600 x 1,800mm	2	for Equipment storage
<b>General Equipment</b>				
GSH02	Diesel Power Generator	450kVA	1	for standby power

### **(3) Overall Plan**

The criteria of the equipment designing is that the sophisticated equipment for the operation and maintenance will not be planned, by mean of facilitating the daily experiment works by students, as well as the maintenance.

As for the planned installation site, the new building for the Department of Electronics and Telecommunication Engineering will be constructed by University of Moratuwa, using counter part fund from the Increased Food Production program, which has been conceived. This building will be 4-storeyed building, and the spaces for the laboratories will be secured for the project. At the time of explanatory mission for the draft final report, the construction work reached at 2<sup>nd</sup> floor, and it is planned to be completed by the end of July 2002. Then, the construction will not cause any problem for the project implementation.

The planed installation site is shown in the "Location map of the project site" at the opening page of this report.

### **2-2-3 Basic Design Drawing**

Equipment layout plan for the Department of Electronics and Telecommunication Engineering is shown in the Figure 2-8 ~ 2-20.

#### **(1) Laboratories disposition in the building**

- Figure 2-8      Ground floor plan of New building for  
Department of Electronics and Telecommunication Engineering
- Figure 2-9      First floor plan of New building for  
Department of Electronics and Telecommunication Engineering
- Figure 2-10     Second floor plan of New building for  
Department of Electronics and Telecommunication Engineering
- Figure 2-11     Third floor plan of New building for  
Department of Electronics and Telecommunication Engineering

#### **(2) Equipment Layout plan for the Department of Electronics and Telecommunication Engineering**

- |             |                       |                            |
|-------------|-----------------------|----------------------------|
| Figure 2-12 | Equipment Layout plan | Generator room             |
| Figure 2-13 | Equipment Layout plan | Computer Lab.              |
| Figure 2-14 | Equipment Layout plan | Digital Electronics Lab.   |
| Figure 2-15 | Equipment Layout plan | Analog Electronics Lab.    |
| Figure 2-16 | Equipment Layout plan | Workshop                   |
| Figure 2-17 | Equipment Layout plan | Optoelectronics Lab.       |
| Figure 2-18 | Equipment Layout Plan | Telecommunication Lab.     |
| Figure 2-19 | Equipment Layout Plan | Microwave Lab.<br>CAD Lab. |
| Figure 2-20 | Equipment Layout Plan | Post-Graduate Lab.         |

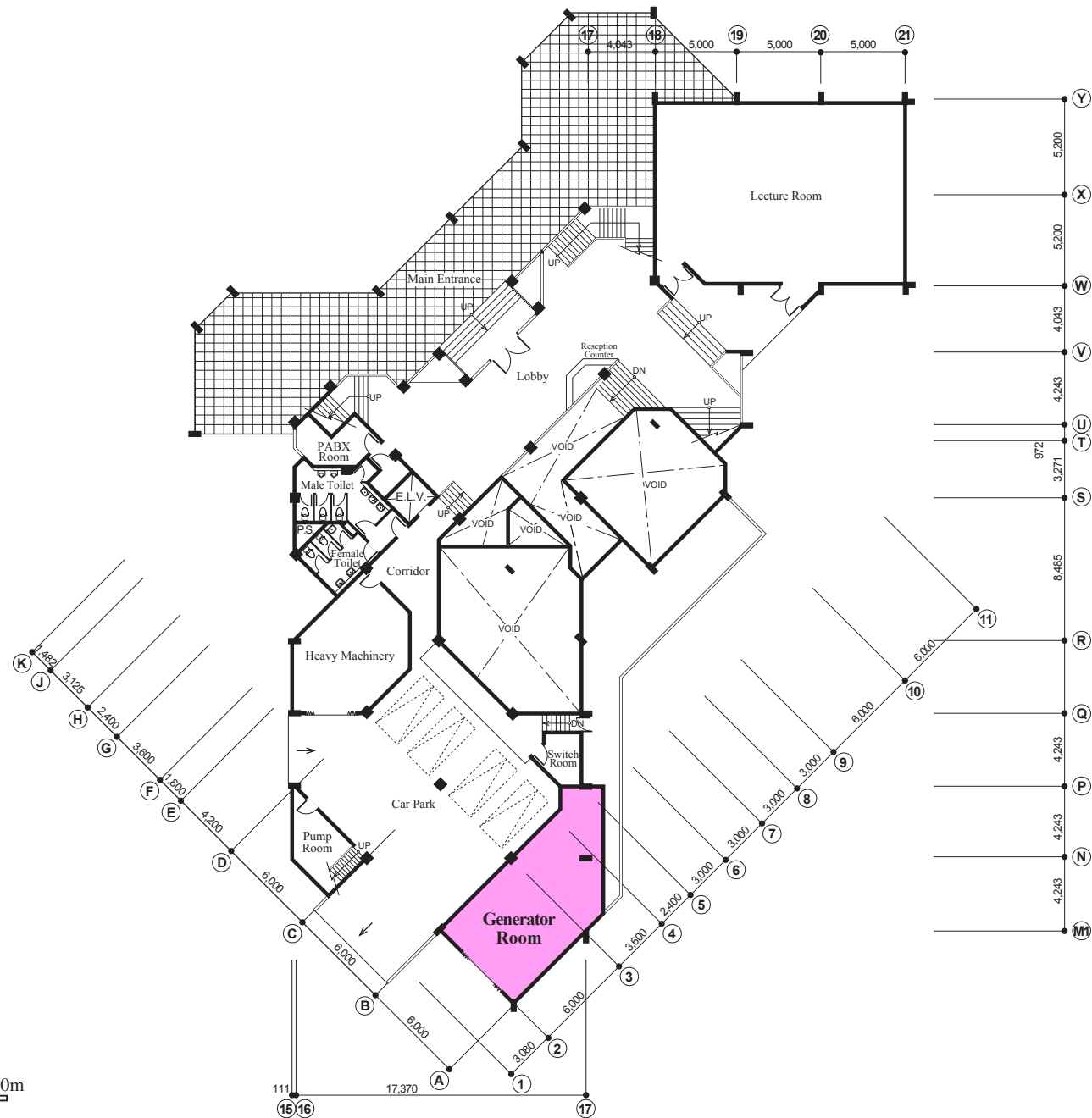


Figure 2-8 Ground Floor Plan of New Building for Department of Electronics & Telecommunication Engineering

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA



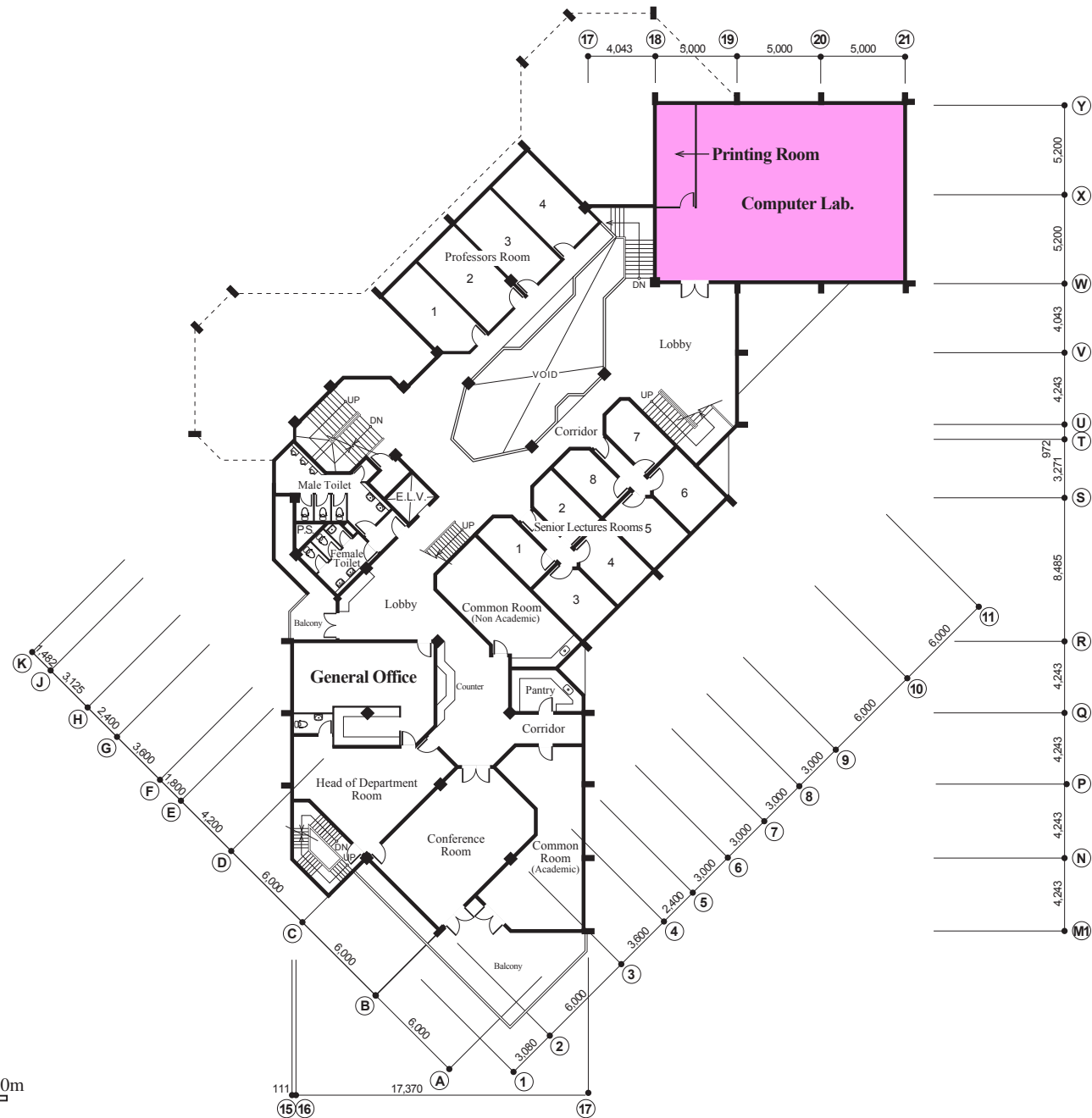


Figure 2-9 First Floor Plan of New Building for Department of Electronics & Telecommunication Engineering

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

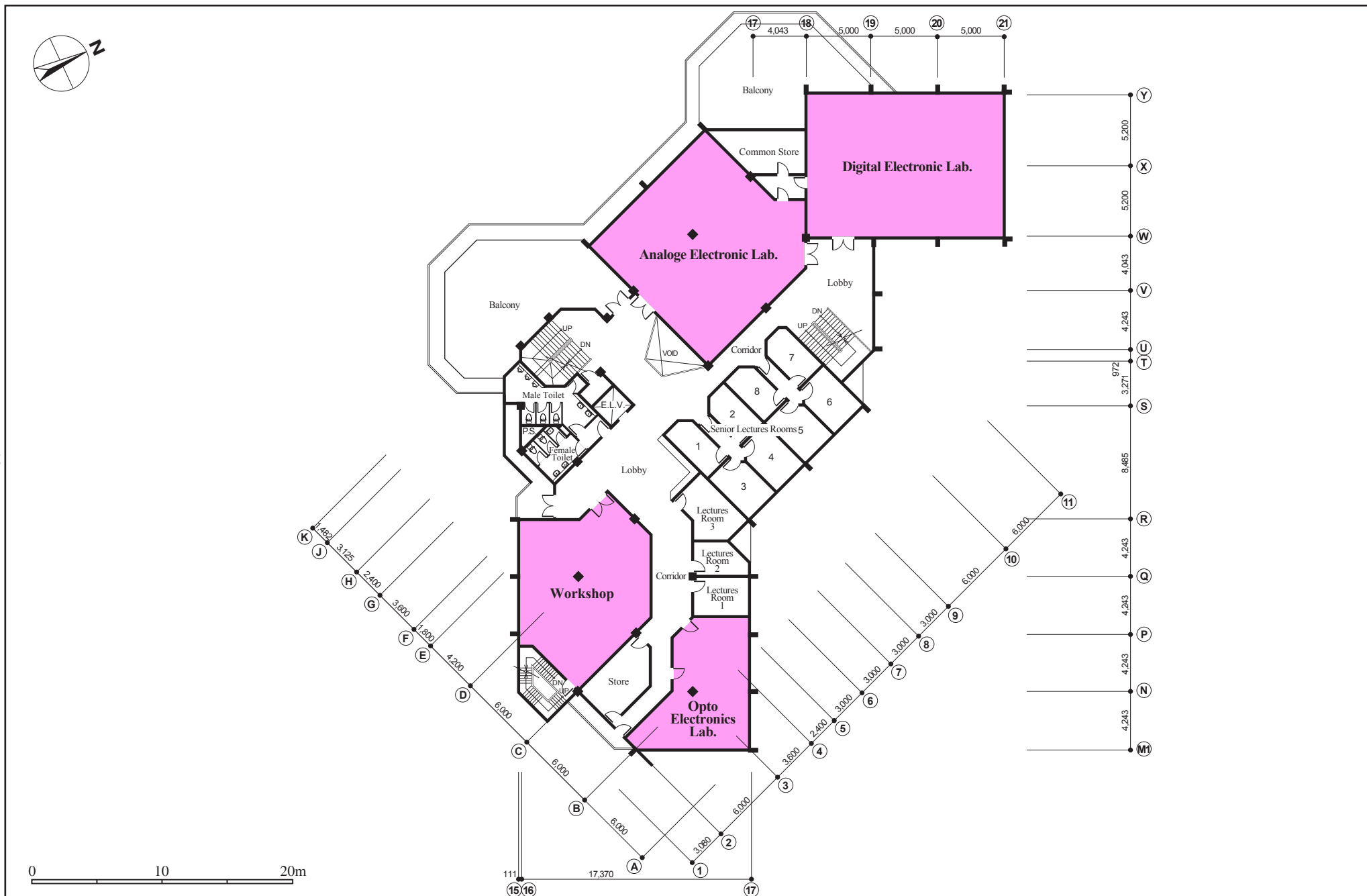


Figure 2-10 Second Floor Plan of New Building for Department of Electronics & Telecommunication Engineering

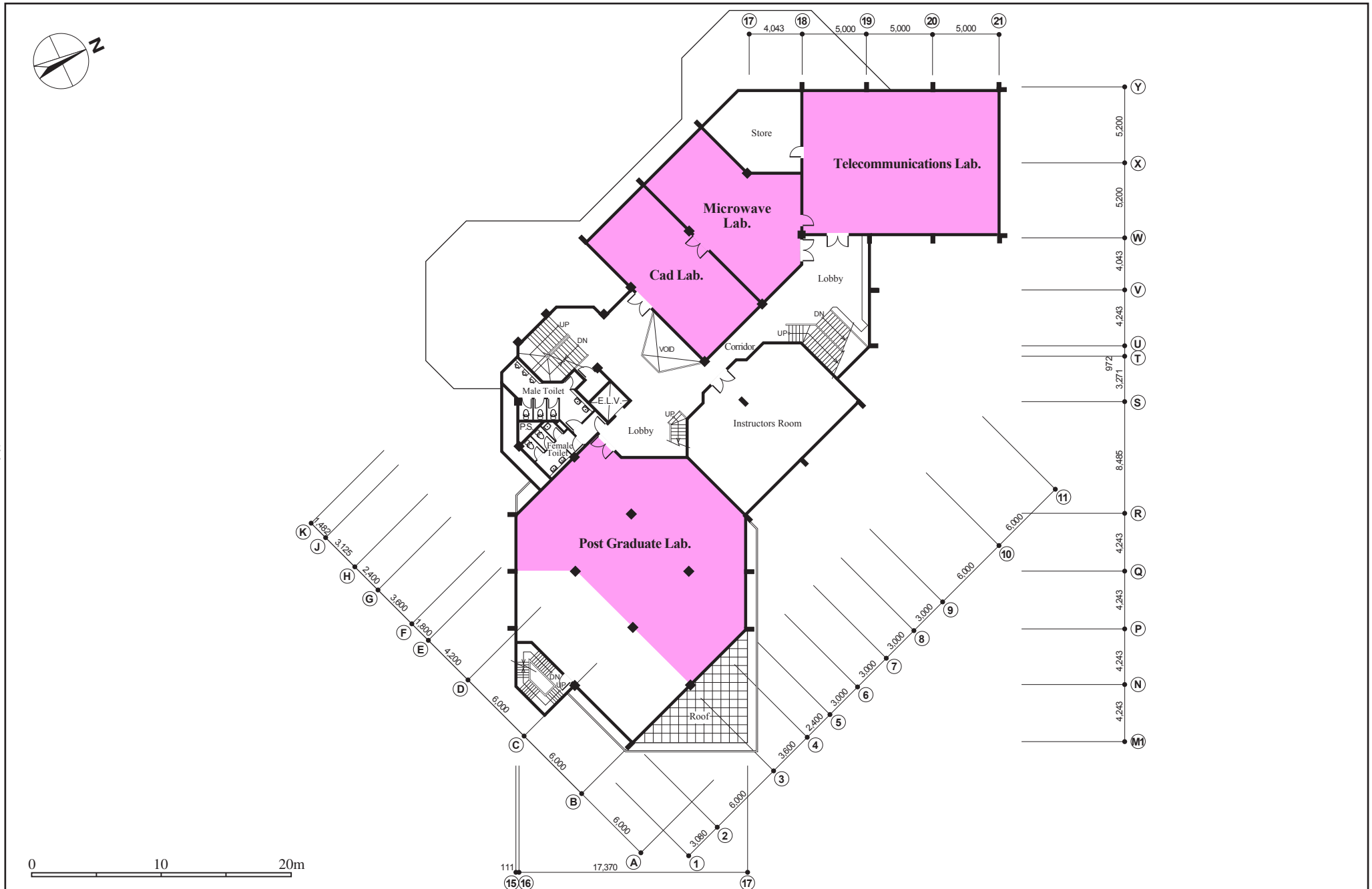


Figure 2-11 Third Floor Plan of New Building for Department of Electronics & Telecommunication Engineering

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

# GENERATER ROOM

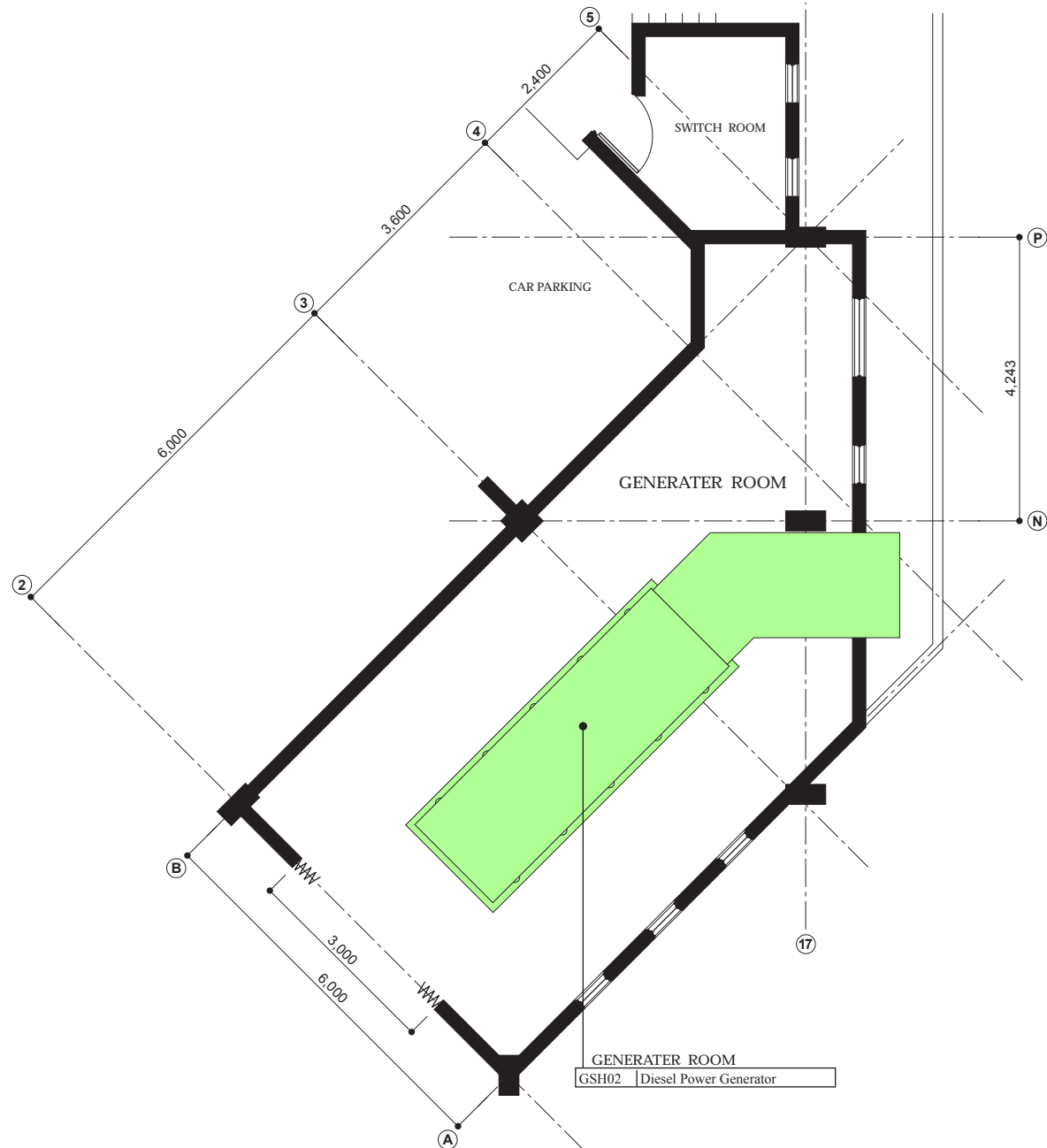


Figure 2-12 Equipment Layout Plan Generator Room

S = 1 : 100

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

COMPUTER LAB.

53

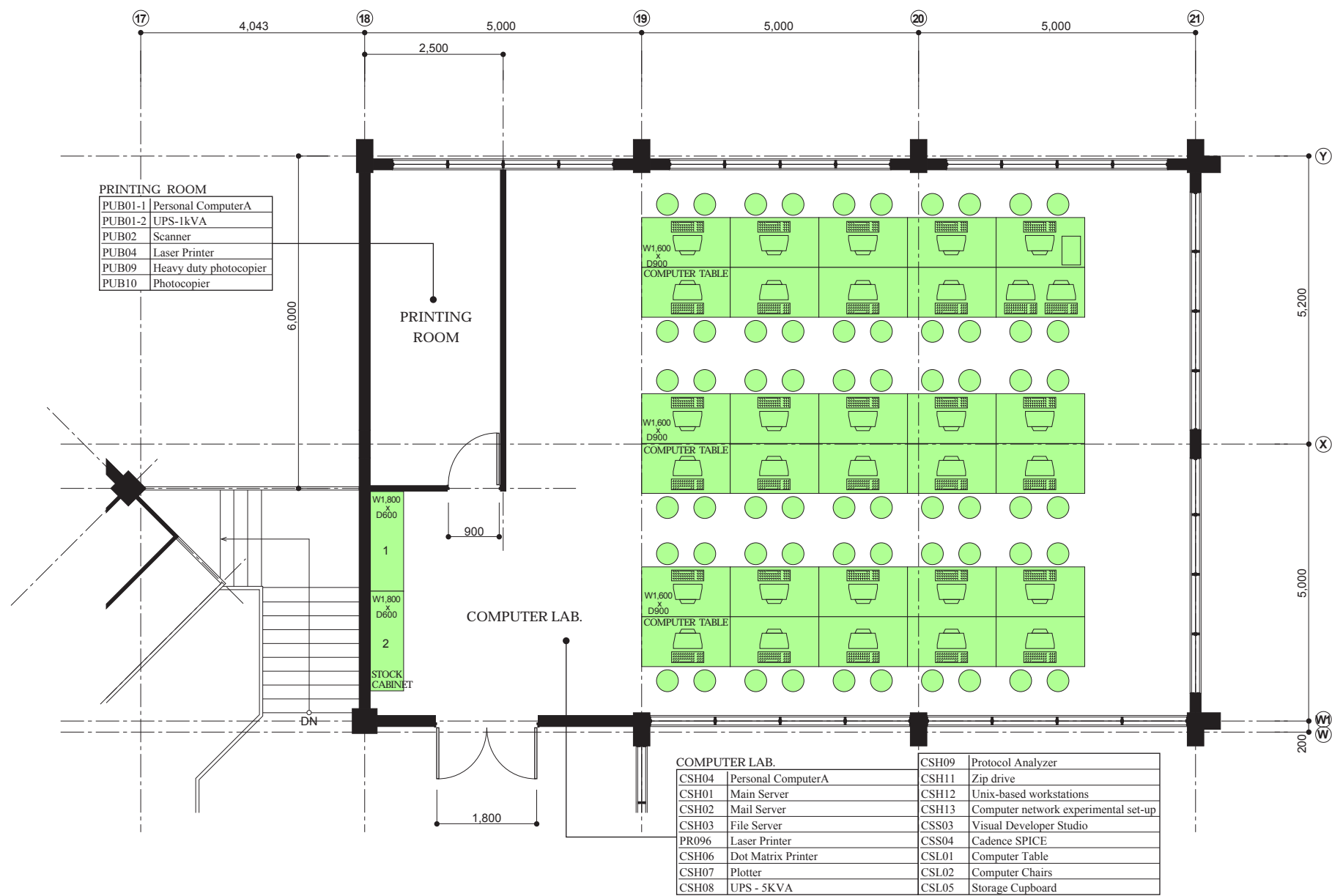
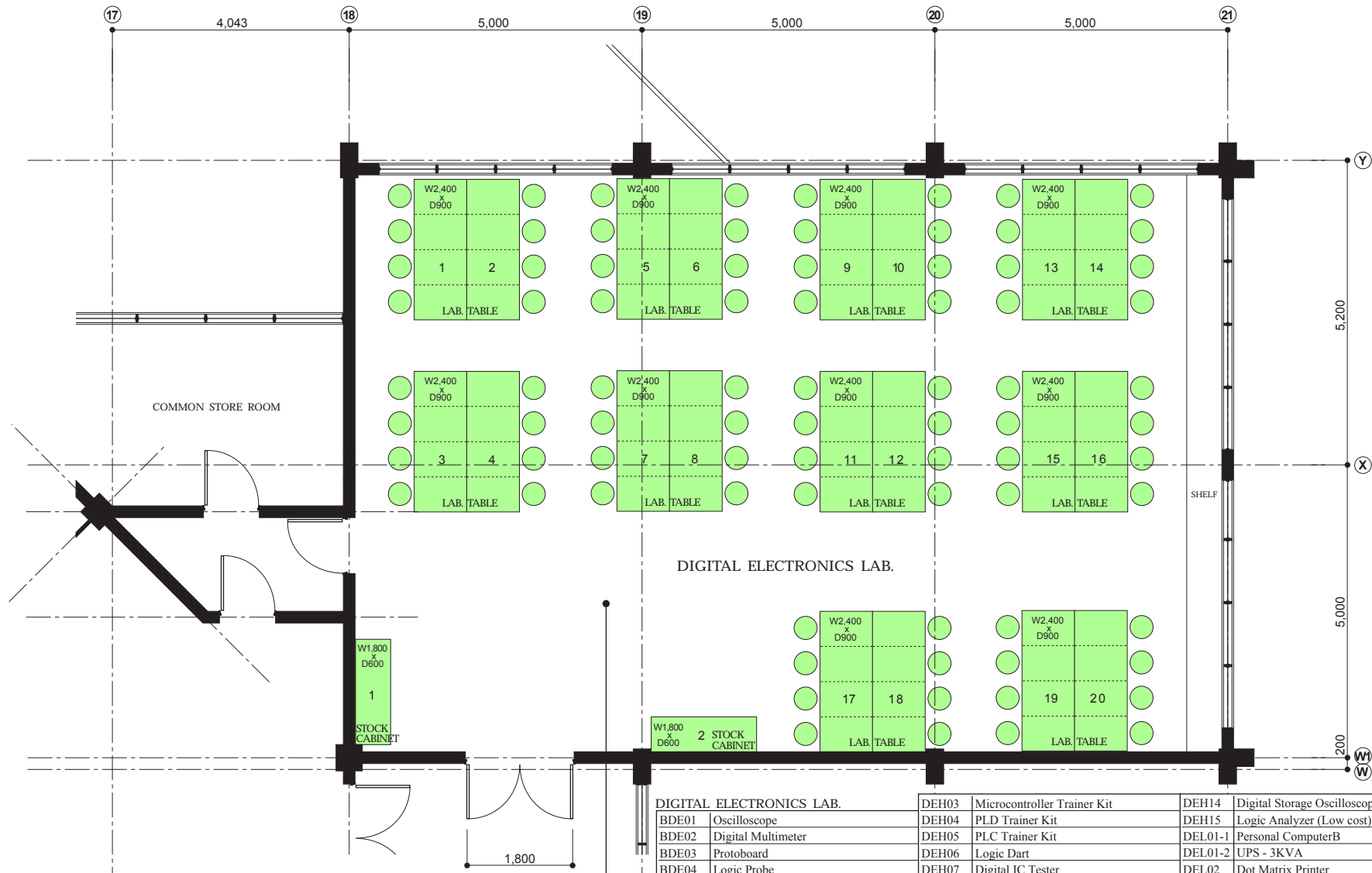


Figure 2-13 Equipment Layout Plan Computer Lab.

S = 1 : 100

# DIGITAL ELECTRONICS LAB.



DIGITAL ELECTRONICS LAB.		DEH03	Microcontroller Trainer Kit	DEH14	Digital Storage Oscilloscope (Low cost)
BDE01	Oscilloscope	DEH04	PLD Trainer Kit	DEH15	Logic Analyzer (Low cost)
BDE02	Digital Multimeter	DEH05	PLC Trainer Kit	DEL01-1	Personal ComputerB
BDE03	Protoboard	DEH06	Logic Dart	DEL01-2	UPS - 3KVA
BDE04	Logic Probe	DEH07	Digital IC Tester	DEL02	Dot Matrix Printer
BDE05	Pulse Generator	DEH09	Microprocessor Emulator	DEL03	Basic Lab Bench
BDE06	Logic pulser	DEH10	Single-board computers	DEL04	Stools
DEH01	Digital Electronics Trainer Kit	DEH12	Handheld Digital Multimeter	DEL06	Tool kit for students
DEH02	Microprocessor Trainer Kit	DEH13	Dual Power Supply 30V	DEL07	Storage Cupboard

Figure 2-14 Equipment Layout Plan Digital Electronics Lab.

S = 1 : 100

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

# ANALOGUE ELECTRONICS LAB.

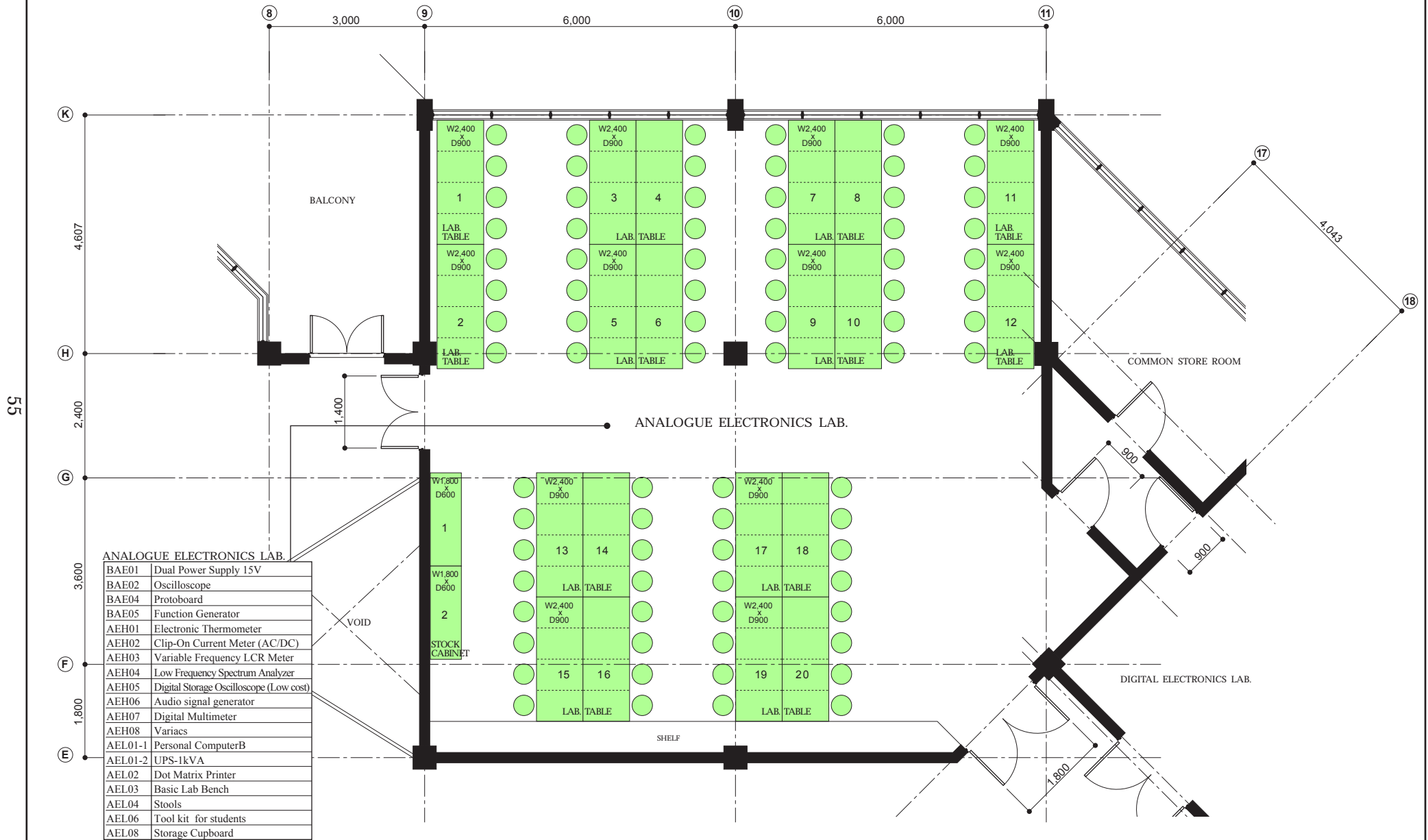


Figure 2-15 Equipment Layout Plan Analogue Electronics Lab.

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THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

# WORKSHOP

## ELECTRONICS WORKSHOP

BWS01	Dual Power Supply 30V	WS03	Desoldering Station	WS14	Scroll Saw	WS25	RF Connector Kit
BWS02	Oscilloscope	WS04	Energy Analyzer	WS15	Electric Fretsaw	WS26	Stacking Type Parts Storage Cabinets
BWS03	Digital Multimeter	WS05	Digital Light Meter	WS16	Drill Bit Set	WSL01	Computer Table
BWS04	Protoboard	WS06	Digital Sound Level Meter	WS17	Spanner Set	WSL02	Stools
BWS05	Logic Probe	WS07	Digital Humidity and Temperature Meter	WS18	Portable Workstand	WSL03-1	Personal ComputerB
BWS06	Function Generator	WS10	Electronic Labeling Machine	WS21	High Voltage Probe	WSL03-2	UPS-1kVA
WS01	PCB Drilling Machine	WS11	Electronics Engineers Tool Set	WS23	AC/DC Current Probe	WSL05	Laser Printer
WS02	Solder Station	WS13	Fluorescent Magnifier	WS24	RF Frequency Counter	WSL09	Storage Cupboard

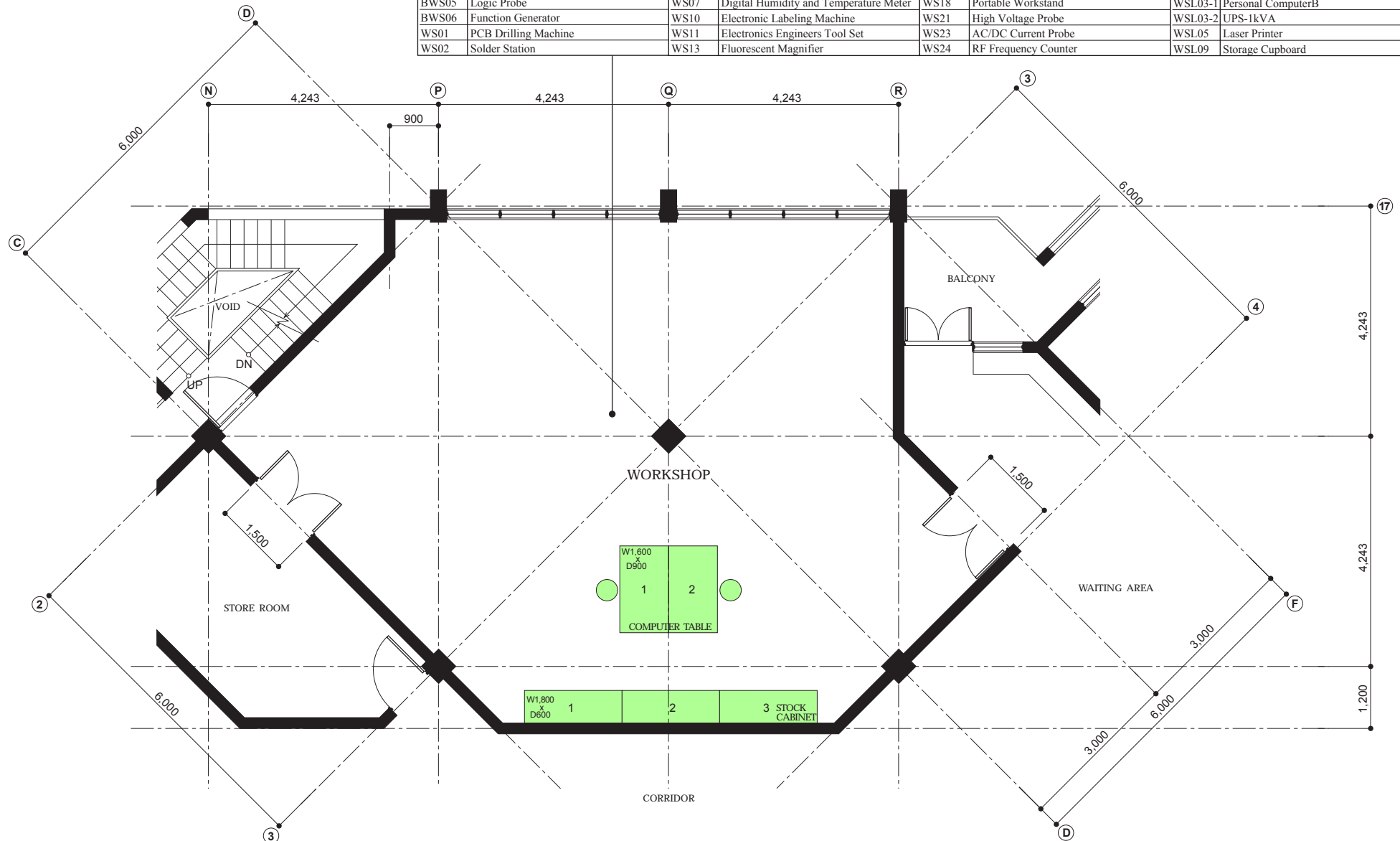


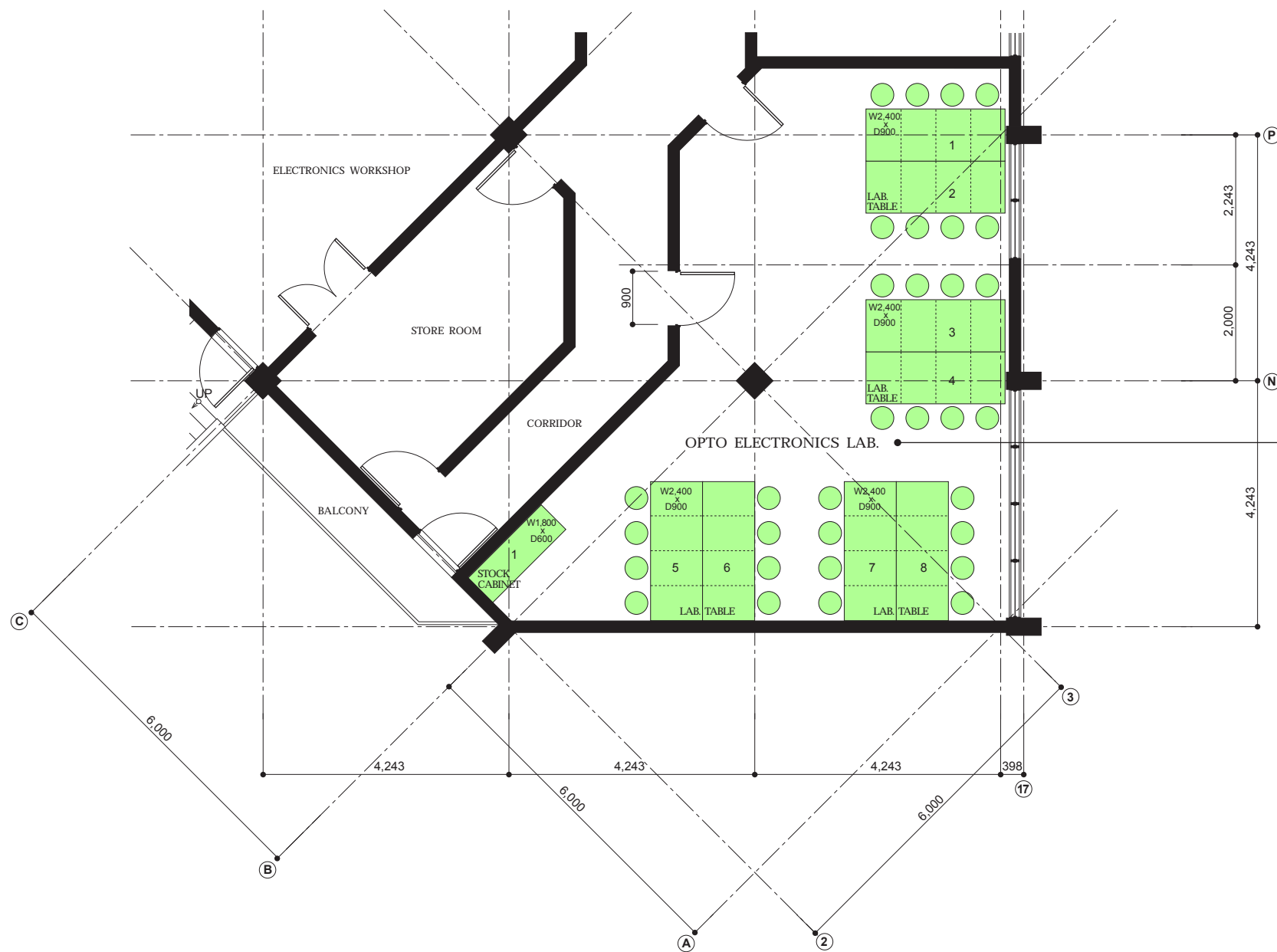
Figure 2-16 Equipment Layout Plan Workshop

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THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA



# OPTO ELECTRONICS LAB.



OPTO ELECTRONICS LAB.

BOP01	Dual Power Supply 30V
BOP03	Digital Multimeter
BOP04	Logic Probe
BOP06	Protoboard
OPH02	Fiber Optic Educator Kit
OPH03	Fiber Optic Monitor Kit
OPH04	Fiber Optic Power Meter
OPH05	LCD Panel
OPH07	LDR
OPH08	Photo Diodes
OPH09	Optocouplers
OPH11	Lux Meter
OPH12	Optical spectrum analyzer
OPH13	Erbium doped fiber amplifier
OPL01	Basic Lab Bench
OPL02	Stools
OPL03-1	Personal ComputerB
OPL03-2	UPS - 2 KVA
OPL04	Dot Matrix Printer
OPL08	Storage Cupboard

Figure 2-17 Equipment Layout Plan Opto Electronics Lab.

S = 1 : 100

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA  
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# TELECOMMUNICATIONS LAB.

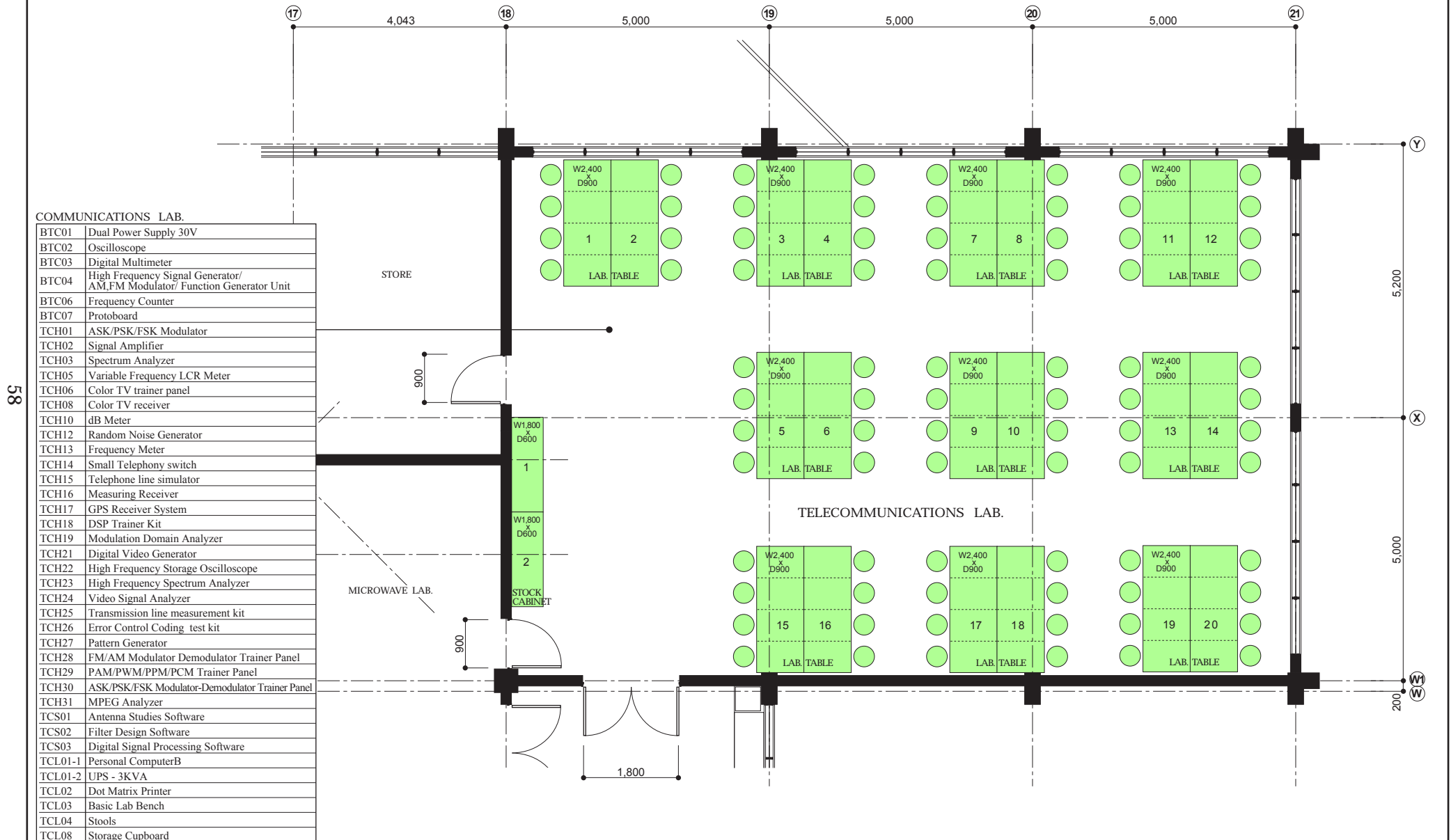
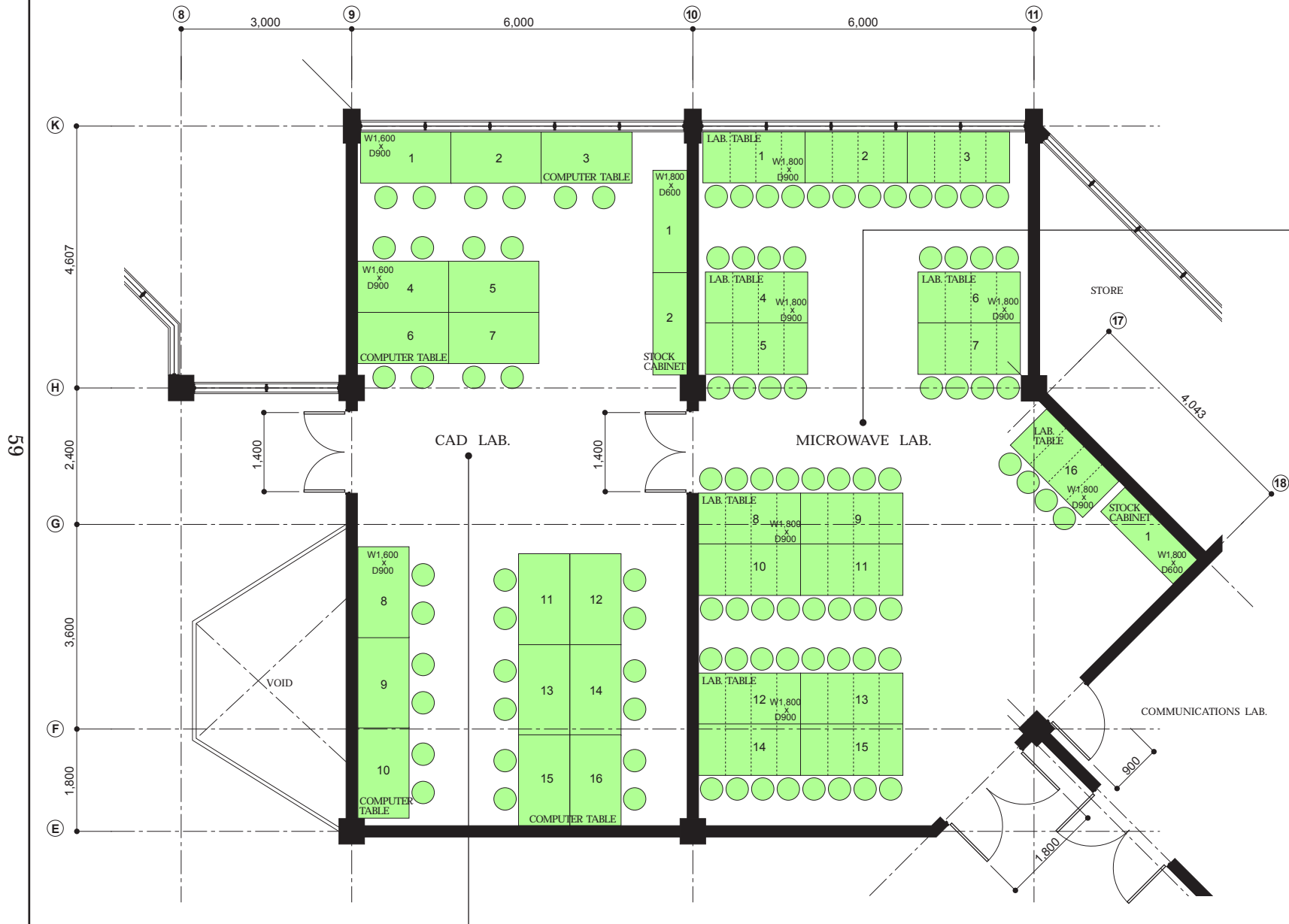


Figure 2-18 Equipment Layout Plan Telecommunications Lab.

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THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR  
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# MICROWAVE LAB. / CAD LAB.



## MICROWAVE LAB.

MWH02	Magnetron
MWH03	Gunn Oscillator, Power supply and waveguide components
MWH04	Spectrum Analyzer
MWH05	Synthesized Sweep Signal Generator
MWH07	SWR Meter
MWH08	Microwave Tx. and Rx. System with Dish antenna and LNA
MWH10	Satellite Receiver System
MWH11	Field Strength Meter
MWH12	Experimental Radar kit
MWH13	Microwave Transistors - Maximum Frequency 1 GHz
MWH14	Microwave Transistors - Maximum Frequency 10 GHz
MWH15	Schottky Detector Diodes
MWH16	PIN Diodes
MWH17	Impedance Bridge
MWH18	Cable Connectors : N(m) to BNC(f)
MWH19	Cable Connectors : K(m) to BNC(f)
MWH20	Cable Connectors : N(f) to BNC(m)
MWH21	Cable Connectors : K(f) to BNC(m)
MWH22	Cable Connectors : BNC(m) to BNC(f)
MWS01	Antenna Studies Software
MWS02	Microwave Circuit Design
MWS03	Radar Cross Section
MWL01-1	Personal ComputerB
MWL01-2	UPS - 2 KVA
MWL02	Dot Matrix Printer
MWL03	Basic Lab Bench
MWL04	Stools
MWL08	Storage Cupboard

## CAD LAB.

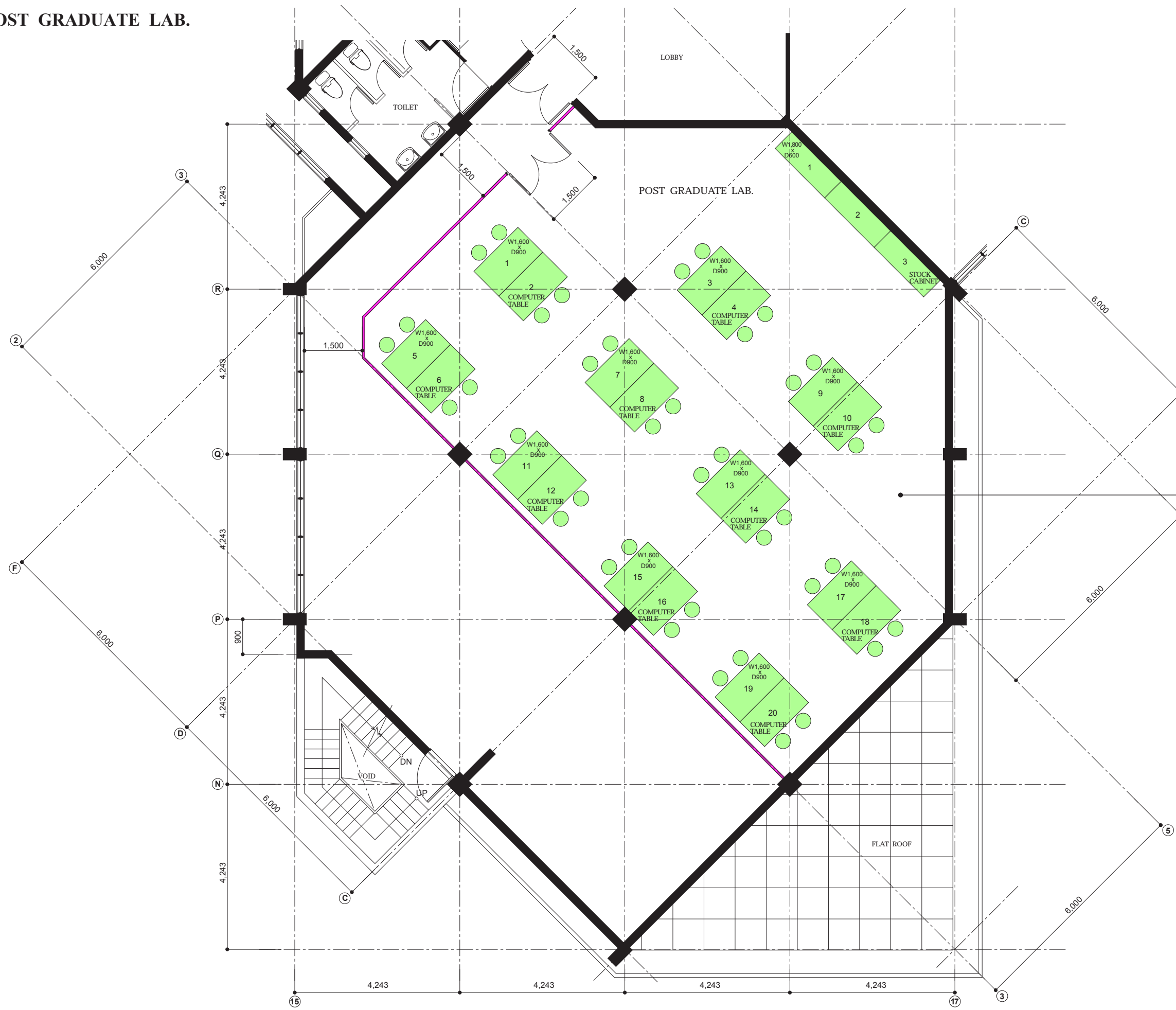
ECH01	Plotter
ECH02-1	Personal ComputerC
ECH02-2	UPS - 5KVA
ECS02	IC Design Tool for PC schematic editor
ECS03	MATLAB
ECS04	Digital and analog circuit design and simulation software
ECS05	PCB design software
ECS08	LABVIEW
ECS09	Mathematica
ECL01	Computer Table
ECL02	Computer Chairs
ECL05	Storage Cupboard

Figure 2-19 Equipment Layout Plan Microwave Lab. / Cad Lab.

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THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

POST GRADUATE LAB.



POST GRADUATE LAB.	
BPG01	Dual Power Supply 30V
BPG02	Oscilloscope
BPG03	Digital Multimeter
BPG04	Protoboard
BPG05	Logic Probe
BPG06	Audio signal generator
BPG08	Function Generator
PGH01	Personal ComputerB
PGH02	Laser Printer
PGH05	Scanner
PGH06	Digital Storage Oscilloscope (Low cost)
PGH07	High Frequency Oscilloscope
PGH08	Digital Frequency Synthesizer
PGH10	Pseudo Random Signal Generator with Noise addition capability
PGH11	dB Meter
PGH13	RF Generator
PGH14	Microwave Frequency Meter
PGH24	Logic Analyzer (Low cost)
PGH25	Spectrum Analyzer
PGH28	Logic pulser
PGH29	Logic Clip
PGH34	Network Analyzer
PGH35	Wireless Mobile and Base Station Test set
PGH39	Wide Bandwidth RF Receiver
PGH40	Programmable Step Attenuator
PGH42	Synthesized RF Signal Generator
PGH43	RF Power Meter
PGH45	RF Terminations
PGH46	RF Power Dividers/ Combiners
PGH48	RF Amplifier (100 kHz - 1.3 GHz)
PGH49	Field Strength Meter
PGH50	Microwave Noise Tubes and Noise Sources
PGH51	Erbium Doped Fiber
PGH52	Optical Source
PGH53	Optical Power Meter
PGH54	Fiber Optic Loss Test Kit
PGH55	Single Mode Variable Attenuator
PGH56	Optical Fiber Scope
PGH57	Optical Time Domain Reflectometer
PGH58	Test and Measurement Hardware for Data Acquisition
PGH59	GPIO Programmer
PGH60	Waveform Monitor
PGH61	Vectorscope
PGH62	Video Signal Generator
PGH63	Audio Analyzer
PGH64	Audio Distortion Meter
PGH65	Audio Jitter Meter
PGH66	Audio Signal Level Meter
PGH67	NTSC/PAL Color Picture Monitor
PGS01	Image Processing System
PGS02	MATLAB
PGS03	Cellular Network Simulation/ Design and Planning Software
PGS05	LAN Network Simulation, Monitoring, Planning and Design Software
PGS07	LABVIEW
PGS08	Mathematica
PGL01	Basic Lab Bench
PGL02	Stools
PGL03	Dot Matrix Printer
PGL04	Laser Printer
PGL08	Storage Cupboard
PGL09-1	Personal ComputerB
PGL09-2	UPS - 5KVA

Figure 2-20 Equipment Layout Plan Post Graduate Lab.

S = 1 : 100

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL EQUIPMENT FOR THE FACULTY OF ENGINEERING UNIVERSITY OF MORATUWA IN DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

## **2-2-4 Implementation Plan**

### **2-2-4-1 Implementation Policy**

- (1) The Project is implemented as a part of the grant aid program by the government of Japan. The communication between the Sri Lanka executing agency, the Japanese consultants, and the equipment suppliers must be closely coordinated and smoothly implemented.
- (2) It is likely that most of the measuring equipments will be procured from Japan. Experiment tables, chairs and racks will be procured locally. The English base computers, the software, as well as some training kit such as the colour TV Training kit will likely be procured in third countries, as they are not widely accessible in Japan or in Sri Lanka.
- (3) Utility installation such as electrical supply and network set-up must be well defined, and efficiently implemented.
- (4) Accidents during equipment storage or installation must be by all means avoided.
- (5) Dispatched engineers from Japan will be electronic equipment engineers, network engineers and general machinery technicians.
- (6) As for the technicians and labors for the equipment installation, local employment is planned, taking the high skilled technicians and labors level into consideration.

### **2-2-4-2 Implementation Conditions**

- (1) Upon implementation of this Project, construction progress of the new building is to be continually monitored, which is at Sri Lanka expense, and advance measures to avoid delays will be emphasized to the applicable agencies.
- (2) The equipment deployment will occur during the day. Thus careful consideration not to hinder daily lecture and laboratory activities is imperative.
- (3) Even for equipment that is originally procured from Japan or third countries, those that require periodical maintenance such as copy machines or computers, are to be procured locally, thereby allowing for smooth and efficient maintenance.

### 2-2-4-3 Scope of Works

Project tasks are classified into those under the responsibility of Sri Lanka and Japan side, respectively. Associated activities for these two parties are shown in the Table 2-6.

Table 2-6 Division of Scope of Works

Work Content	Japan	Sri Lanka
1. Equipment procurement, installation Equipment procurement, Installation work, Test operation, adjustments, Guidance on equipment use Procurement of the network switch Electrical connection work from Generator to the automatic switching device, Exhausting duct installation		
2. Utilities installation and maintenance Preliminary electrical work Basement work for Generator (installation of the automatic switching device, electrical work towards the electrical distribution board) University's LAN connection and internal network Electrical connection to the laboratory table Tables and racks for the common use printers etc in the laboratories Air conditioning for network server and central switch		
3. All related expenditures incurred in the site preparation, transport, delivery, and set up work, which are not included in the Grant Aid. Site preparation of the container (about 10 20ft containers, or about 5 40ft containers) handling, access, equipment delivery inside of the university Fuel for generator White board, and other common use furniture procurement		

### 2-2-4-4 Consultant Supervision

The basic approach and points of special note with regard to procurement supervision under the Project are set out below.

- (1) With regard to the progress of the new building construction to be borne by the Sri Lanka side, it is essential that these be completed prior to arrival of procured equipment on site. Toward this end, the consultant will be required to confirm with the execution agency on a monthly basis the status of budget allocation and work progress.
- (2) Prior to equipment lading, equipment content is to be inspected by a third party agency to ensure strict adherence to terms of contract.

- (3) For smooth delivery and installation of the equipment, the consultant will dispatch a spot supervisor to the site immediately prior to equipment set-up for detailed coordination, with University of Moratuwa, the execution agency of the project.
- (4) Additionally in conjunction with equipment delivery, a heavy cargo delivery plan and access to the site are to be reviewed. Because preliminary electrical works, network works and other utility related construction will affect the installation works for the equipment supplied by the Japanese side, through coordination between the consultant and the execution agency will be required with regard to these activities.

#### **2-2-4-5 Implementation Schedule**

A contractual agreement between the execution agency of Sri Lanka and the Japanese consulting firm is to be finalized after the signing of Exchange of Notes between the Sri Lanka and the Japanese governments. The assigned consultant firm selected by the Japanese government is to commence the detail design phase of the Project after the Japanese government's verification of the agreement.

After the detail design phase is completed, the execution agency and the consultant are to begin preparation of the tender documents. Tender preparation is to include tender documentation, tendering and tender evaluation for the equipment procurement and installation. After tender evaluation, the execution agency is to conclude an equipment supply contract with the successful Japanese tenderer. Procurement and installation of the equipment will commence after review and verification by the Japanese government. In consideration of the Project content and the above procedures, it is possible to accomplish this Project within one year as the estimated required period is approximately shorter than 12 months.

#### **(1) Detailed Design**

Based on the basic design report, the assigned consultant is to review the equipment specification documents and the local site conditions, and then finalize the tender documents. Additional modification of equipment specifications is to be conducted if necessary. During this phase of the Project, discontinuance of specific equipment manufacture and any

significant changes in the Sri Lankan situation are taken into account.  
Estimated required period for this work is approximately 2.0 months.

## (2) Tendering

After completing the detailed design report, the assigned consultant verifies the progress of the Project on site. Soon thereafter in Japan, the consultant publicly makes notice of the tender for the procurement and installation of the equipment for the Project in local newspapers. The consultant also organizes tender opening among the concerned parties. The estimated required period for this work is approximately 2.0 months.

## (3) Procurement and Installation

Procurement and installation of the equipment covered by the Project is to commence after the Project contract is formally signed, and approval of Japanese government has been obtained. Estimated required period is approximately 6.5 months. The implementation schedule is shown in the Figure 2-21.

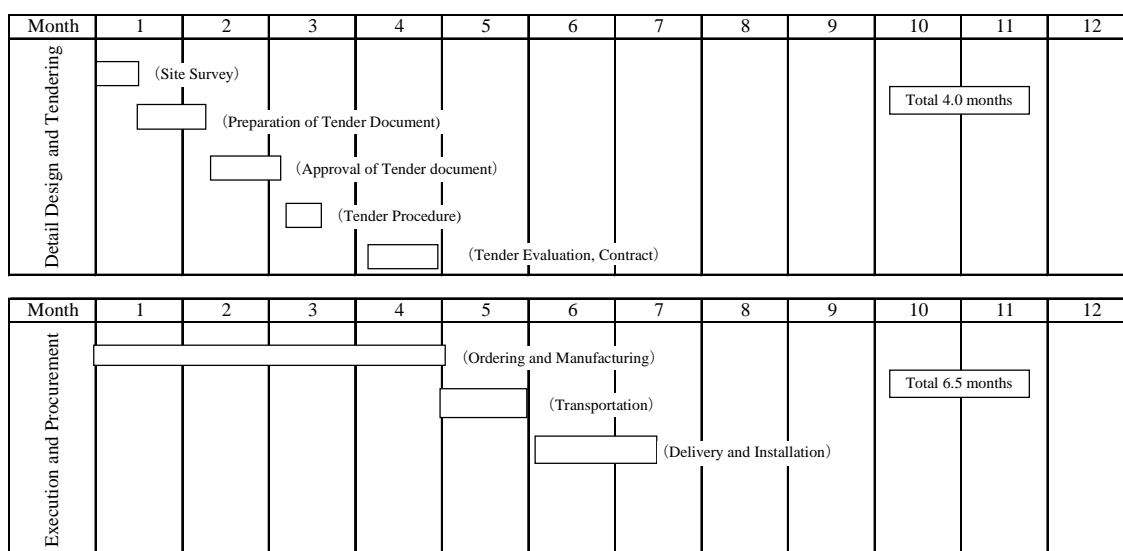


Figure 2-21 Implementation schedule



## **2-3 Obligations of Recipient Country**

The project executing agency tasks in Sri Lanka for this Project are enumerated below.

(1) Secure of the project site

Securing of the site for construction of the new building for the Department of Electronics and Telecommunication.

(2) Banking arrangement (B/A) to the Japanese exchange bank

In order to proceed with banking arrangement, issuance of an authorization to pay, as well as necessary payment for banking commission.

(3) Custom clearance, Tax exemption arrangement

Import custom clearance, relevant documents preparation, tax exemption arrangement.

(4) Convenience for Japanese personnel related to the procurement, installation, adjustment work.

Ensuring the safety, and expediting the entry / departure immigration formalities for the project related Japanese personnel sent to Sri Lanka.

(5) Utilities installation and maintenance

Preliminary electrical work, Basement work for Generator room, University's LAN connecting work to the new building, Electrical work in onto the laboratory tables, Tables and Racks for the common use printers etc. in the laboratories, Air conditioning for central switch and servers.

(6) Apply and secure all the licenses needed to execute the project.

Secure all the licenses needed for equipment procurement, application documents preparation

(7) Obtaining appropriate budget and personnel required for effective operation and maintenance of the project

Secure necessary educational staffs, maintenance staffs and the related budget.

(8) Appropriate and effective operation and maintenance of the equipment provided in grant aid program

Practical course planning and execution in accordance with the new curriculum

(9) All related expenditures incurred in the site preparation, transport, delivery, and set up work, which are not inclusive of the Grant Aid

Procurement of tables for common use equipment in each laboratory, white

board, provisional site preparation for container handling, access, equipment delivery inside of the university

- (10) To resolve and coordinate all problem concerning third parties during the project implementation at the project site.

The estimated cost to be borne by the Sri Lankan executing agency is approximately Rp 4,731,945 (¥ 6.39 million), when this project is implemented as a Japanese Grant Aid project (refer to Annex 5 for details). Estimated cost breakdown is set out in Table 2-7.

Table 2-7 Estimated cost breakdown of the project

Electrical facility construction	Rp	313,675
Installation of LAN network	Rp	160,413
Generator foundation construction, etc.	Rp	191,858
Office equipment	Rp	526,000
Miscellaneous apputenant equipment, etc.	Rp	540,000
PABX	Rp	3,000,000
<b>Total</b>	<b>Rp</b>	<b>4,731,945</b>

## 2-4 Project Operation Plan

### (1) Operation and maintenance system

At University of Moratuwa, the educational program is managed under the central body with the Vice Chancellor at the apex, followed by the faculty dean, and subsequently the department head. The educational staffs of each laboratory are in charge of management of the practical course in line with the curriculum and experimental planning. The operation and maintenance structure of the execution agency are shown in Figure 2-22.

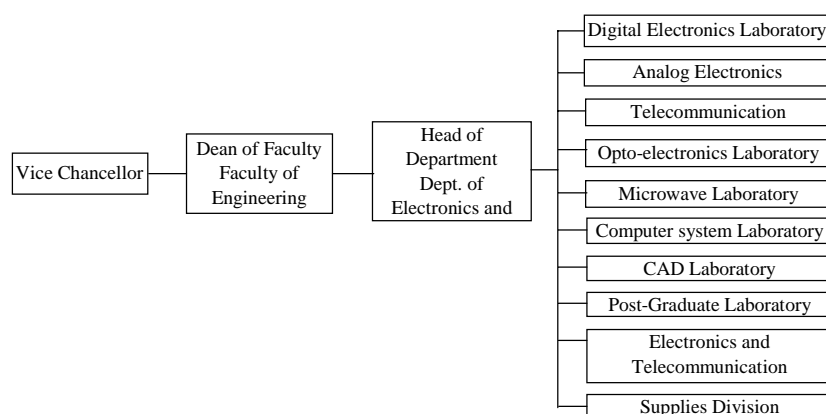


Figure 2-22 Operation and maintenance structure of the execution agency

Two well-trained and experienced maintenance engineers work full-time in the workshop of the Department of Electronic & Telecommunication Engineering, who are in charge of daily maintenance work. The technical skill of the maintenance engineers is quite high, and the most of old equipment is maintained in this workshop. Repair requiring metal working, however, is performed at the university's main workshop. Repair work that cannot be performed at either workshop is out-sourced to an appropriate repair facility, manufacturer's agent outlet, etc. In the case where the spare parts for the repair works cost less than Rp 25,000 (¥ 33,750), the parts can be purchased with the approval and clearance of the dean of the faculty or after submission of three bids from 3 different suppliers. In case where parts cost more than Rp 25,000, after the director of Supplies division gives initial approval, procurement is based on 3 offers from 3 different suppliers one of which is then approved by the Vice Chancellor.

A flow chart illustrating the equipment maintenance control as performed at the University of Moratuwa is shown in the Figure 2-23.

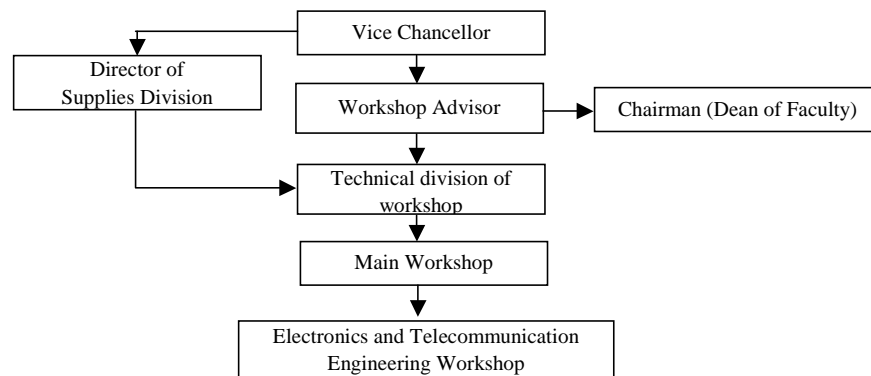


Figure 2-23 Maintenance Structure of University of Moratuwa

## (2) Operation and maintenance costs

The estimated annual operation and maintenance cost of the equipment that will be provided under the project is set out in Table 2-8.

Table 2-8 Estimated operation and maintenance cost

<b>Category</b>	<b>Detail</b>	<b>Expense</b>	
Electricity		256,224	Rp/year
Telephone		324,000	Rp/year
Fuel		1,029,000	Rp/year
Labor Cost	3 newly employed engineers	660,000	Rp/year
Consumables		604,500	Rp/year
Spare parts		880,000	Rp/year
<b>Total</b>		<b>3,753,724</b>	<b>Rp/year</b>

In this cost in Table 2-8, labor cost amounts at 0.3% of the total amount of salary for the educational staffs in the annual budget of University of Moratuwa in the year 2001. As for the total amount of the other items, it corresponds to 2% of the annual budget except the personnel expenses. Both costs remain at low level signifying that the operation and maintenance cost may not cause any financial problem to the University.

## 2-5 Other Relevant Issues

The equipment of the project is to be entirely installed in the new building, currently under construction by Sri Lanka side. The construction work is to be achieved in July 2002. While the construction progress in December 2001 was as scheduled, there will not be any problem for the equipment handling and installation, if the work is carried out as it is. Nevertheless, it is needed to follow the progress of the construction work.

## **Chapter 3**

## Chapter 3 Project Evaluation and Recommendations

### 3-1 Project Effect

#### Direct effect

- The increased practical course offering (from 11 to 98 themes) planned under the new curriculum can be executed, and the experiment time allotted per student will be increased.

Direct effect 1	Year 2001 (Before project)	Year 2007 (After project)
Students of the Department of Electronics and Telecommunication Engineering	33 hours for 4 years	294 hours for 4 years
Students of the Department of Electric Engineering, and the Department of Computer Science	0 hours for 4 years	126 hours for 4 years
Students of the other departments of the Faculty of Engineering (depending on the department)	0 hours for 4 years	15 ~ 60 hours for 4 years

- The practical courses of the Department of Electronics and Telecommunication Engineering will be partly available for the other departments of the Faculty of Engineering. This will afford the students in these departments the opportunity to attend lectures in basic electronics and telecommunications engineering, thereby expanding the number of graduates with across-the-board training in electronics, information, and communication technology which are currently in high demand by local industries.

Direct effect 2	Year 2001 (Before project)	Year 2007 (After project)
Number of graduates per year of the Faculty of Engineering, University of Moratuwa, attending the practical courses provided by the Department of Electronics and Telecommunication Engineering	50 students	550 students

#### Indirect effect

- A pool of personnel will be created for employment in decision making positions at both the central and local government level with regard to national policy for electronics, information and communication technologies.
- In the industrial sector in Sri Lanka, the below mentioned indirect effects are expected :

#### Telecommunication industry :

The telecommunication infrastructure, including fixed telephony, internet, mobile phone network, will be expanded in Sri Lanka by the increase of the engineering personnel in the technology development, operation and maintenance divisions.

#### Software Development:

The engineering personnel skilled in the system development will be increased, and that will contribute in the information technology development in the administrative organization networking, networking of financial institutions, remote education, electro-medicine, and medical information system networking.

#### Manufacturing :

Sub-contracting activities are the mainstay of many manufacturers at present. Nevertheless, the employment of university graduates skilled in the electronics, information, and communication technology will enhance manufacturer capabilities with regard to new product design, cost reduction, product quality control, market research, and commercial networking using internet technology.

### **3-2 Recommendations**

- (1) The round robin method offers an alternative way to execute multiple experiment themes in staggered order within the same time frame by multiple experiment teams (Round Robin method). This is in contrast to the present method where a single experiment is simultaneously carried out by all the students in the class (All-in-once method). The round robin approach enables staggered sharing of equipment among experiment groups thereby enhancing the effectiveness of each experiment. The adoption of this approach should accordingly be aggressively examined.
- (2) Continuous funding by the Sri Lankan side will be essential not only for equipment maintenance but also for renewal of those equipment items that are subject to a short utility-life due to the rapid pace of technical progress (Personal computers, etc.), and the timely purchase of necessary equipment to respond to educational purposes in line with the future introduction of advanced technologies. For that objective, own funding system shall be expanded within the University of Moratuwa.
- (3) Continuous effort on the part of the University of Moratuwa is required in the areas of equipment renewal, curriculum reform, recruitment of skilled educational staff, and teaching personnel capability development in order to respond to industrial sector requirements. This applies in particular to the electronics, information technology, and communication industries, which in recent years have been especially subject to rapid progress.



## **APPENDICES**

## **APPENDICES**

### **Annex - 1.**

#### **Member List of the Study Team**

## Annex - 1 Member List of the Study Team

### Basic Design Study

Name	Title	Institution
Team Leader	Yasujiro SUZUKI	Deputy Resident Representative, JICA Sri Lanka office
Grant Aid Project Study	Noriko TANAKA	Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Technical officer	Tomoaki TOKUMURA	Instructor in Media Technology for Education and communication, Okinawa office, Japan International Cooperation Center
Coordinator	Hiroyasu TONOKAWA	First Project Management Division Grant Aid Management Department, JICA
Project Manager / Operation and Maintenance planner	Masami SUDA	System Science Consultants Inc.
Engineering Education Planner	Akira YUKAWA	System Science Consultants Inc.
Equipment Planner 1	Hidehisa HASHIMOTO	System Science Consultants Inc.
Equipment Planner II / Cost Estimator - Procurement Planner	Eriko OHARA	System Science Consultants Inc.

### Draft Final Study

Name	Title	Institution
Team Leader	Yasujiro SUZUKI	Deputy Resident Representative, JICA Sri Lanka office
Coordinator	Hiroyasu TONOKAWA	First Project Management Division Grant Aid Management Department, JICA
Project Manager / Operation and Maintenance planner	Masami SUDA	System Science Consultants Inc.
Equipment Planner 1	Hidehisa HASHIMOTO	System Science Consultants Inc.

## **APPENDICES**

### **Annex - 2.**

#### **Study Schedule**

#### **(Basic Design Study)**

## Study Schedule

## 2-1 Basic Design Study

No.	Date	Officials	Project Manager / Operation and Maintenance Planner	Engineering Education Planner	Equipment Planner I	Equipment Planner II / Cost Estimator - Procurement Planner
1	Sep. 16	Sun	Narita Singapore			
2	Sep. 17	Mon	Arrival at Colombo (SQ402 0:05) Courtesy visit to JICA, EOJ, Ministry of Finance and Planning (MOFP), University of Moratuwa (UOM), Ministry of Education and Higher Education (MOEH), University Grants Commission (UGC)		Arrival at Colombo Courtesy visit to JICA, Embassy of Japan, University of Moratuwa Curriculum study	Arrival at Colombo Courtesy visit to JICA, Embassy of Japan, University of Moratuwa Investigation for supplied equipment in Grant Aid 1987
3	Sep. 18	Tue	University of Moratuwa, site investigation ( 1 ) Courtesy visit to Computer and Information Technology Council of Sri Lanka (CINTEC), ADB	University of Moratuwa, site investigation (Curriculum, Syllabus, Laboratory sheet)	University of Moratuwa, site investigation (Curriculum, Syllabus, Investigation for existing equipment in laboratories)	University of Moratuwa, site investigation (Investigation for supplied equipment in Grant Aid 1987)
4	Sep. 19	Wed	Discussion with UOM and site survey (2), Courtesy visit to University of Colombo Computer Center, World Bank	University of Moratuwa, site investigation (Curriculum, Syllabus, Experiments in Laboratories)	University of Moratuwa, site investigation (Curriculum, Syllabus, Investigation for existing equipment in laboratories)	University of Moratuwa, site investigation (Investigation for supplied equipment in Grant Aid 1987)
5	Sep. 20	Thu	Site survey in UOM (3)	University of Moratuwa, site investigation (Curriculum, Syllabus, Laboratory sheet)	University of Moratuwa, site investigation (Curriculum, Syllabus, Investigation for existing equipment in laboratories)	University of Moratuwa, site investigation (Investigation for supplied equipment in Grant Aid 1987)
6	Sep. 21	Fri	Discussion with UOM (1)	University of Moratuwa, site investigation (Curriculum, Syllabus, Laboratory sheet)	University of Moratuwa, site investigation (Curriculum, Syllabus, Investigation for existing equipment in laboratories)	University of Moratuwa, site investigation (Investigation for supplied equipment in Grant Aid 1987)
7	Sep. 22	Sat	Documentation work, Internal meeting			
8	Sep. 23	Sun	Colombo Candy		Documentation work	
9	Sep. 24	Mon	Courtesy visit to University of Peladeniya, Faculty of Engineering Candy Colombo	University of Moratuwa (Experiments in laboratories, Required equipment investigation)	Federation for Information Technology in Sri Lanka, Employment survey	University of Moratuwa, site investigation (Investigation for existing equipment)
10	Sep. 25	Tue	Documentation work with UGC, University of Moratuwa Discussion on M/D (2 )	University of Moratuwa (Experiments in laboratories, Required equipment investigation)	Employment survey	Questionnaire survey on employment
11	Sep. 26	Wed	Discussion with UOM (3), Signing of M/D in MOEH, Report to JICA, EOJ	University of Moratuwa (Experiments in laboratories, Required equipment investigation)	Employment survey	Questionnaire survey on employment
12	Sep. 27	Thu	Depart Colombo ( SQ401 01:20 ) Singapore Tokyo ( 17:35 )	University of Moratuwa (Budget, Operation and Maintenance Planning)	University of Moratuwa (Experiments in laboratories, Questionnaire survey on employment)	Questionnaire survey on employment
13	Sep. 28	Fri	University of Moratuwa (National plan, National account, Other donor project)	University of Moratuwa (Experiments in laboratories, Questionnaire survey on employment)		Investigation for Custom clearance, Forwarding company, Legal terms (equipment / facilities)
14	Sep. 29	Sat	Internal meeting Documentation work			
15	Sep. 30	Sun	Internal meeting Documentation work			
16	Oct. 01	Mon	University of Moratuwa (Division of the Scope of works, Cooperation contents)	University of Moratuwa (Syllabus, Required equipment, Specifications)		Investigation for Custom clearance, Forwarding company, Legal terms (equipment / facilities)
17	Oct. 02	Tue	University of Moratuwa (Cooperation contents)	University of Moratuwa (Syllabus, Required equipment, Specifications)		University of Moratuwa (Existing facility, its use, Utilities)
18	Oct. 03	Wed	Discussion with MOEH (National Plan, Educational budget, Other donors' projects, Division of scope of works)	Ministry of Industries, Discussion with organization for commercials and industries)	Discussion with the architecture design consultant for the new building	Discussion with Architecture consultant for new building, Construction company (Construction plan, Utilities, Labor cost)
19	Oct. 04	Thu	Discussion with MOFP, UGC	Investigation of Other universities	University of Moratuwa (Layout plan)	Other donor project detail investigation, Local procurement investigation
20	Oct. 05	Fri	Discussion with international institution (World Bank, ADB)	Colombo Singapore Narita	University of Moratuwa (Layout plan)	Institutional survey for the custom clearance, Procurement logistics, Facility construction, Equipment standard
21	Oct. 06	Sat	Internal Meeting, Documentation work		Internal Meeting, Documentation work	
22	Oct. 07	Sun	Internal Meeting, Documentation work		Internal Meeting, Documentation work	
23	Oct. 08	Mon	University of Moratuwa (Scope of work, New building construction plan)		University of Moratuwa (Scope of work, New building construction plan)	
24	Oct. 09	Tue	Report to JICA, EOJ, MOEH		Report to JICA, EOJ, MOEH	
25	Oct. 10	Wed	Colombo Singapore Narita		Colombo Singapore Narita	

## **APPENDICES**

### **Annex - 2.**

#### **Study Schedule**

**(Explanation of Draft Final Report)**

## Study Schedule

### 2-2 Explanation of Draft Final Report

No.	Date		Officials	Project Manager / Operation and Maintenance Planner	Equipment Planner I
1	15-Dec	Sun	Narita Singapore		
2	16-Dec	Mon	Arrival at Colombo (SQ402 0:05) Courtesy visit to JICA, EOJ, MOFP, Explanation of Draft Final Report, Discussion on M/D to MOEH		
3	17-Dec	Tue	Courtesy visit to MOEH, UGC, Explanation of Draft Final Report, Discussion on M/D to University of Moratuwa		
4	18-Dec	Wed	Discussion on M/D with University of Moratuwa		
5	19-Dec	Thu	Signing of M/D with MOEH, UGC		
6	20-Dec	Fri	Report to JICA, EOJ, MOFP, MOEH		
7	21-Dec	Sat	Colombo ( SQ401 01:20 ) Singapore Tokyo ( 17:35)	University of Moratuwa Discussion on specifications	
8	22-Dec	Sun		University of Moratuwa Discussion on specifications	
9	23-Dec	Mon		University of Moratuwa Discussion on specifications Report to JICA, EOJ, MOFP, MOEH	
10	24-Dec	Tue		Colombo ( SQ401 01:20 ) Singapore Tokyo ( 17:35)	

## **APPENDICES**

### **Annex - 3.**

#### **List of Parties Concerned in the Recipient Country**



Annex - 3 List of Parties Concerned in the Recipient Country

Organization	Department	Position	Name
Institute of Computer Technology (ICT), University of Colombo		Director	Prof. V.K. SAMARANAYAKE
			Mr. S.T. NANDASARA
University of Peladeniya	Faculty of Engineering	Dean	Prof. W.J.N. FERNANDO
	Department of Electric & Electronics Engineering	Head	Dr. K.M. LIYANAGE
	Department of Computer Engineering	Head	Dr. I. IKRAM
University of Moratuwa	Direction	Vice Chancellor	Prof. Dayantha S WIJEYESEKERA
	Faculty of Engineering	Dean	Prof. Malik RANASINGHE
		Senior Assistant Registrar	Ms R.P. WIJESURIYA
		Project Manager	Ms T.L.P. de MEL
	Electronics & Telecom. Engineering Microwave Laboratory / Optoelectronic	Associate Professor	Prof. (Mrs) Indra DAYAWANSA
	Electronics & Telecom. Engineering Electronic Laboratory	Senior Lecturer, Acting Head	Mr A.T.L.K. SAMARASINGHE
	Electronics & Telecom. Engineering Telecommunication Laboratory	Senior Lecturer	Prof. Kapila JAYASINGHE
	Electronics & Telecom. Engineering	Senior Lecturer	S.A.S. PUNCHIHEWA
	Electronics & Telecom. Engineering Optoelectronic Laboratory	Senior Lecturer	Dr R.P. THILAKUMARA
	Electronics & Telecom. Engineering Computer Systems Laboratory	Senior Lecturer	Dr K.G.P DHARMAWARDANA
	Electronics & Telecom. Engineering Electronic Laboratory	Senior Lecturer	Dr D.Amith I. MUNINDRADASA
	Electronics & Telecom. Engineering Post-Graduate Laboratory	Lecturer	Dr Chulantha KULASEKARA
	Electronics & Telecom. Engineering	Temporary lecturer	R. WIJESIRIWARDANA
	Electronics & Telecom. Engineering	Temporary lecturer	W.K.K. KULADINITHI
	Electronics & Telecom. Engineering	Temporary lecturer	Ranga RODRIGO
	Electronics & Telecom. Engineering		Mr I.J. DAYAWANSA
	Electronics & Telecom. Engineering		Mr E.C. KULASEKERE
	Electronics & Telecom. Engineering		S.W. MOHOTTALA
	Electronics & Telecom. Engineering		A.S. ZAVAHIR
	Electronics & Telecom. Engineering		N.T. JAZEEL
	Electronics & Telecom. Engineering		V. SANJEEPAN
	Electronics & Telecom. Engineering		C.M. VITHANAGE
	Electronics & Telecom. Engineering		P.S. HAMWARIGE
	Electronics Workshop		Mr. Gamini nanayakkara
	Electrical Engineering	Head	Mr J. Rohan LUCAS
	Electrical Engineering Power Electronics Laboratory Electrical Machines Laboratory	Technical Officer,	Mr J.D. LEELASIRI
		Head	Dr Nalin WICKRAMARACHILI
	Dept.of Computer Science & Eng.	Lecturer	Dr. Gihan V. Dias Ph.D.
		Technical officer, Workshop	Mr N.H.K.G DE SILVA
	Computer Science Engineering Micro Processing Laboratory	Technical officer	Mr JINADESA
	Computer Science Engineering Data Communication Laboratory	Technical officer	Mr Anura PERESA
	Management of Technology		Mr Amal PUNDRIHAZ
	Civil engineering	Head	Dr Gamini KODIKAR
	Civil engineering	Senior Lecturer	Mr T.A. PEIRIS
	Textile & Clothing Technology	Head	Dr Nirmati DE SILVA
	Textile & Clothing Technology	Senior Lecturer	Dr W.D.G. LANAROLLE
	Textile & Clothing Technology	Temporary Lecturer	Mr W.M.P. RANASINGHE

Annex - 3 List of Parties Concerned in the Recipient Country

Organization	Department	Position	Name
University of Moratuwa	Materials Engineering	Head	Dr Nauda MUNASINGHE
	Materials Engineering	Senior Lecturer	Dr M. JAYARATHA
	Materials Engineering	Staff technical officer	Mr Sarath CHANDRAPALA
	Materials Engineering	Technical officer	Mr T.D. MENDIS
	Chemical Engineering	Head	Dr Padara AMARASINGHE
	Chemical Engineering	Senior Lecturer (Grade II)	Dr Ajith GUNATILLEKA
	Chemical Engineering	Head of Polymer division	Dr Shantha WELPALAGE
	Mechanical Engineering	Head	Dr Rohan TITTAGALA
	Mathematics	Head	Dr. M. INDRALINGAM
	Undergraduate Studies of Engineering	Director	Dr J.M.S.J. BANDANA
	Training Division	Head	Eng. Nikal WIJEYEWICKREMA
	Library	Senior Assistant Registrar	Ms Priyani HERATH
	Physical Education	Instructor	Mr S.R. Oliver FERNANDO
	Faculty of Engineering	Dean	Mr Cecil FONSEKA
The Open University of Sri Lanka	Faculty of Engineering, Department of Electrical & Computer Engineering	(Former Head of dept)	Dr Lakdasa TALDENA
University of Ruhuna	Faculty of Engineering	Dean	Dr KEETHISINA
Arthur C Clarke Institute		Director	Mr Nihal KULARATNA

Annex - 3 List of Parties Concerned in the Recipient Country

Organization	Department	Position	Name
Ministry of Finance & Planning	External Resources (ERD)	Director	Ms Sujatha COORAY
		Assistant Director	Mr D.C.W. HAPUGODA
	Bilateral aid	Deputy Director	Mr H.N. JAYAWEERA
	National Planning Department / Fiscal Policy & Economic Affairs		Mr Sujatha SATHKUMARA
	National Planning Department / Human Resources Development	Director	Mr B. ABEYGUNAWARDENA
	National Planning Department / Industrial Development	Deputy Director	Mr V. MAHENDRARAJAH
	National Planning Department / Industrial Development	Assistant Director	Mr A.M.P.M.B. ATAPATTU
	National Planning Department / Economic Infrastructure	Director	Mr Upali DAHANAYAKE
	Macro Division	Director	Mr R.H.S. SAMARATUNGA
Ministry of Higher Education & Information Technology		Secretary	Prof. R.P. GUNAWARDANA
Ministry of Education & Higher Education	Higher Education	Secretary	Dr. Tara DE MEL (Ms)
	Reforms Implementation	Director General	Mr R.S. MEDAGAMA
University Grants Commission		Chairman	Prof. B.R.R.N. MENDIS
		Personal Secretary to Chairman	Ms Hiranthi D. GUNAWARDENA
		Vice-Chairman	Prof. L.L. RATNAYAKE
Council for Information Technology (CINTEC)		Chairman	Mr G.P.GUNAWARDENA
		Chief Executive	Mr. Akjith EKANAYAKE

Organization	Department	Position	Name
Asian Development Bank		Dy. Represent Representative	Mr Joseph ZVEGLICH
		Project Specialist	Mr. K.M. TILAKARATNE
World Bank Office	Education	Operation Analyst	Mrs. Sarasvathi DAHANAYAKE
		Implementation	Mr D. FERNANDO
British High Commission, Department for International Development (DFID)	Development	Second Secretary	Ms Penny THORPE
Royal Norwegian	Development Cooperation	Senior Advisor	Mr W.M. LEELASENA
Embassy of Sweden Colombo	SIDA	Deputy Head of of Mission	Mr Anders ERIKSSON

## **APPENDICES**

### **Annex - 4.**

#### **Minutes of Discussions**

#### **(Basic Design Study)**

MINUTES OF DISCUSSIONS  
ON THE BASIC DESIGN STUDY  
ON THE PROJECT FOR IMPROVEMENT OF THE FACULTY OF ENGINEERING,  
UNIVERSITY OF MORATUWA  
IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "the Sri Lanka side"), the Government of Japan decided to conduct a Basic Design Study on the Project for Improvement of the Faculty of Engineering, University of Moratuwa, (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Sri Lanka the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Yasujiro SUZUKI, Deputy Resident Representative, JICA Sri Lanka Office, and is scheduled to stay in the country from 17 September to 10 October, 2001.

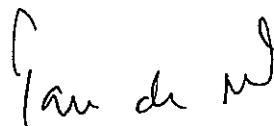
The Team held discussions with the officials concerned of the Government of Sri Lanka and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Colombo, September 26, 2001



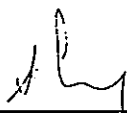
Mr. Yasujiro SUZUKI  
Leader  
Basic Design Study Team  
Japan International Cooperation Agency  
(Japan)



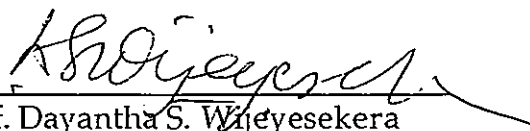
Dr. Tara De Mel  
Secretary  
Ministry of Education and  
Higher Education  
(Sri Lanka)



Prof. B. R. R. N. Mendis  
Chairman  
University Grants Commission  
(Sri Lanka)



Ms. Sujatha Cooray  
Director  
Department of External Resources  
Ministry of Finance & Planning  
(Sri Lanka)



Prof. Dayantha S. Wijeyesekera  
Vice Chancellor  
University of Moratuwa  
(Sri Lanka)

## ATTACHMENT

### 1. Objective of the Project

The objective of the Project is to improve the capacity and quality of engineering education in Sri Lanka through helping the Faculty of Engineering, University of Moratuwa to provide its students better educational environment.

### 2. Project Site

The site of the Project is located in the Faculty of Engineering, University of Moratuwa in Katubedda, Moratuwa.

### 3. Responsible and Implementing Agency

3-1. The Responsible Agency is Ministry of Education and Higher Education which has taken over the authority of former Ministry of Higher Education and Information Technology Development.

3-2. The Implementing Agency is University of Moratuwa.

The tentative organization chart of responsible and implementing agencies are attached as Annex 1. But once the organization of Ministry of Education and Higher Education is finalized, the Sri Lanka side shall submit the new organization chart to the Team.

### 4. Items requested by the Sri Lanka side

4-1. After discussions with the Team, the items described in Annex 2 were finally requested by the Sri Lanka side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

4-2. The Sri Lanka side assigned their own priorities on the items in Annex 2

Note: A: 1<sup>st</sup> Priority / essential

B: 2<sup>nd</sup> Priority / necessary

C: 3<sup>rd</sup> Priority / desirable

### 5. Japan's Grant Aid Scheme

5-1. The Sri Lanka side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex 3.

5-2. The Sri Lanka side will take the necessary measures, as described in Annex 4, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

### 6. Schedule of the Study

6-1. The consultants will proceed to further studies in Sri Lanka until 10 October, 2001.

6-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around December, 2001.

6-3. In case that the contents of the report is accepted in principle by the Sri Lanka side, JICA will complete the final report and send it to the Sri Lanka side by March 2002.

7. Other relevant issues

7-1. The Sri Lanka side shall make necessary budgetary provision to settle GST, NSL and any other duties & fiscal levies applicable for the equipment procured under the Project.

7-2. The Sri Lanka side shall complete all the construction works and the utility works of the new buildings for the Department of Electronic & Telecommunication Engineering by the end of June, 2002 as shown in Annex 5. The Sri Lanka side will send the updated construction schedule every two months to JICA Sri Lanka office.

7-3. The Sri Lanka side shall complete the setup of all the furniture in the new buildings prior to the start of the installation works.

7-4. The Sri Lanka side shall allocate necessary budget and personnel to operate and maintain the equipment procured by the Project.

7-5. The Sri Lanka side stated that the component-wide priority is as follows.

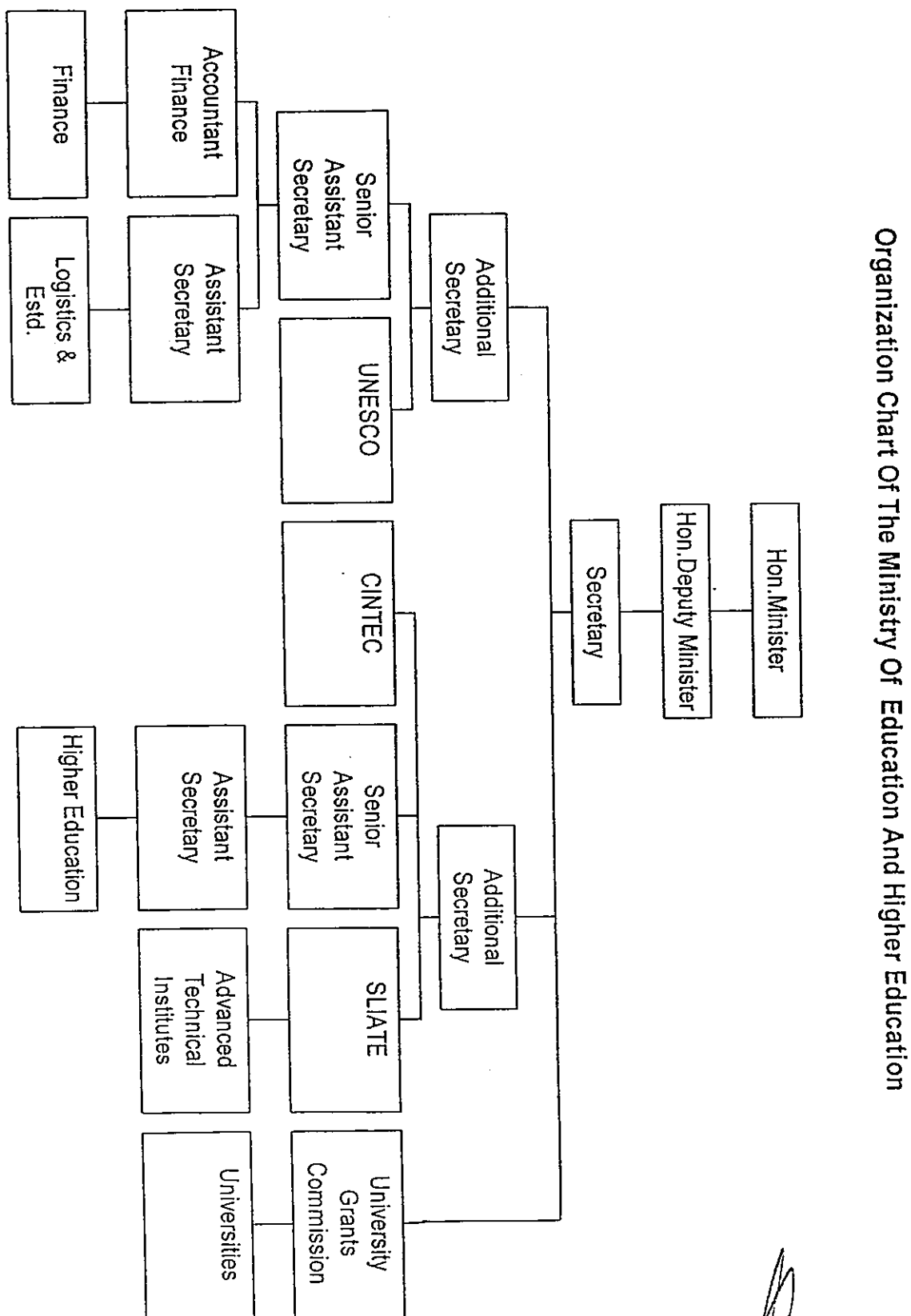
- 1<sup>st</sup> Priority - Equipment for the laboratories and the general services of the Department of Electronic & Telecommunication Engineering
- 2<sup>nd</sup> Priority - Common equipment for the Department of Electronic & Telecommunication Engineering
- Equipment for the newly proposed multimedia laboratory
- 3<sup>rd</sup> Priority - Spare parts and replacement of equipment procured by the Japanese grant aid in 1987

But the Sri Lanka side agreed to assign equipment-wide priority as described in 4-2.

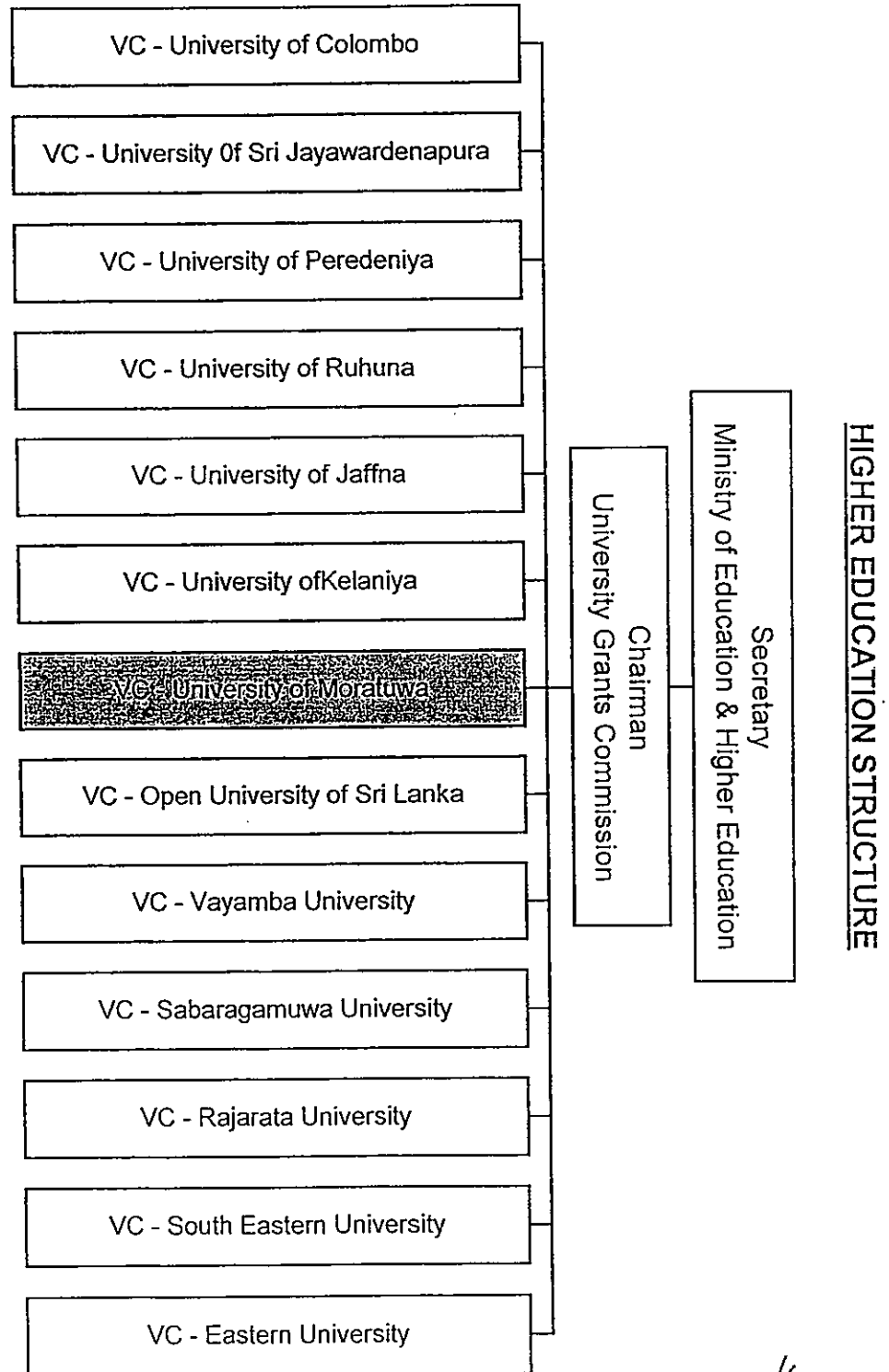
7-6. Both parties agreed with the criteria attached as Annex 6. Nevertheless items to be included in the Project will be finalized after further studies in Japan.

7-7. Regarding the equipment for the multimedia laboratory, the Sri Lanka side agreed to submit the curriculum, the concrete utilization plan and the layout plan to the Team by the end of September, 2001.

# ANNEX 1: ORGANIZATION CHART

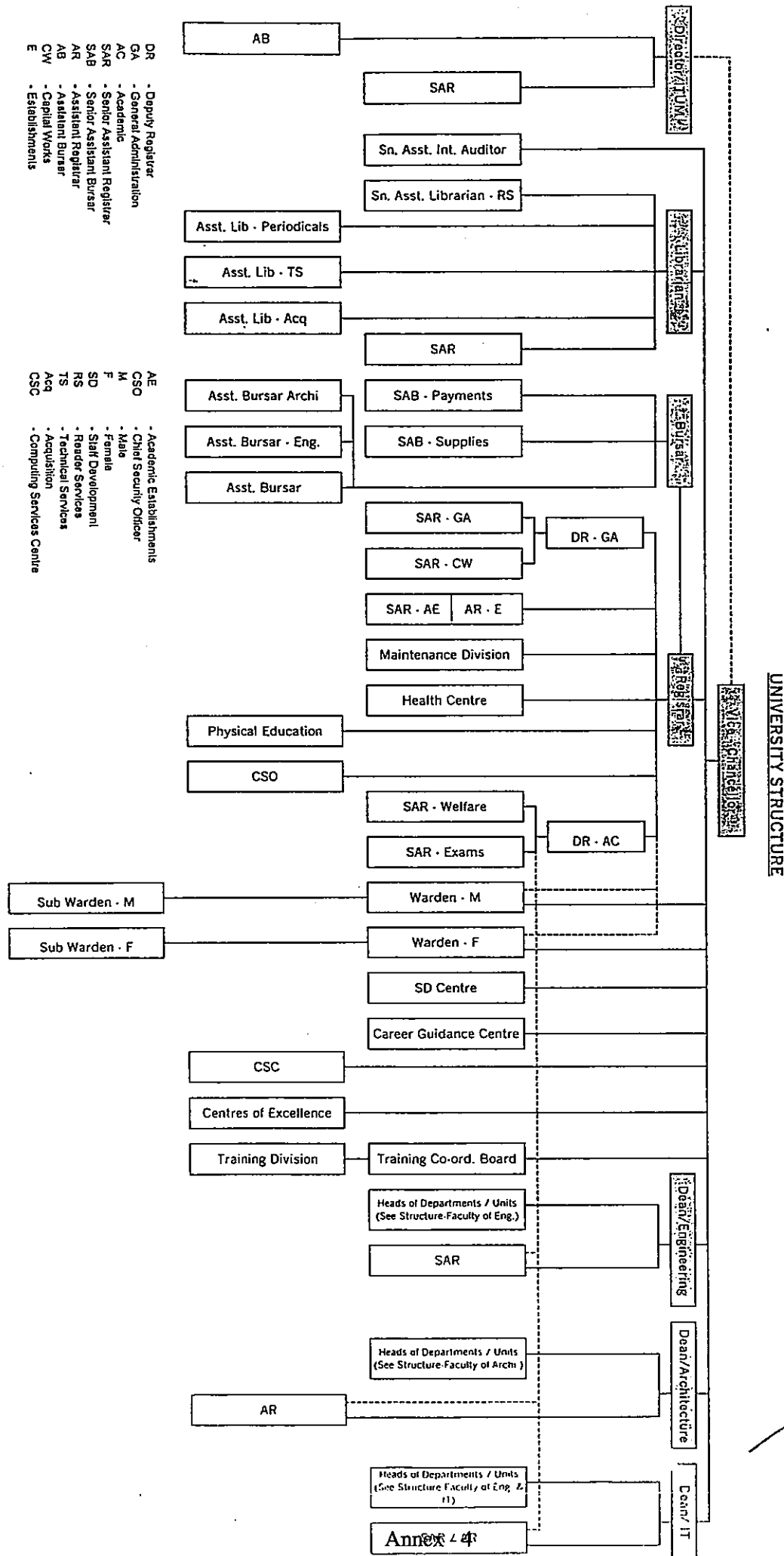






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# Annex - 4 Minutes of Discussions (M/D)



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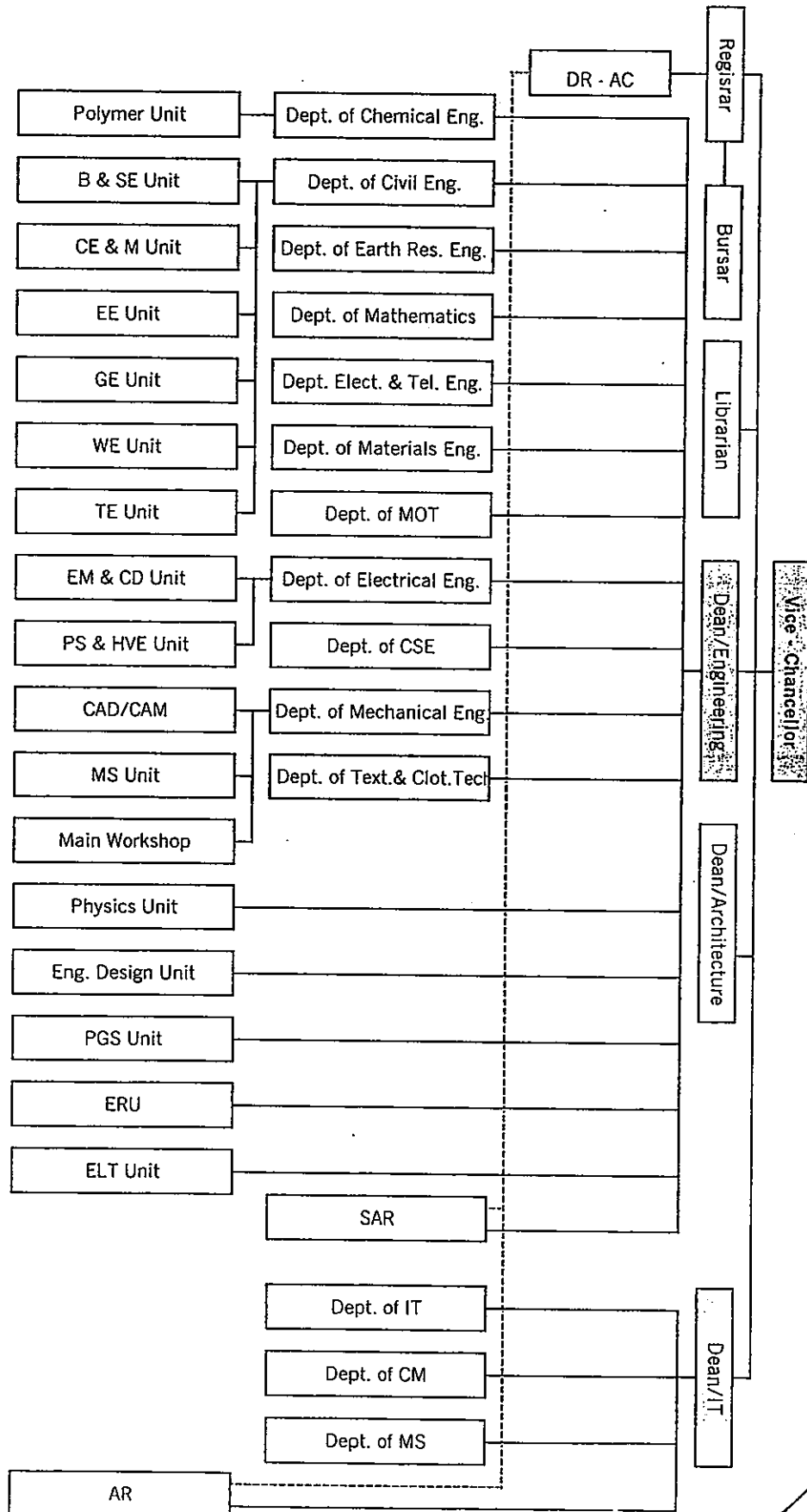
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3. [Signature]

4. [Signature]

**University Structure**  
**(Faculty of Engineering & Faculty of Information Technology)**



DR  
AC  
MOT  
CSE  
B & SE  
CE & M  
EE  
GE  
WE

- Deputy Registrar  
- Academic  
- Management of Technology  
- Computer Science & Engineering  
- Building & Structural Engineering  
- Construction Engineering & Management  
- Environmental Engineering  
- Geotechnical Engineering  
- Water Engineering

TE  
EM & CD  
PS & HVE  
MS  
PGS  
ERU  
ELT  
IT  
CM  
MS

- Transportation Engineering  
- Electrical Machines & Controlled Drives  
- Power Systems & High Voltage Engineering  
- Maritime Studies  
- Postgraduate Studies  
- Engineering Research Unit  
- English Language Teaching  
- Information Technology  
- Computational Mathematics  
- Multi-disciplinary Studies

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## ANNEX 2: LIST OF ITEMS REQUESTED BY THE SRI LANKA SIDE

## I. Office

Item No.	Description	Quantity	Priority
OFF01	Personal Computers	2	A
OFF03	Dot Matrix Printer	1	B
OFF04	Laser Printer	1	B
OFF05	Heavy duty photocopier	1	A
OFF06	Photocopier	1	B
OFF07	Paper cutter	1	A

## II. Publication Unit

Item No.	Description	Quantity	Priority
PUB01	PC	2	A
POB02	Scanner	1	A
PUB03	Heavy Duty Printer	1	A
PUB04	Laser printer (B&W)	1	B
PUB05	Laser printer (Color)	1	A
PUB06	Paper cutter	1	B
PUB07	Laminator	1	B
PUB08	Book binder	1	B
Software			
PUBS01	Desktop publishing software package	1 Lot	B

## III. Audio-Visual Unit

Item No.	Description	Quantity	Priority
AVU01	PC	1	A
AVU02	Laptop computer	1	A
AVU03	High Quality AM-FM Stereo Set	1	A
AVU04	VCR/VCD System	1	A
AVU05	Multimedia Projector	2	A
AVU06	Overhead Projector	8	A
AVU07	Projection screens	8	A
AVU08	TV Receiver	2	B
AVU09	Public Address System	5	A
AVU10	SLR Camera	2	A
AVU11	Digital Video Camera	2	A
Software			
AVUS01	Video/Image processing and editing software	1	A

## IV. Network Equipment

Item No.	Description	Quantity	Priority
NET01	Central Switch : 12-port Layer 3 Gb Ethernet Switch	1	A
NET02	Server Switch : 12-port Gb Ethernet Switch	1	A
NET03	CAD Lab Switch : 24-port Gb Ethernet Switch	1	A
NET03	Switches for each floor : 24-port 100 Mb/s VLAN switch	17	A
NET04	Wireless access point : 803.11b compatible wireless access point	7	A
NET05	Additional switch : 8-port 100Mb/s VLAN switch	2	A

## V. Computer Systems Laboratory

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## Annex - 4 Minutes of Discussions (M/D)

Item No.	Description	Quantity	Priority
<b>Hardware</b>			
CSH01	Main Server	1	A
CSH02	Mail Server	1	A
CSH03	File Server	1	A
CSH04	Personal Computers	60	A
CSH05	Laser Printer	3	A
CSH06	Dot Matrix Printer	12	A
CSH07	Plotter	1	A
CSH08	UPS - 5 KVA	10	A
CSH09	Protocol Analyzer	2	A
CSH10	GPIB Interface Card	8	A
CSH11	Zip drive	2	A
CSH12	Unix-based workstations	4	A
CSH13	Computer network experimental set-up	1	A
CSH14	Removable CD writer	2	A
<b>Software</b>			
CSS01	Windows NT	1 Lot	A
CSS02	MS Office	1 Lot	A
CSS03	Visual Developer Studio	1 Lot	A
CSS04	Cadence SPICE	1 Lot	A
<b>Common Laboratory Equipment</b>			
CSL01	Computer Table	30	B
CSL02	Chairs	60	B
CSL03	White Board	2	B
CSL04	Display Board	2	B
CSL05	Storage Cupboard and Racks	2 sets	B

## VI. Digital Electronics Laboratory

### Equipment Codes

BDExx - Basic Lab bench equipment for digital electronics laboratory

DELxx - Common Laboratory equipment

DEHxx - Equipment for Digital Electronics lab

DESxx - Software for Digital Electronics lab

### Basic Lab Bench Equipment

Item No.	Description	Quantity	Priority
BDE01	Oscilloscope	20	A
BDE02	Digital Multimeter	20	A
BDE03	Protoboard	40	A
BDE04	Logic Probe	20	A
BDE05	Pulse Generator	20	A
BDE06	Logic pulser	20	A

### Equipment for Regular Laboratory Use

Item No.	Description	Quantity	Priority
DEH01	Digital Electronics Trainer Kit	20	A
DEH02	Microprocessor Trainer Kit	4	A
DEH03	Microcontroller Trainer Kit	4	A
DEH04	PLD Trainer Kit	4	A

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## Annex - 4 Minutes of Discussions (M/D)

DEH05	PLC Trainer Kit	4	A
DEH06	Logic Dart	4	B
DEH07	Digital IC Tester	2	A
DEH08	PLD Programmer	2	A
DEH09	Microprocessor Emulator	4	A
DEH10	Single-board computers	10	B

### Special Purpose Equipment

DEH11	Electronic Tool Kit (without Multimeter)	1	A
DEH12	Handheld Digital Multimeter	5	B
DEH13	Dual Power Supply	10	A
DEH14	Digital Storage Oscilloscope (Low cost)	2	A
DEH15	Logic Analyzer (Low cost)	2	A
DEH16	Function Generator	5	A

### Common Laboratory Equipment

DEL01	Lab Bench Computer	20	A
DEL02	Dot Matrix printer	5	A
DEL03	Basic Lab Bench	20	B
DEL04	Stools	80	B
DEL05	First Aid Panel	1	B
DEL06	Tool kit for students	2	A
DEL07	Storage Cupboards and Racks	2 sets	B
DEL08	White Board	2	B
DEL09	Display Board	2	B

## VII. Analogue Electronics Laboratory

### Equipment Codes

BAExx - Basic Lab bench equipment

AELxx - Common Laboratory equipment

AEHxx - Equipment for Analogue Electronics lab

AESxx - Software for Analogue Electronics lab .

### Basic Lab Bench Equipment

Item No.	Description	Quantity	Priority
BAE01	Dual Power Supply	20	A
BAE02	Oscilloscope	20	A
BAE03	Analog Multimeter	20	A
BAE04	Protoboard	40	A
BAE05	Function Generator	20	A

### Special Purpose Equipment

Item No.	Description	Quantity	Priority
AEH01	Electronic Thermometer	2	A
AEH02	Clip-On Current Meter (ac/dc)	5	A
AEH03	Variable Frequency LCR Meter	2	A
AEH04	Low Frequency Spectrum Analyzer	2	A
AEH05	Digital Storage Oscilloscope (Low cost)	2	A
AEH06	Audio signal generator	5	A
AEH07	Digital Multimeter	2	A
AEH08	Variacs	5	A

### Common Laboratory Equipment

AEL01	Lab Bench Computer	20	A
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## Annex - 4 Minutes of Discussions (M/D)

AEL02	Dot Matrix printer	5	A
AEL03	Basic Lab bench	20	B
AEL04	Stools	80	B
AEL05	First Aid Panel	1	B
AEL06	Tool kit for students	2	A
AEL07	White Board	2	B
AEL08	Storage Cupboards and Racks	2 sets	B
AEL09	Display Boards	2	B

## VII . Telecommunication Laboratory

### Equipment Codes

BTCxx - Basic Lab bench equipment

TCLxx - Common Laboratory equipment

TCHxx - Equipment for Telecommunication lab

TCSxx - Software for Telecommunication lab

### Basic Lab Bench Equipment

Item No.	Description	Quantity	Priority
BTC01	Dual Power Supply	20	A
BTC02	Oscilloscope	20	A
BTC03	Multimeter	20	A
BTC04	High Frequency Signal Generator/ AM,FM Modulator/ Function Generator Unit	20	A
BTC05	Audio Signal Generator	20	A
BTC06	Frequency Counter	20	A
BTC07	Protoboard	40	A

### Equipment for Regular Laboratory Use

Item No.	Description	Quantity	Priority
TCH01	ASK/PSK/FSK Modulator	5	A
TCH02	Signal Amplifier	8	A
TCH03	Spectrum Analyser	8	A
TCH04	Pattern Generator	2	A
TCH05	LCR Meter	2	A
TCH06	Colour TV trainer panel	2	A
TCH07	Black & White TV trainer panel	2	A
TCH08	Colour TV receiver	5	A
TCH09	Black & White TV receiver	5	A
TCH10	dB Meter	2	A
TCH11	Pseudo Random Sequence Generator	2	A
TCH12	Random Noise Generator	8	A
TCH13	Frequency Meter	2	A
TCH14	Small Telephony switch	1	A
TCH15	Telephone line simulator	2	A

### Special Purpose Equipment

TCH16	Measuring Receiver	2	A
TCH17	GPS Receiver System	1	A
TCH18	DSP Trainer Kit	5	A
TCH19	Modulation Domain Analyzer	1	A
TCH20	BER Tester	2	B
TCH21	Digital Video Generator	1	A

## Annex - 4 Minutes of Discussions (M/D)

TCH22	High Frequency Storage Oscilloscope	2	A
TCH23	High Frequency Spectrum Analyzer	2	A
TCH24	Video Signal Analyzer	1	A
TCH25	Transmission line measurement kit	1	A
TCH26	Error Control Coding test kit	1	A
TCH27	TV Pattern Generator	1	A
TCH28	FM/AM Modulator Demodulator Trainer Panel	1	A
TCH29	PAM/PWM/PPM/PCM Trainer Panel	1	A
TCH30	ASK/PSK/FSK Modulator-Demodulator Trainer Panel	1	A
<b>Software</b>			
TCS01	Antenna Studies Software	1 Lot	A
TCS02	Filter Design Software	1 Lot	A
TCS03	Digital Signal Processing Software	1 Lot	A
<b>Common Laboratory Equipment</b>			
TCL01	Personal Computer	6	A
TCL02	Dot Matrix Printer	1	A
TCL03	Basic Lab bench	20	B
TCL04	Stools	80	B
TCL05	First Aid Panel	1	B
TCL06	White Board	2	B
TCL07	Display Boards	2	B
TCL08	Storage Cupboards and Racks	2 sets	B

## VIII. Microwave Laboratory

### Equipment Codes

MWLxx - Common Laboratory equipment

MWHxx - Equipment for Microwave lab

MWSxx - Software for Microwave lab

### Equipment for Regular Laboratory Use

#### List of Equipment

Item No.	Description	Quantity	Priority
MWH01	Klystron, Power Supply and Waveguide Components	3	A
MWH02	Magnetron	2	A
MWH03	Gunn Oscillator, Power supply and waveguide components	3	A
MWH04	Spectrum Analyzer	1	A
MWH05	Synthesized Sweep Signal Generator	2	A
MWH06	Frequency Counter	2	A
MWH07	SWR Meter	2	A
MWH08	Microwave Tx. and Rx. System with Dish antenna and LNA	1	A
MWH09	Antenna Trainer Kit	2	A
MWH10	Satellite Receiver System	1	A
MWH11	Field Strength Meter	2	A
MWH12	Experimental Radar kit	1	A
MWH13	Microwave Transistors - Maximum Frequency 1 GHz	10	A
MWH14	Microwave Transistors - Maximum Frequency 10 GHz	10	A
MWH15	Zero bias Schottky Detector Diodes	10	A
MWH16	PIN Diodes	5	A
MWH17	Impedance Bridge	1	A
MWH18	Cable Connectors : N(m) to BNC(f)	5	A

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## Annex - 4 Minutes of Discussions (M/D)

MWH19	Cable Connectors : K(m) to BNC(f)	5	A
MWH20	Cable Connectors : N(f) to BNC(m)	5	A
MWH21	Cable Connectors : K(f) to BNC(m)	5	A
MWH22	Cable Connectors : BNC(m) to BNC(f)	5	A
<b>Software</b>			
MWS01	Antenna Design	1 Lot	A
MWS02	Microwave Circuit Design	1 Lot	A
MWS03	Radar Cross Section	1 Lot	A
<b>Common Laboratory Equipment</b>			
MWL01	Personal Computer	4	A
MWL02	Dot Matrix Printer	1	A
MWL03	Basic Lab Bench	10	B
MWL04	Stools	40	B
MWL05	First Aid Panel	1	B
MWL06	White Board	1	B
MWL07	Display Boards	1	B
MWL08	Storage Cabinets and Racks	1	B

## IX Optoelectronics Laboratory

### Equipment Codes

BOPxx - Basic Lab bench equipment

OPLxx - Common Laboratory Equipment+A292

OPHxx - Equipment for Optoelectronics Lab

OPSxx - Software for Optoelectronics Lab

### Basic Lab Bench Equipment

Item No.	Description	Quantity	
BOP01	Dual Power Supply	8	A
BOP02	Oscilloscope	8	A
BOP03	Multimeter	8	A
BOP04	Logic Probe	8	A
BOP05	Audio Signal Generator	8	A
BOP06	Protoboard	16	A

### List of Equipment

Item No.	Description	Quantity	Priority
<b>Equipment for Regular Laboratory Use</b>			
OPH01	Laser Pointer	10	B
OPH02	Fibre Optic Educator Kit	5	A
OPH03	Fibre Optic Monitor Kit	5	A
OPH04	Fibre Optic Power Meter	1	A
OPH05	LCD Panel	2	A
OPH06	Laser Diodes	20	A
OPH07	LDR	50	B
OPH08	Photo Diodes	20	B
OPH09	Optocouplers	20	B
OPH10	Ellipsometer	2	A
OPH11	Lux Meter	2	A
OPH12	Optical spectrum analyzer	1	A
OPH13	Erbium doped fibre amplifier	1	A
OPH14	1550nm DFB Laser	2	A

## Annex - 4 Minutes of Discussions (M/D)

OPH15	1310nm FP laser	2	A
<b>Common Laboratory Equipment</b>			
OPL01	Basic Lab Bench	8	B
OPL02	Stools	32	B
OPL03	Personal Computer	4	A
OPL04	Dot Matrix Printer	1	A
OPL05	First Aid Panel	1	B
OPL06	White Board	1	B
OPL07	Display Boards	1	B
OPL08	Storage Cupboard and Racks	1 Set	B

## X. Postgraduate Research Laboratory

### Equipment Codes

BPGxx - Basic Lab bench equipment

PGLxx - Common Laboratory equipment

PGHxx - Equipment for Postgraduate lab

PGSxx - Software for postgraduate lab

### Basic Lab Bench Equipment

Item No.	Description	Quantity	Priority
BPG01	Dual Power Supply	20	A
BPG02	Oscilloscope	20	A
BPG03	Multimeter	20	A
BPG04	Protoboard	40	A
BPG05	Logic Probe	20	A
BPG06	Audio Signal Generator	20	A
BPG07	Pulse Generator	20	A
BPG08	Function Generator	20	A

### List of Equipment

<b>Laboratory Equipment</b>			
Item No.	Description	Quantity	Priority
PGH01	Personal Computers	6	A
PGH02	Laser Printer	1	A
PGH03	Dot Matrix Printer	1	B
PGH04	Plotter	1	A
PGH05	Scanner	1	B
PGH06	Digital Storage Oscilloscope	2	A
PGH07	High Frequency Oscilloscope	2	A
PGH08	Digital Frequency Synthesizer	1	A
PGH09	ASK/PSK/FSK Modulator	2	A
PGH10	Pseudo Random Signal Generator with Noise addition capability	2	A
PGH11	dB Meter	3	A
PGH12	Audio Generator	10	A
PGH13	RF Generator	10	A
PGH14	Microwave Frequency Meter	1	A
PGH15	Video Camera	1	B
PGH16	TV Receiver	1	B
PGH17	Video Recorder	1	B
PGH18	Digital TV Receiver for Research	2	A
PGH19	Audio Tape Recorder	2	B

Annex - 4 Minutes of Discussions (M/D)

PGH20	Microwave Tx. And Rx. Unit with antenna, LNA etc.	1	A
PGH21	SWR Meter	1	A
PGH22	TMS320 family DSP Development System	1	A
PGH23	Small Experimental ISDN Phone and Switching equipment	1	A
PGH24	Logic Analyzer	2	A
PGH25	Low cost Spectrum Analyzer	2	A
PGH26	Pulse Generator	10	A
PGH27	Logic Probe	12	A
PGH28	Logic Pulser	12	A
PGH29	Logic Clip	3	A
PGH30	PLD Programmer	1	A
PGH31	EPROM Eraser	1	A
PGH32	Broadband RF Front End	1	A
PGH33	Broadcast TV Analyzer	1	A
PGH34	Network Analyzer	1	A
PGH35	Wireless Mobile and Base Station Test set	1	A
PGH36	Basic Network Experiment kit	1	A
PGH37	Parameter Analyzer	1	A
PGH38	Antenna Tester HF, VHF and UHF	1	A
PGH39	Wide Bandwidth RF Receiver	1	A
PGH40	Programmable Step Attenuator	1	A
PGH41	S-Parameter Test bed	1	A
PGH42	Synthesized RF Signal Generator	1	A
PGH43	RF Power Meter	5	A
PGH44	Quick response RF power monitor	1	A
PGH45	RF Terminations	1 series	A
PGH46	RF Power Dividers/ Combiners	1	A
PGH47	RF Amplifier (0.1 MHz - 400MHz)	1	A
PGH48	RF Amplifier (100kHz - 1.3 GHz)	1	A
PGH49	Field Strength Meter	1	A
PGH50	Microwave Noise Tubes and Noise Sources	1	A
PGH51	Erbium Doped Fiber	1	A
PGH55	Optical Source	1	A
PGH52	Optical Power Meter	1	A
PGH53	Fiber Optic Loss Test Kit	5	A
PGH54	Single Mode Variable Attenuator	1	A
PGH55	Optical Fiber Scope	1	A
PGH56	Optical Time Domain Reflectometer	1	A
PGH57	Test and Measurement Hardware for Data Acquisition	1	A
PGH58	GPIO Programmer	1	A
PGH59	Waveform Monitor	1	A
PGH60	Vectorscope	1	A
PGH61	Video Signal Generator	1	A
PGH62	Audio Analyzer	1	A
PGH63	Audio Distortion Meter	1	A
PGH64	Audio Jitter Meter	1	A
PGH65	Audio Signal Level Meter	1	A
PGH66	NTSC/PAL Color Picture Monitor	1	A
<b>Software</b>			
PGS01	Image Processing System	1 Lot	A
PGS02	MATLAB	1 Lot	A
PGS03	Cellular Network Simulation/ Design and Planning Software	1 Lot	A
PGS04	Microwave System Design and Planning Software	1 Lot	A

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## Annex - 4 Minutes of Discussions (M/D)

PGS05	LAN Network Simulation, Monitoring , Planning and Design Software	1 Lot	A
PGS06	OPNET Software Package	1 Lot	A
PGS07	LABVIEW	1 Lot	A
PGS08	Mathematica	1 Lot	B
PGS09	NEC- Numeric Electronic Code	1 Lot	A
PGS10	Workstation emulation software for PC	1 Lot	A
<b>Common Laboratory Equipment</b>			
PGL01	Basic Lab Bench	20	B
PGL02	Stools	40	B
PGL03	Dot Matrix Printer	2	B
PGL04	Laser Printer	1	B
PGL05	First Aid Panel	1	B
PGL06	White Board	4	B
PGL07	Display Boards	2	B
PGL08	Storage Cupboards and Racks	3 sets	B

## XI. Electronic Workshop

### Equipment Codes

BWSxx - Basic Lab bench equipment

WSLxx - Common Laboratory equipment

WSxx - Equipment for Electronic Workshop

### Basic Lab Bench Equipment

Item No.	Description	Quantity	Priority
BWS01	Dual Power Supply	9	A
BWS02	Oscilloscope	9	A
BWS03	Multimeter	9	A
BWS04	Protoboard	18	A
BWS05	Logic Probe	9	A
BWS06	Audio Signal Generator	9	A

### List of Equipment

Item No.	Description	Quantity	Priority
WS01	PCB Drilling Machine	1	A
WS02	Solder Station	1	A
WS03	Desoldering Station	1	A
WS04	Energy Analyzer	1	A
WS05	Digital Light Meter	1	A
WS06	Digital Sound Level Meter	1	A
WS07	Digital Humidity and Temperature Meter	1	A
WS08	Hand Held Digital Multimeter	1	A
WS09	Mixed Signal Oscilloscope	1	A
WS10	Electronic Labeling Machine	1	A
WS11	Electronics Engineers Tool Set	2	A
WS12	First Aid Panel	1	A
WS13	Fluorescent Magnifier	1	A
WS14	Scroll Saw	1	A
WS15	Electric Fretsaw	1	A
WS16	Drill Bit Set	2	A

## Annex - 4 Minutes of Discussions (M/D)

WS17	Spanner Set	2	A
WS18	Portable Workstand	2	A
WS19	Device Viewer System	1	A
WS20	Active Probe for SMDs	2	A
WS21	High Voltage Probe	2	A
WS22	Differential Probe	2	A
WS23	AC/DC Current Probe	2	A
WS24	RF Frequency Counter	1	A
WS25	RF Connector Kit	1	A
WS26	Stacking Type Parts Storage Cabinets	15	A
WS27	Solder Bath	1	A
WS28	Multi Layer PCB Development System	1	A
WS29	Tachometer	1	A
WS30	UV Exposure Unit	1	A
<b>Common Laboratory Equipment</b>			
WSL01	Basic Lab bench	9	B
WSL02	Stools	18	B
WSL03	Personal Computer	4	B
WSL04	Dot Matrix Printer	1	B
WSL05	Laser Printer	1	B
WSL06	First Aid Panel	1	B
WSL07	White Board	2	B
WSL08	Display Boards	1	B
WSL09	Storage Cabinets and Racks	3	B

## XII. Electronic CAD Lab.

### Equipment Codes

ECH xx - Equipment for CAD Lab.

EDSxx - Software for CAD Lab.

ECLxx - Common Laboratory Equipment

### List of Equipment

Item No.	Description	Quantity	Priority
<b>Hardware</b>			
ECH01	Plotter	1	A
ECH02	Personal Computer	8	A
ECH03	RISC Station Running UNIX	10	A
<b>Software</b>			
ECS01	IC Design for UNIX Platform(a) VLSI Standard Cell Design Tool(b) VLSI Layout Tool(c) VLSI Sticks to Create Layout Easily(d) VLSI Design Rule Checker(e) VLSI Schematic Editor(f) Schematic to Spice Converter(g) Parasitic Extractor ( from layout)(h) Logic Simulator(i) Spice Simulator(j) VHDL High Level Synthesis Compiler(k) Graph Display Tool	2 Lot	A
ECS02	IC Design Tool for PC(a) Schematic Editor(b) Logic Simulator(c) Spice Simulator(d) Mixed Signal Simulator(e) VHDL High Level Synthesis Tool(f) Layout Editor(g) Graphical Display	2 Lot	A
ECS03	MATLAB for PC	2 Lot	A
ECS04	Digital and analog circuit design and simulation software	1 Lot	A
ECS05	PCB design software	1 Lot	A
ECS06	Antenna Design Software for PC	1 Lot	A

## Annex - 4 Minutes of Discussions (M/D)

ECS07	Image Processing and Computer Graphics design software for UNIX platform	1 Lot	A
ECS08	Labview	1 Lot	A
ECS09	Mathematica	1 Lot	B
ECS10	NEC - Numeric Electronic Code	1 Lot	A
ECS11	Mathcad for PC	1 Lot	A
ECS12	RF design and simulation software	1 Lot	A
ECS09	Optical System/Network Design Software	1 Lot	A
<b>Common Laboratory Equipment</b>			
ECL01	Computer Table	18	B
ECL02	Chairs	40	B
ECL03	White Board	1	B
ECL04	Display Board	1	B
ECL05	Storage Cupboard and Racks	2 sets	B

## X.III General Services

### Equipment Codes

GSH xx -General services equipment.

Item No.	Description	Quantity	Priority
GSH01	PABX	1	A
GSH02	Diesel Power Generator	1	A

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**MULTIMEDIA LABORATORY**

Item	Description	Priority	Quantity
<b>For Training</b>			
<b>1</b>	<b>Image Processing &amp; Training Laboratory</b>		
1	Personal Computer System for Teacher With CD-RW	B	1
2	17" Display	B	1
3	Main Control Unit for Teacher	B	1
4	Main Control System for Teacher	B	1
5	Head Set Box for Teacher	B	1
6	Main Control Console for Teacher	B	1
7	Monitor Television for Teacher	B	1
8	Personal Computer System for Student	B	16
9	17" Display	B	16
10	Booth Box for Student	B	16
11	Main Control System for Student	B	16
12	Main Control Console for Student	B	8
13	Monitor Television for Student	B	8
14	Intercom System	B	1
15	Scan Converter	B	1
16	Audio Video Control Console	B	1
17	Video Distribution Amplifier	B	1
18	DV Cam Recorder	B	1
19	Monitor Television	B	4
20	Video Presentation Stand	B	1
21	Wireless Microphone System	B	1 set
22	Public Address System	B	1 set
23	UPS 7.5kVA backup time: 10 minutes	B	1
<b>2</b>	<b>Internet Production Training Laboratory</b>		
1	Personal Computer System	B	16
2	17" Display	B	16
3	Color Printer	B	4
4	Scanner	B	2
5	ZIP Drive Unit	B	4
6	Digital Video Cassette Player	B	4
7	VHS Cassette Recorder	B	4
8	Input Matrix Selector	B	4
9	CD Player	B	4
10	MD Player	B	4
11	Monitor Television	B	4
12	Table for Personal Computer / Chairs	B	16
13	System Rack for AV Equipment	B	4
14	UPS 7.5kVA Backup Time : 10 minutes	B	1
15	Software : Authorware & other related graphic capture, editing software	B	16




# Annex - 4 Minutes of Discussions (M/D)

Item	Description	Priority	Quantity
<b>3</b>	<b>2D Graphics, Animation</b>		
1	Personal Computer System for Graphics	B	5
	ZIP Drive	B	
2	21" Color Display	B	5
3	Color Printer	B	2
4	UPS 5kVA Backup time : 10 minutes	B	1
5	Software :2D Graphic & Animation software	B	5
	Software : Picture and sound libraries	B	5
6	Table for PC / Chairs	B	5
<b>4</b>	<b>Non-liner Digital Video Editing Training Laboratory</b>		
1	Non-liner Editing Processor Unit	B	4
2	Digital Video Recorder	B	4
3	21" Color Display	B	4
4	Video Monitor	B	4
5	Audio Mixer	B	4
6	Audio Monitor	B	4
7	CD Player	B	4
8	MD Player	B	4
9	Operation Desk / Chairs	B	4
10	UPS 7 kVA Backup time : 10 minutes	B	1
<b>5</b>	<b>Audio / Video Production</b>		
1	2/3" 3CCD Color Video Camera	B	3
2	Camera Tools	B	3
3	Camera Control Unit	B	3
4	5" View Finder	B	3
5	Camera Cable	B	3
6	Zoom Lens	B	3
7	Tri-pods	B	3
8	Video Monitor TV for Studio Floor	B	2
9	Audio Monitor Speaker for Studio Floor	B	2
10	Clip-on Wireless Microphone	B	3
11	Hand Held Dynamic Microphone	B	2
12	8-input Video Swicher with Digital Effect	B	1
13	8-input Audio Mixer	B	1
14	Character Generator	B	1
15	Digital Video Recorder	B	3
16	VHS VTR	B	2
17	Video Monitor TV for Control Room	B	1 lot
18	Audio Monitor System for Control Room	B	1 lot
19	Video Distribution Amplifier	B	1
20	Audio Distribution Amplifier	B	1
21	Wave Form Monitor	B	1
22	Vector Scope	B	1
23	X-Y Scope	B	1
24	Sync Generator	B	1
25	CD Player	B	1
26	MD Player	B	1
27	Studio Lighting System	B	1
28	Operation Console	B	1
29	System Rack	B	3
30	Monitor Rack	B	1

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# Annex - 4 Minutes of Discussions (M/D)

Item	Description	Priority	Quantity
31	UPS 7 kVA Backup time : 10 minutes	B	1
<b>6</b>	<b>Publishing Equipment</b>		
1	Personal Computer with CD-RW	B	4
2	21" Display	B	4
3	Color Printer	B	4
4	Scanner	B	4
5	ZIP Drive Unit	B	4
6	UPS 3 kVA Backup time : 10 minutes	B	1
7	Table for Personal Computer	B	4
8	Software : Publishing software full package	B	4
9	Software : Acrobat ( Web Publisher - PDF files)	B	4
10	Digital Camera (still)	B	4
<b>7</b>	<b>Web-Outgoing</b>		
1	Fire Wall	B	1
2	Net Server for Internet Connection	B	1
3	Internet Kit	B	1
4	Filtering Soft	B	1
5	17" Display	B	2
6	UPS 2 kVA Backup time : 10 minutes	B	1
7	Table for PC	B	1
<b>8</b>	<b>Networking Equipment</b>		
	Ethernet Switches / Hub and Accessories	B	1 lot
	Ether network Cable and Accessories	B	1 lot

The Project for the improvement of the Educational Equipment for the  
University of Moratuwa - Spare parts and replacement of equipment procured by the  
Japanese grant aid in 1987

Item No.	Description	Quantity	Priority
EE 11	Pocket Tachometer (Model OSK5988)	02	C
EE 12	Pocket Tachometer (Model OSK5989)	02	C
EE 13	Pocket Tachometer (Model OSK5990)	02	C
EE 20	Analog Multi-meter	03	C
EE 23	Oscilloscope	03	C
EE 24	Digital storage Oscilloscope	01	C
EE 25	Insulated Terminals	1200	C
EE 37	Power Electronics basic Demonstration set	01 Lot	C
EE 39	Thyristor Leonard experiment system	01 set	C
EE 41	Chopper driven Dc Motor	01 set	C
EE 42-43	Thyristor Inverter system trainer	01 set	C
EE 48	Un-interruptable power supply	01 set	C
EE 24	Digital Storage oscilloscope	02 set	C
EE-1	Clip on ac power meter	02	C
EE-8	Galvanometer	03	C
EE-4	Flux meter	01	C
EE-18	Portable Lux meter	01	C
EE-19	Portable whetstone bridge	02	C
EE-10	Precision double bridge	01	C
EE-23	Oscilloscope	03	C
EE-2	Gauss meter	01	C
EE-22	Function generator	02	C
EE -38	Plastic counted white steel morning board	01	C

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Annex - 4 Minutes of Discussions (M/D)

No.	Equipment	Model	Quantity	Priority
1	LCR Meter		1 Lot	C
2	Oscilloscope	COS 5040	10 sets	C
3	Oscilloscope	COS 7061	2 sets	C
4	CR Oscillator		4	C
5	Precision Digital Multimeter		1	C
6	DC/AC Voltage, Current, Ohm Calibrator		1	C
7	Digital Hi Tester		1 Lot	C
8	Microwave Frequency Counter		1 Lot	C
9	Modulation Demodulation Trainer		1 Lot	C
10	FM/AM Standard Signal Generator		1 Lot	C
11	Digital System Trainer		1 Lot	C
12	Model Computer System		1 Lot	C

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### ANNEX 3: JAPAN'S GRANT AID

The Grant Aid Scheme provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

#### 1. Grant Aid Procedures

Japan's Grant Aid Scheme is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for the Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Scheme, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes (E/N) signed by the Governments of Japan and the recipient country.

Finally, for the smooth implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

#### 2. Basic Design Study

##### 1) Contents of the Study

The aim of the Basic Design Study (hereafter referred to as "the Study"), conducted by JICA on a requested project (hereafter referred to as "the Project"), is to provide a basic document necessary for the appraisal of the Project by the

Government of Japan. The contents of the Study are as follows:

Confirmation of the background, objectives, and benefits of the requested Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.

Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic points of view.

Confirmation of items agreed upon by both parties concerning the basic concept of the Project;

Preparation of a basic design of the Project

Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

1) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

2) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consulting firm(s) and (a) contractor(s) and final payment to them must be completed.

However, in case of delays in delivery, installation or construction due to unforeseen factors such as natural disaster, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

3) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely consulting constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

5) Undertakings required to the Government of the Recipient country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

- ① To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction,
- ② To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,
- ③ To secure buildings prior to the procurement in case the installation of the equipment,
- ④ To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,
- ⑤ To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;
- ⑥ To accord Japanese nationals, whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;

6) "Proper Use"

The recipient country is required to operate and maintain the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

7) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

8) Banking Arrangement (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its

designated authority under the verified contracts.

- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of recipient country or its designated authority.
- 9) Authorization to Pay (A/P)  
The government of the recipient country should bear an advising commission of an Authorization to Pay and payment commission to the Bank.

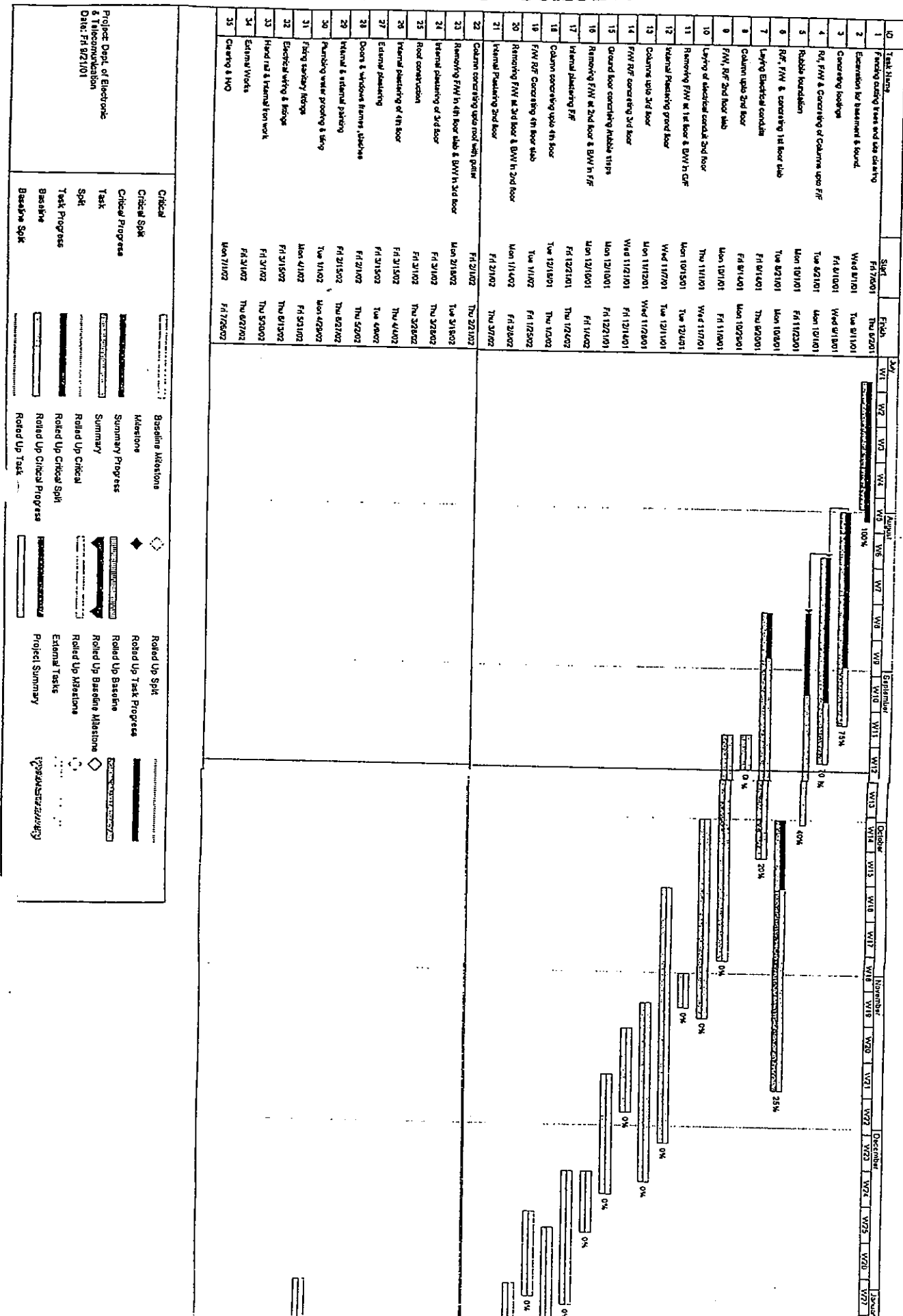
## ANNEX 4: UNDERTAKINGS TO BE TAKEN BY EACH GOVERNMENT

NO	Items	To be covered by Grant Aid	To be covered by Recipient side
1	To bear the following commissions to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
2	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To accord Japanese nationals, whose services may be required in connection with the supply of the products and the services under the verified contract, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
4	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts		●
5	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		●

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## ANNEX 5: CONSTRUCTION SCHEDULE OF NEW BUILDINGS



4/20

Annex - 4

## ANNEX 6: CRITERIA FOR EQUIPMENT SELECTION AND SPECIFICATION

### 1. Criteria for High Priority

Equipment to be included in the Project should be in accordance with the curriculum and frequently used by practices and experiments. Among that equipment, the following equipment will be given high priority.

- 1) equipment which is difficult to purchase by the university's own budget
- 2) addition to the existing equipment the number of which is not sufficient compared to the number of students
- 3) replacement of the existing equipment which is outdated or out of order

### 2. Criteria for Low Priority

- 1) equipment which is likely to be used only for specific purpose by the specific person or groups.
- 2) equipment which is used at the Office, the Publication Unit and the Audio-Visual Unit which is not directly related to education
- 3) furniture like desks, chairs, racks and boards other than necessary one to install the equipment included in the Project

### 3. Criteria for Elimination

- 1) equipment which needs big improvement of buildings and facilities
- 2) software other than general purpose software
- 3) equipment which is scheduled to be covered by other donor agencies

### 4. Criteria for Specification & Number of Equipment

- 1) The number of same kinds of equipment requested by several laboratories will be reduced to the minimum by intensive utilization of the same kinds of equipment in smaller number of laboratories.
- 2) The number of equipment shall be in accordance with the expected number of students.
- 3) The number of equipment which might become outdated in few years like a personal computer should be reduced to the minimum.
- 4) Equipment to be included in the Project should not need high level skill or many trained staff and too highly graded equipment and specifications should be eliminated.
- 5) Equipment to be included in the Project should not need expensive cost for proper operation and maintenance and spare parts and repair service of the equipment should be available within Sri Lanka easily.

## **APPENDICES**

### **Annex - 4.**

#### **Minutes of Discussions**

#### **(Explanation of Draft Final Report)**

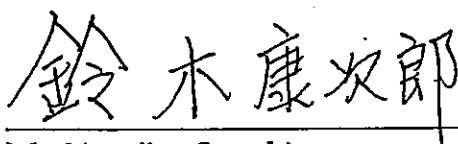
MINUTES OF DISCUSSIONS  
ON BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF THE  
FACULTY OF ENGINEERING, UNIVERSITY OF MORATUWA  
IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA  
(EXPLANATION ON DRAFT REPORT)

In September 2001, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for Improvement of the Faculty of Engineering, University of Moratuwa, (hereinafter referred to as "the Project") to the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "Sri Lanka"), and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

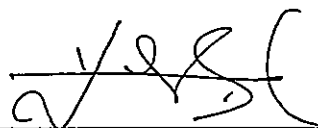
In order to explain and to consult the Sri Lanka on the components of the draft report, JICA sent to Sri Lanka the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed Mr. Yasujiro SUZUKI, Deputy Resident Representative, JICA Sri Lanka Office, from December 17 to December 25, 2001.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

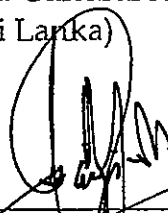
Colombo, December 21, 2001



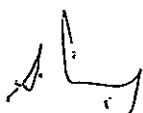
Mr. Yasujiro Suzuki  
Leader  
Basic Design Study Team  
Japan International Cooperation Agency  
(Japan)



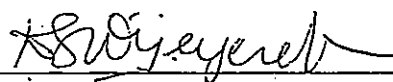
Mr. A.M. Chandrapala  
Additional Secretary  
Ministry of Human Resources  
Development, Education  
and Cultural Affairs  
(Sri Lanka)



Prof. B.R.R.N. Mendis  
Chairman  
University Grants Commission  
(Sri Lanka)



Ms. Sujatha Cooray  
Director  
Department of External Resources  
Government of Sri Lanka  
(Sri Lanka)



Prof. Dayantha S. Wijeyesekera  
Vice Chancellor  
University of Moratuwa  
(Sri Lanka)

ATTACHMENT

1. Components of the Draft Report

The Government of Sri Lanka agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid scheme

Sri Lanka side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Sri Lanka as explained by the Team and described in Annex-3 and Annex-4 of the Minutes of Discussions signed by both parties on September 26, 2001.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Sri Lanka by the end of March, 2002.

4. Other relevant issues

4-1 Sri Lanka side ensures the completion of all construction works and utility works of the new building for the Department of Electronics & Telecommunication Engineering, Faculty of Engineering, University of Moratuwa by the end of June, 2002 as shown in Annex 1. Sri Lanka side agreed to send progress reports with updated construction schedule to JICA Sri Lanka Office every two months without delay.

4-2 Sri Lanka side agreed to install local area network cabling in the new building and to wire necessary electricity up to the changeover switch of the generator.

4-3 Sri Lanka side agreed to complete the set-up of all furniture and necessary items for the new building, other than those to be procured under the Project, prior to the start of the installation works.

4-4 Sri Lanka side will bear the expenses to allocate the necessary budgetary provisions to settle CID, GST, NSL and any other duties and fiscal levies applicable for the equipment

procured under the Project.

4-5 Sri Lanka side agreed to allocate necessary budget and personnel described in the draft report and to operate and maintain the equipment procured under the Project appropriately.

4-6 Sri Lanka side agreed not to conduct unauthorized copy of softwares procured under the Project.

4-7 Both sides confirmed that the internal transportation for the equipment procured under the Project, from the port of disembarkation to the delivery sites, shall be covered by Japanese side.

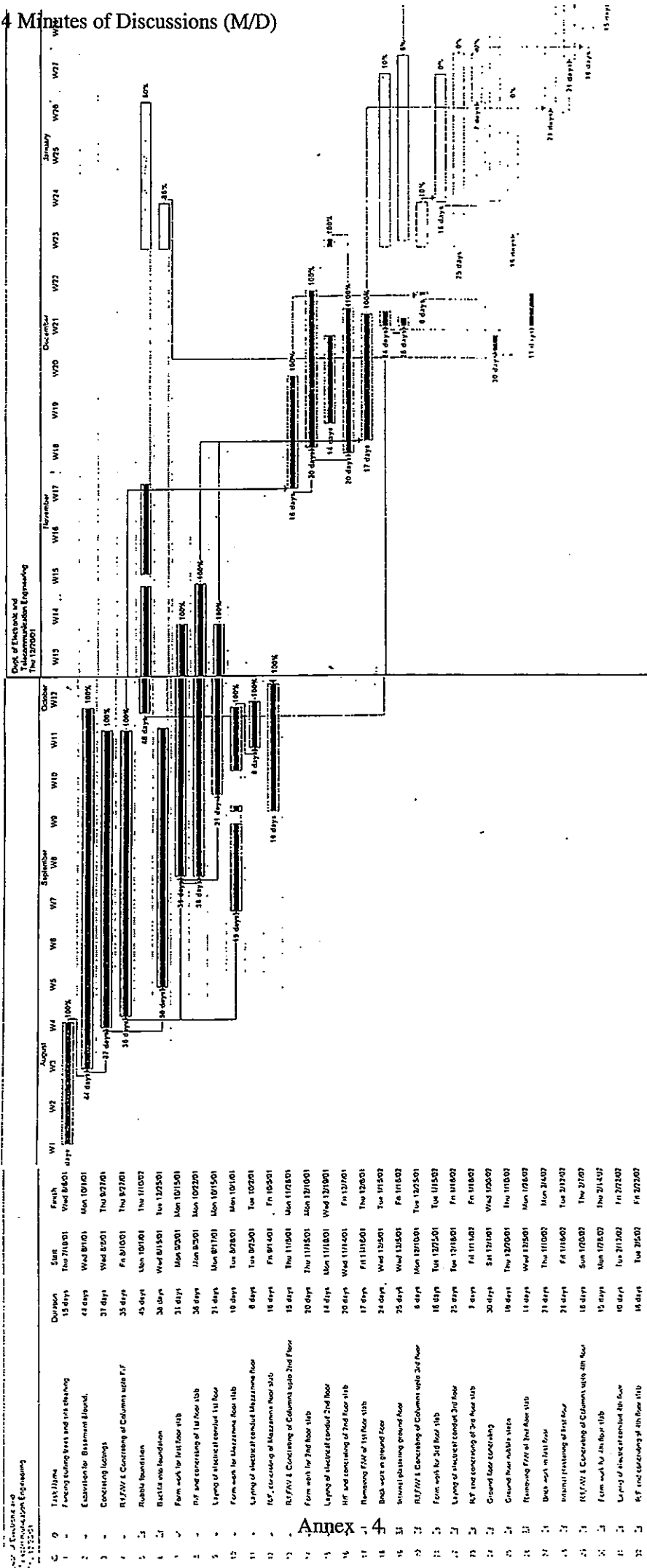
4-8 Sri Lanka side requested the modification of the equipment list as described in Annex 2 and the Team agreed to convey Sri Lanka side's request to Japanese related authorities for reconsideration. Nevertheless both sides agreed that the final decision will be made by Japanese side.

4-9 The Team explained the merit of "Round Robin Method", in which students divided in small groups will conduct different practices in a same laboratory on the rotation basis. Sri Lanka side understood the necessity of the method and agreed to consider the introduction of the method in order to utilize the limited number of equipment in more effective and efficient way.

4-10 Both sides agreed that the draft report shall be confidential, be dealt with carefully and not be disclosed to any other parties.

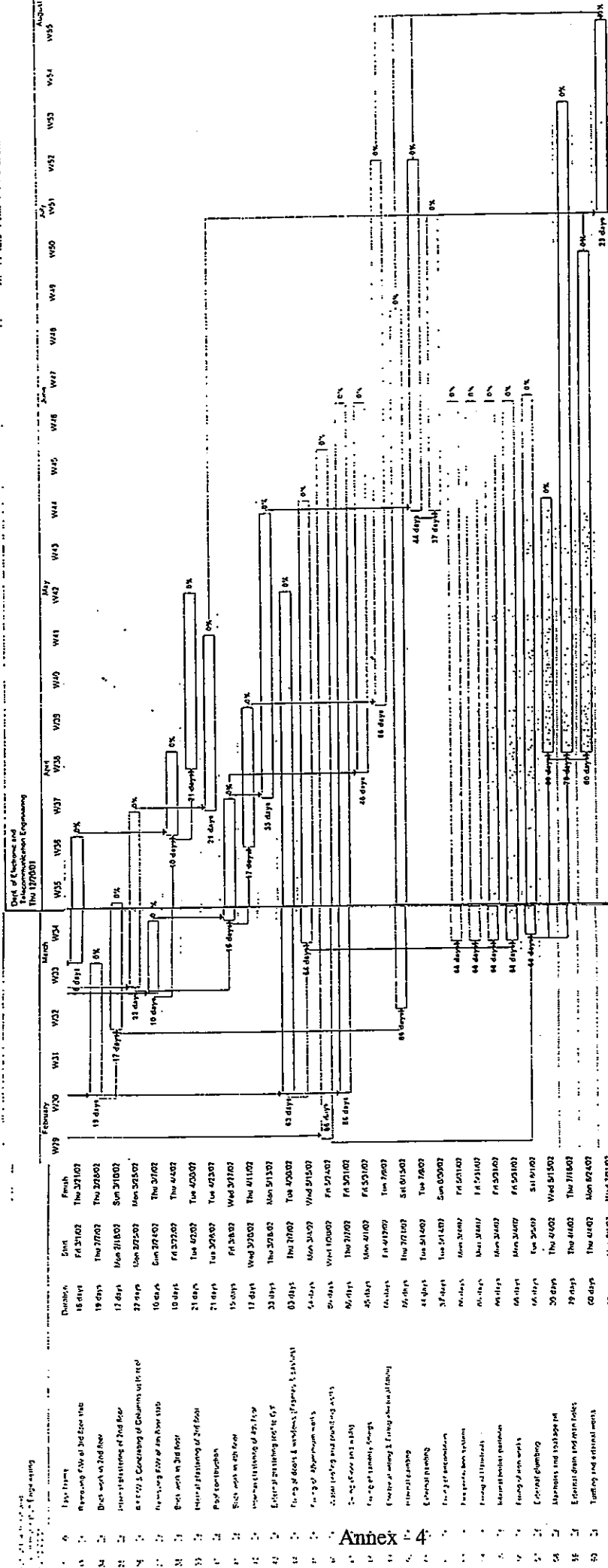
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# Progress of Construction of New Building





### Annex - 4 Minutes of Discussions (M/D)



Annex : 4

Request for Modification of Equipment List by Sri Lanka side

## 1. Equipment to be added

## (1) Analog Electronics Laboratory

- Lab Bench Computer 5 pcs.

## (2) Telecommunication Laboratory

- High Frequency Signal Generator/AM, FM Modulator/Function Generator 1 pc.

- DSP Trainer Kit 2 pcs.

## (3) Microwave Laboratory

- Antenna Trainer Kit 1 pc.

## (4) Postgraduate Research Laboratory

- Small Experimental ISDN Phone and Switching Equipment 1 pc.

## (5) Internet Technology Laboratory

- Personal Computer 20 pcs.

- Color Printer 2 pcs.

- Scanner 2 pcs.

- Digital Video Cassette Player 2 pcs.

- MD Player 2 pcs.

- Monitor TV 2 pcs.

- Software (Authorware) 20 pcs.

- Software (2D Graphic) 20 pcs.

- Software (DTP Software) 20 pcs.

- Software (Acrobat) 2 pcs.

- Software (Video Editing Software) 20 pcs.

- Software (Streaming Service Software) 1 pc.

- Video Capture Card 20 pcs.

- Digital Camera 2 pcs.

- Video Camera 2 pcs.

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Annex - 4 Minutes of Discussions (M/D)

- Web Server 1 pc.
- Fire Wall 1 pc.
- Internet Kit 1 pc.

2. Equipment to be reduced

(1) Electronic CAD Laboratory

- Plotter 1 pc.

*L*

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*[Handwritten initials]*

## **APPENDICES**

### **Annex - 5.**

#### **Cost Estimation Borne by the Recipient Country**

**Project Cost**

## Publication Unit

## Electric Facility

Socket	6 units	200.0	RP	1,200
Material for Wiring	18 m	100.0	RP	1,800
Installation Cost	0.3 Days	250.0	RP	<u>75</u>
				3,075

## LAN Facility

Port	1.0 unit	150	RP	150
LAN Cable	3.0 m	100	RP	300
Installation Cost	0.1 Days	250	RP	<u>25</u>
				475

## Network Equipment

## Electric Facility

Socket	24 Units	200.0	RP	4,800
Material for Wiring	72 m	100.0	RP	7,200
Installation Cost	1 Day	250.0	RP	<u>250</u>
				12,250

## LAN Facility

Port	112.0 Units	150	RP	16,800
LAN Cable	1,120.0 m	100	RP	112,000
Installation Cost	6.0 Day	250	RP	<u>1,500</u>
				130,300

## Computer System Laboratory

## Electric Facility

Socket	47 units	200.0	RP	9,400
Material for Wiring	141 m	100.0	RP	14,100
Installation Cost	2 Days	250.0	RP	<u>500</u>
				24,000

## LAN Facility

Port	33.0 units	150	RP	4,950
LAN Cable	99.0 m	100	RP	9,900
Installation Cost	1.5 Days	250	RP	<u>375</u>
				15,225

## Digital Electronics Laboratory

## Electric Facility

Socket	122 units	200.0	RP	24,400
Material for Wiring	366 m	100.0	RP	36,600
Installation Cost	6 Days	250.0	RP	<u>1,500</u>
				62,500

## LAN Facility

Port	6.0 units	150	RP	900
LAN Cable	18.0 m	100	RP	1,800
Installation Cost	0.3 Days	250	RP	<u>75</u>
				2,775

## Analog Electronics Laboratory

## Electric Facility

Socket	99 units	200.0	RP	19,800
Material for Wiring	297 m	100.0	RP	29,700
Installation Cost	5 Days	250.0	RP	<u>1,250</u>
				50,750

## LAN Facility

Port	2.0 units	150	RP	300
LAN Cable	6.0 m	100	RP	600
Installation Cost	0.2 Days	250	RP	<u>38</u>
				938

## Annex - 5 Cost Estimation Borne by the Recipient Country

### Telecommunication Laboratory

#### Electric Facility

Socket	96 units	200.0	RP	19,200
Material for Wiring	288 m	100.0	RP	28,800
Installation Cost	5 Days	250.0	RP	<u>1,250</u>
				49,250

#### LAN Facility

Port	6.0 units	150	RP	900
LAN Cable	18.0 m	100	RP	1,800
Installation Cost	0.3 Days	250	RP	<u>75</u>
				2,775

### Optoelectronics Laboratory

#### Electric Facility

Socket	23 units	200.0	RP	4,600
Material for Wiring	69 m	100.0	RP	6,900
Installation Cost	1 Days	250.0	RP	<u>250</u>
				11,750

#### LAN Facility

Port	2.0 units	150	RP	300
LAN Cable	6.0 m	100	RP	600
Installation Cost	0.3 Days	250	RP	<u>75</u>
				975

### Postgraduate Research Laboratory

#### Electric Facility

Socket	169 units	200.0	RP	33,800
Material for Wiring	507 m	100.0	RP	50,700
Installation Cost	9 Days	250.0	RP	<u>2,250</u>
				86,750

#### LAN Facility

Port	11.0 units	150	RP	1,650
LAN Cable	33.0 m	100	RP	3,300
Installation Cost	0.6 Days	250	RP	<u>150</u>
				5,100

### Electronic Workshop

#### Electric Facility

Socket	13 units	200.0	RP	2,600
Material for Wiring	39 m	100.0	RP	3,900
Installation Cost	0.7 Days	250.0	RP	<u>175</u>
				6,675

#### LAN Facility

Port	2.0 units	150	RP	300
LAN Cable	6.0 m	100	RP	600
Installation Cost	0.1 Days	250	RP	<u>25</u>
				925

### Electronic CAD Laboratory

#### Electric Facility

Socket	13 units	200.0	RP	2,600
Material for Wiring	39 m	100.0	RP	3,900
Installation Cost	0.7 Days	250.0	RP	<u>175</u>
				6,675

#### LAN Facility

Port	2.0 units	150	RP	300
LAN Cable	6.0 m	100	RP	600
Installation Cost	0.1 Days	250	RP	<u>25</u>
				925

## Annex - 5 Cost Estimation Borne by the Recipient Country

### Equipment procured by University

Office			526,000
Board	9	60,000.0	540,000
PABX			<u>3,000,000</u>
			4,066,000

### Diesel Generator Installation Charge

Mortar	12.5	m3	12,075.0	RP	150,938
Iron bar	350	m			
D16	0.546	ton	20,000.0	RP	10,920
Installation Works	1		20,000.0	RP	20,000
Piping Works	1		10,000.0	RP	<u>10,000</u>
					191,858

1 Electrical facility construction	313,675
2 Installation of LAN network	160,413
3 Generator foundation construction, etc	191,858
4 Office equipment	526,000
5 Miscellaneous appurtenant equipment, etc.	540,000
6 PABX	<u>3,000,000</u>
	4,731,945

## Operation and Maintenance Cost

Publication Unit	Electricity	Q'ty	kW	Hr.	kW/Year	Annual RP
	Computer	1	0		6	360
	Heavy duty photocopy	1	1		2	600
						6,528
Network Equipment	Electricity					
	LAN Switch	24	0		24	1,728
						11,750
Computer System Laboratory	Server	3	0		24	6,480
	Computer	40	0		6	14,400
						44,064
						97,920
Digital Electronics Laboratory	Computer	6	0		6	2,160
	Measuring Instrument	99	0		1	1,485
						14,688
						10,098
						24,786
Analog Electronics Laboratory	Computer	5	0		6	1,800
	Measuring Instrument	94	0		1	1,410
						12,240
						9,588
						21,828
Telecommunication Laboratory	Computer	8	0		6	2,880
	Measuring Instrument	88	0		1	1,320
						19,584
						8,976
						28,560
Optoelectronics Laboratory	Computer	3	0		6	1,080
	Measuring Instrument	20	0		1	300
						7,344
						2,040
						9,384
Postgraduate Research Laboratory	Computer	15	0		6	5,400
	Measuring Instrument	154	0		0.5	1,155
						36,720
						7,854
						44,574
Electronic Workshop	Computer	2	0		6	720
	Measuring Instrument	11	0		0.5	83
						4,896
						561
						5,457
Electronic CAD Laboratory	Computer	2	0		6	720
	Measuring Instrument	11	0		0.5	83
						4,896
						561
						5,457
	Fuel					
	Diesel Generator	420	100	24.5		1,029,000
	Telephone	480	300	2.25		324,000



## Annex - 5 Cost Estimation Borne by the Recipient Country

Personnel Expenditure				
Electronics and Information	3	15,000	12	540,000
Maintenance	1	10,000	12	120,000
				660,000
Consumable				
Heavy duty photocopy				
Ink	41	2,200		90,200
Master	8	4,600		36,800
Paper	500	400		200,000
				<u>327,000</u>
Copy				
Drum	1	20,000		20,000
Toner	3	4,000		12,000
Paper	100	400		40,000
				<u>72,000</u>
Laser Printer	5			
Toner	5	10,000	1	50,000
Paper	5	400	20	40,000
				<u>90,000</u>
Dot Matrix Printer	13			
Ink	13	1,500	1	19,500
Paper	13	400	10	52,000
				<u>71,500</u>
Plotter				
Ink	2	20,000	1	40,000
Paper	2	1,000	2	4,000
				<u>44,000</u>
Spare parts				
Generator				780,000
Others				<u>100,000</u>
				880,000

1 Electricity	256,244	Rp/Year
2 Telephone	324,000	Rp/Year
3 Fuel	1,029,000	Rp/Year
4 Labor Cost	660,000	Rp/Year
5 Consumable	604,500	Rp/Year
6 Spare Parts	880,000	Rp/Year

## **APPENDICES**

### **Annex - 6.**

#### **References**

## **APPENDICES**

### **Annex 6-1)**

**New curriculum and Grade-wise Schedule of  
ICT Group, Faculty of Engineering,  
University of Moratuwa**

## Curriculum

2000/10/1

## B.Sc-Engineering: Electrical, Electronic &amp; Computer Engineering Group

## Symbol

Offered By: C: Faculty of Engineering, EN&TC: Electronic & Telecommunication Engineering Dept., Dept.,  
EE: Electrical Engineering, CS: Computer Science and Engineering Dept, Other: Other Dept.

Students: C: Common in Faculty of Engineering, EN: Electronic, TC: Telecommunication, EE: Electrical,  
CS: Computer Science, G: Group(=EN&TC + EE + CS)

Selection: C: Compulsory, E: Elective

Semester: SS: Semester SS, SJ: Semester SJ, SS+SJ: Both Semester, T: Term T

Credits: (Within parenthesis) is non-GPA

Level	Offered by	Priority		General		Semester	Course Code	Course	Hour/wk			Credits	Remarks
		Specialization	Select	Students	Select				Lect.	Tutorials	Practicals		
1	C			C	C	SS	MA101	Mathematics	4	2		3	
							CE101	Applied Mechanics (Statics)	1.5	1.5		2	
							ME102	Thermodynamics	1.5	1.5		2	
							EE101	Electrical Engineering	1.5	1.5		2	
							CS101	Introduction to Computer System	1.5	3		2	
							CH101	Process Engineering	1.5	1.5		2	
					C	SJ	DE101	English (Non GPA)	-	3		(1)	
							MA102	Methods of Mathematics	4	2		3	
							MT101	Engineering Materials	1.5	1.5		2	
							EN101	Electronic Engineering	1.5	1.5		2	
							ME101	Applied Mechanics (Dynamics)	1.5	1.5		2	
							CE102	Fluid Mechanics	1.5	1.5		2	
					E	T	CS102	Computer Application			3	1	
							DE102	English Certificate (Optional)		3			
							ED101	Engineering Design		4		(1.5)	
							MN101	Engineering in Context		2		(1)	
							EN190	Skill Development Projects (non GPA)		4		(1.5)	
							Total GPA		21.5	12	3	25	
							Total non-GPA		16	0	(5)		

Level	Offered by	Specialization	Select	General		Semester	Course Code	Course	Hour/wk			Credits	Remarks			
				Students	Select				Lect.	Tutorials	Practicals					
2	C			C	SS	MA102	Differential Equations	2			2					
						MA202	Calculus	2			2					
					SJ	MA203	Linear Algebra	2			2					
						MA204	Discrete Mathematics	2			2					
					E	SS	EN290	Communication Skills		3		(1)				
						SJ	EN291	Presentation Skills		3		(1)				
	EN&TC			C	SS+SJ	EN201	Principles of Electronics	4		3	5					
						EN203	Introduction to Communication Systems	2	1.5		2.5					
					E	EN202	Computer Organizations	2	1.5		2.5					
						EN204	Signals and Systems	2	1.5		2.5					
						EN205	Applied Electronics	2	1.5		2.5					
				C	SS+SJ	EE201	Theory of Electricity	4		3	5					
						EE203	Introduction to Electrical Machines	2	1.5		2.5					
					E	EE204	Introduction to Power Systems	2	1.5		2.5					
						EE202	Electrical Measurements	2	1.5		2.5					
				C	SS+SJ	EE205	Applied Electricity	2	1.5		2.5					
						CS201	Principles of Programming	4		3	5					
					E	CS202	Operating Systems	2	1.5		2.5					
						CS203	Algorithms	2	1.5		2.5					
				CS204		Database Systems	2	1.5		2.5						
	CS			E	CE201	Fluid Mechanics	2	1.5		2.5						
					ME201	Thermodynamics	2	1.5		2.5						
					ME202	Strength of Materials	2	1.5		2.5						
				Other								Total GPA	52	24	9	63
								Total non-GPA		6		(2)				

Annex -6-1) New Curriculum and Grade-wise Schedule of ICT Group, Faculty of Engineering, University of Moratuwa

Level	Offered by	Priority		General		Semester	Course Code	Course	Hour/wk			Credits	Remarks
		Specialization	Select	Students	Select				Lect.	Tutorials	Practicals		
3,4	C			C	C	3,4	MN301	Organizational Management	2			2	
							MN302	Financial & Management Accounting	2			2	
							MN303	Elements of Economics & Technology	2			2	
					E	3,4	MN401	Human Resource Management	2			2	
							MN402	Industrial Relations & Marketing	2			2	
							MN403	Engineering Economics	2			2	
							MN404	Technology Management	2			2	
							MA301	Numerical Methods	2			2	
							MA302	Applied Statistics	2			2	
							MA401	Time Series & Stochastic Processes	2			2	
							MA402	Operational Research	3			3	
							ME401	CAD/CAM	2			2	
							MN405	General Engineering Aspects	1			1	
					C		EN390	Field Visit I				(1)	
							EN391	Independent Study I				0	
							EN490	Field Visit II				(1)	
							EN491	Independent Study II				0	
							EN499	Project	10			10	
	G	EN&TC		G	C		EN301	Electronics	2		3	3	
							EN302	Communications	2		3	3	
							EN303	Electronic Measurement and Instrumentation	2		1.5	2.5	
							ME301	Control Theory	2		1.5	2.5	
							EN304	Advanced Analog Electronics	2		1.5	2.5	
							EN305	Digital System Design	2		1.5	2.5	
							EN306	Physical Electronics	2		1.5	2.5	
							EN307	Optoelectronics	2		1.5	2.5	
							EN308	Communication Theory	2		1.5	2.5	
							EN309	Antennas and Propagation	2		1.5	2.5	
					E		EN310	Electromagnetics	2		1.5	2.5	
							EN311	Information Theory and Coding	2		1.5	2.5	
							EN312	Digital Signal Processing	2		1.5	2.5	
							EN401	Broadcast Technologies	2		1.5	2.5	
							EN402	Computer Aided Circuit Design	2		1.5	2.5	
							EN403	Image Processing	2		1.5	2.5	
							EN404	Industrial and Biomedical Electronics	2		1.5	2.5	
							EN405	Radar and Navigation	2			2	
							EN406	Robotics	2		1.5	2.5	
							EN407	Optical Communication	2		1.5	2.5	
							EN408	Microelectronics	2		1.5	2.5	
							EN409	Microwave Communication	2		1.5	2.5	
							EN410	Telecomm. Transmission and Switching	2		1.5	2.5	
							EN411	Wireless Communications	2		1.5	2.5	

Annex -6-1) New Curriculum and Grade-wise Schedule of ICT Group, Faculty of Engineering, University of Moratuwa

Level	Offered by	Priority	General		Semester	Course Code	Course	Hour/wk			Credits	Remarks	
		Specialization	Select	Students				Select	Lect.	Tutorials			Practicals
3,4	EE	EE	C	G	E		EE301	Advanced Circuit Theory	3			3	
							EE302	Control Theory	2		1.5	2.5	
		EE	C				EE303	Electrical Installation	2		1.5	2.5	
							EE304	Power System Protection	2		1.5	2.5	
			E				EE305	Power Generation and Transmission	2		1.5	2.5	
							EE306	Distribution & Utilization	2		1.5	2.5	
			C				EE307	Illumination	2		1.5	2.5	
							EE308	Power Transformers	2		1.5	2.5	
			E				EE309	Induction Machines	2		1.5	2.5	
							EE310	Synchronous Machines	2		1.5	2.5	
			C				EE311	Power Electronics	2		1.5	2.5	
							EE312	Control Theory	2		1.5	2.5	
		EE		G	E		EE401	Advanced Power Electronics	2			2	
							EE402	Controlled Drives	2			2	
			E				EE403	Energy Studies	2			2	
							EE405	High Voltage Breakdown Phenomena	2			2	
			C				EE406	High Voltage generators for Testing	2			2	
							EE407	High Voltage Measurement & Testing	2			2	
			E				EE408	High Voltage Transient Analysis	2			2	
							EE409	Insulation Co-ordination	2			2	
			C				EE410	Mechanical Characteristics of Lines &	2			2	
							EE411	Nuclear Power Engineering	2			2	
		EE		G	E		EE412	Power Electronics	2			2	
							EE413	Power Flow & Fault Analysis	2			2	
			E				EE414	Power System Control & Stability	2			2	
							EE415	Power System Planning & Reliability	2			2	
			G		E		EE416	system Grounding	2			2	
							EE417	Unit Commitment and Economic Dispatch	2			2	
				G	E		CS301	Software Engineering	2		1.5	2.5	
	CS						CS302	Distributed Database Systems	2		1.5	2.5	
	CS	CS	C				CS390	Programming Project	2		1.5	2.5	
												CS303	Theory of Computing
		E		G	E		CS304	Object Oriented Principles	2		1.5	2.5	
							CS					CS305	Concurrent Processing
		C					CS306	Digital Communications	2		1.5	2.5	
												CS307	Computer Graphics
		CS	E				CS308	Advanced Operating Systems	2		1.5	2.5	
							CS309	Computer Networks I	4		3	5	
			E	G	E		CS401	Artificial Intelligence	2			2	
							CS402	Computer Architecture	2			2	
		CS	C				CS403	Computer Networks II	2			2	
							CS404	Computer Vision & Image Processing	2			2	
				G	E		CS405	Internet Technologies	2			2	
							CS406	Management Information Systems	2			2	
							CS407	Neural Networks & Fuzzy Logic	2			2	
							Total GPA Credits		177	0	70.5	200.5	
							Total non-GPA Credits		(2)			(2)	

 : Offered by the Department of Electronics and Telecommunication

## **APPENDICES**

### **Annex 6-2)**

#### **Post-Graduate Laboratory Research Themes**

**(1997 ~ 2000 )**

## Annex -6-2) Post-Graduate Laboratory Research themes (1997~2001)

Project Code	Area	Project Title	Description
Term 2 - 97/98 A: Subject Presentations			
PGPRJ-01	TC	Global positioning system	A literature survey of the GPS and its uses for the communication industry is discussed in detail.1
PGPRJ-02	CS	Mobile satellite communication systems	A study of satellite communication systems and related areas. Relevant areas related to current technology is investigated in detail.
PGPRJ-03	OP	Soliton transmission in optical fiber systems	Theory and practices of Soliton transmission in optical fibers are discussed.
PGPRJ-04	EN	Mobile microprocessors and semiconductor memories	A survey of modern microprocessor design strategies are discussed in this project. Details of several architectures and semiconductor memories are discussed.
PGPRJ-05	EN	Electronic nose	A proposal of an electronic simulation of a human olfactory organ is presented. The proposal contains two main components, a chemical vapor sensor array and an artificial neural network that simulates the sensory organ. The processing is carried out by a microprocessor which has built in algorithms to identify the different signature patterns associated with odorants.
PGPRJ-06	TC	Global maritime distress and safety system	Design and implementation of a low cost system.
PGPRJ-07	CS	Fuzzy logic controller	Fuzzy logic controllers and their feasibility in non-linear applications are discussed in this project. Several applications of fuzzy controllers in commercial applications are considered.
PGPRJ-08	TC	Speech coding techniques	Speech coding for audio is discussed in detail. Different characteristics of the coding is explained.
PGPRJ-09	CS	Image compression techniques	Several image compression techniques and their limitations are discussed.
PGPRJ-10	CS	Security over the Internet	Design and implementation of a firewall and other security issues.
PGPRJ-11	CS	Mobile computing	Current trends and limitations of mobile computing is discussed in this project. Issues related to limitations of TCP for mobile networks are also discussed.
PGPRJ-12	EN	Modern OP amps	A case study of new design techniques.
PGPRJ-13	CS	Internet protocol version 6: IPV-6	In depth analysis of the new IPV6 protocol and its uses.
PGPRJ-14	MW	Antennas on an aircraft	This project focus's on the current trends in airborne antenna systems. Navigation and communication systems of aircraft's are discussed citing new trends such as satellite linked GPS and VHF methods
PGPRJ-15	MW	Current trends in Microwave radio based systems - SDH and PDH	This project deals with the asynchronous multiplexing schemes used in the world and its limitations and problems. Characteristics such as multiplexing, bit rates in the transport network and its network topology's are considered.
PGPRJ-16	TC	Modern rural telecommunication systems	A proposal for a rural telecommunication system using wireless technologies.
PGPRJ-17	TC	Numbering planning	Number planning in telecommunication is discussed with respect to the communication network in Sri Lanka. The structure of numbering, its uses and limitations are presented in this project.



## Annex -6-2) Post-Graduate Laboratory Research themes (1997~2001)

Project Code	Area	Project Title	Description
Term 2 - 97/98 B: Design Projects			
PGPRJ-18	EN	Programmable logic controller	This project deals with the design of a low cost PLC using a combination of hardware and software techniques.
PGPRJ-19	MW	Adaptive antenna array	Design and implementation of a adaptive antenna array.
PGPRJ-20	TC	Frequency assignments in Sri Lanka	A case study with application to the telecommunication system in Sri Lanka.
PGPRJ-21	EN	Digital IC tester using LabVIEW	Software emulation of a digital IC tester using a standard IO board.
PGPRJ-22	EN	Frequency programmable HF active filter	This project involves designing and implementing a HF filter for laboratory use. This filter has the capability of automatically adjusting its cut-off frequency according to a user input in real time.
PGPRJ-23	EN	Electronic aids for the visually handicapped	In this project an electronic aid was designed that indicates an obstruction in the path within a predefined range. This portable and light weight device is of immense use to the visually handicapped to be self reliant.
PGPRJ-24	EN	Model based signal processing	The theory for accurately determining model based systems using recursive estimation is discussed in this project.
A - Subject Presentations 98/99			
PGPRJ-25	MW	Circularly polarized antennas	Several different circularly polarized antennas are presented. Each antenna is discussed in details giving its background and limitations of its use.
PGPRJ-26	CS	Data compression	Modern methods in data compression.
PGPRJ-27	TC	Digital subscriber loop techniques	Analysis of DSL, ADSL, SDSL and VDSL is presented in this report.
PGPRJ-28	OP	Recent advances in optical computing	This project deals with an in depth analysis of recent advances in optical computing paying attention to support hardware and their limitations. 3D optical storage methods and other relevant storage methods are also analyzed.
PGPRJ-29	OP	Positron emission tomography	The project deals with medical imaging techniques that are used for disease diagnostics. This discusses the topic of using PET as an alternative to MRI and CTI. The project deals with medical imaging techniques that are used for disease diagnostics. This discusses the topic of using PET as an alternative to MRI and CTI.
PGPRJ-30	EN	Mechatronics: An overview	Feasibility of mechatronics in Sri Lanka.
PGPRJ-31	TC	Wireless local area networks	Study of wireless LANs in Sri Lanka.
PGPRJ-32	EN	Flat panel displays	Current advances in at panel technology and its future.
PGPRJ-33	EN	Application of pattern recognition and signal processing in cardiology and in audiology	The cardiovascular system is analyzed using signal processing of the ECG signals. Different heart patterns are recognized that gives rise to different identifiable problems in the heart. The analysis is extended to the human ear as well.
PGPRJ-34	CS	Key cryptography	Classification and use of cryptography methods.

## Annex -6-2) Post-Graduate Laboratory Research themes (1997~2001)

Project Code	Area	Project Title	Description
PGPRJ-35	EN	Digital receivers	Current technology in digital receivers are explained in detail using a comparative study with its analog counterpart.
PGPRJ-36	OP	Optical time division multiplexing techniques	In depth analysis of the OTDM techniques currently available are addressed in this project.
PGPRJ-37	OP	GaAs MMICs	Amplifiers for cellular based products using GaAs ICs are discussed.
PGPRJ-38	CS.	ISDN	Currently available ISDN technologies are discussed in detail
PGPRJ-39	MW	Broadband and frequency independent antennas	This project discusses some popular broad band antennas such as log-periodic, dipole, rhombic and log spiral antennas. Practical difficulties in designing and constructing such antennas are discussed in detail.
PGPRJ-40	CS	Fuzzy logic: Principles and application	A case study of current research in this area and their implications.
PGPRJ-41	CS	Speech and audio compression	Speech and audio compression for Internet based applications.
PGPRJ-42	EN	Automotive electronics	Electronics in modern day engines are discussed in detail. The various sensors in circuits that provide feedback to the main control of the automobile is also discussed.
B - Field survey 98/99			
PGPRJ-43	MW	Radar signal processing	Advances in radar technology.
PGPRJ-44	MW	Airport surveillance radar and their trends	Current technologies in airport surveillance and aviation.
PGPRJ-45	TC	National telecommunication network	Description and the architecture of the national telecommunication system. Demand forecasting in the telecommunication network in Sri Lanka.
PGPRJ-46	EN	High definition television	Analysis of HTDV technology.
PGPRJ-47	TC	Quality monitoring techniques for telecommunication	A proposal application to Sri Lanka.
PGPRJ-48	CS	New IBM computer architectures	Analysis of AS/400, S/390 and RS/6000 system analysis.
PGPRJ-49	EN	Electronics in the film industry	Electronics applications in the film industry in Sri Lanka.
PGPRJ-50	TC	Current trends in PABXs	A case study of modern PABX units.
PGPRJ-51	MW	Trends in air traffic control	Modern air traffic control technologies and their limitations.
PGPRJ-52	CS	Software industry in Sri Lanka	A case study of the development of software industry in Sri Lanka.
PGPRJ-53	TC	Cables for telecommunication	A comparative study of communication cables used in the national telecommunication network.
PGPRJ-54	TC	Comparison of analog and digital satellite communication systems	Analysis of analog and digital communication systems uses and limitations.
PGPRJ-55	TC	Mobile satellite telephone systems	Study of mobile satellite systems.
PGPRJ-56	MW	Radar invisible aircraft	Proposal for stealth technology.
PGPRJ-57	TC	Current WLL systems by Lanka Bell	A case study of Sri Lankas WLLs.

## Annex -6-2) Post-Graduate Laboratory Research themes (1997~2001)

Project Code	Area	Project Title	Description
PGPRJ-58	TC	Planning a WLL system	Design concepts of a wireless WLL.
PGPRJ-59	TC	Air Lanka communication network	A case study of the communication network of the national carrier.
PGPRJ-60	OP	Infra red imaging	Current trends and proposal of new techniques.
A - Subject Presentations 00/01			
PGPRJ-61	CS	Data security for E-commerce	A case study of current approaches.
PGPRJ-62	CS	Enterprise computer networks	Design and implementation of computer networks.
PGPRJ-63	MW	Adaptive antennas for base stations	Current trends and new proposals.
PGPRJ-64	OP	Optical networks	A case study of current theory and practice.
PGPRJ-65	TC	Fading in radio communication systems	Design strategies and latest technologies to minimize this effect is discussed in detail.
PGPRJ-66	TC	Hand-phone related misconduct in driving and in the working environment	A case study of road accidents and the use of mobile phones. The study is extended to cover work place related incidents as well.
PGPRJ-67	MW	Health hazard in microwave oven usage in Sri Lanka	Analysis of radiation levels in microwave ovens in Sri Lanka discussed in relation to the usage patterns.
PGPRJ-68	TC	Financial suitability of FM radio broadcast Vs. conventional broadcast in rural Sri Lanka	Recommendation for broadcast expansion to rural Sri Lanka.
PGPRJ-69	CS	Software radio techniques	Internet audio transmission techniques.
PGPRJ-70	CS	Intelligent network concepts and implementation	Automated resource allocation and control of networks.
PGPRJ-71	CS	Voice over IP: technology overview and applications	A case study of audio transmission over IP is discussed in this project. Several applications are cited with distinct advantages and disadvantages.
PGPRJ-72	OP	Measuring instruments and techniques for SDH/PHD and fiber transmission systems	A case study.
PGPRJ-73	TC	New developments in DSP and microcontrollers for portable telecommunication products	In depth analysis of the state of the art technologies related to mobile telecommunication products.
PGPRJ-74	CS	Internet security: protecting your network from hackers	Strategies of network protection and its implementation.
PGPRJ-75	CS	Mobile Internet and location based Internet services	A case study of relevant installations in Sri Lanka.
B - Field survey 00/01			
PGPRJ-76	TC	DSP techniques for AM demodulation	Frequency domain analysis of AM demodulation.
PGPRJ-77	TC	Laboratory generation of Rayleigh fading	Matlab simulation of Rayleigh fading and implementation using an arbitrary waveform generator.
PGPRJ-78	EN	Characterization of switch mode power supplies	Design of a low cost switch mode power supply.
PGPRJ-79	EN	Leakage current of transistors at room temperature using the curve tracer	An existing curve-tracer functions are used as a design strategy to obtain the leakage current of a transistor

Annex -6-2) Post-Graduate Laboratory Research themes (1997~2001)

Project Code	Area	Project Title	Description
PGPRJ-80	MW	Adaptive beam forming algorithms for antenna arrays	Proposal of a smart antenna using neural networks.
PGPRJ-81	MW	Human exposure to RF radiation from base station antennas in an urban environment	A case study of the radiation levels and proposal of reduction in radiation to acceptable levels.
PGPRJ-82	MW	Design of a matching network for a radio transmitter operating at 7 MHz	Designing and implementing an automated matching circuit that adaptively corrects itself to provide a perfect match.
PGPRJ-83	MW	Design of a flexible rooftop antenna for a HF receiver	Design and construction of a wide band antenna that can be used on an automobile rooftop.
PGPRJ-84	EN	Simulation of an electric choke for fluorescent lamps using SPICE	Proposal of a new technique that replaces the magnetic ballast which is more efficient in terms of power consumption and illumination.
PGPRJ-85	MW	Development of a software package for wide-band terrestrial microwave link, satellite link and radio system.	A working copy of a software is designed using VB. A single piece of software is designed which caters to the engineer designing terrestrial or satellite links.

## **APPENDICES**

### **Annex 6-3)**

**Curriculum for Faculty of  
Information Technology (IT),  
University of Moratuwa**

## **Report to be submitted to the UGC on the commencement of a Degree Programme in Information Technology at the University of Moratuwa**

### **Introduction**

Based on the proposal made by the University of Moratuwa, the University Grants Commission approved the establishment of the Faculty of Information Technology. It was legally established under Section 27 (1) of Universities Act, No 16 of 1978 by the Government Gazette Notification of the Democratic Socialist Republic of Sri Lanka – Extraordinary, No. 1191/3 dated 2<sup>nd</sup> July 2001, with the following three Departments

Department of Information Technology  
Department of Computational Mathematics,  
Department of Interdisciplinary Studies

Academic activities will commence from September/October 2001.

### **Course Description**

The undergraduate course leading to Bachelor of Science in Information Technology consists of course modules to satisfy the basic requirements of a first degree in IT. Initially all the students are admitted to the three year degree programme. Only a limited number of students based on academic performances in the first three levels will be allowed to proceed to level 4 the successful completion of which is required for the four year Special degree.

### **Curriculum**

<b>Level 1</b>			
			<b>Credits</b>
IT 101	Programming Fundamentals I	Com	3
IT 102	Programming Fundamentals II	Com	3
IT 103	Integrated Development Environments (IDE)	Com	3
IT 104	Digital Circuits and Devices I	Com	3
IT 105	Digital Circuits and Devices II	Com	3
IT 106	Computer Organisation	Com	3
IT 107	Introduction to Operating Systems	Com	3
IT 108	Computer Networks	Com	3
IT 109	Social aspects of IT	Com	3
IT 110	Mathematics for IT	Com	3
IT 111	Discrete Structures	Com	3
IT 112	A Project on Programming	Com	3
IT 113	Communication Skill Development (Non GPA)	Com	3
<b>Total Credits ( 36 – GPA and 3- Non-GPA)</b>			<b>39</b>

Annex - 6-3) Curriculum for the Faculty of Information Technology (IT),  
University of Moratuwa

**Admission**

The Intake for academic year 2001/2001 will be 50 students. The Faculty plans to admit more students once the infrastructure facilities are in place.

Admission for the first Intake will be carried out by the UGC and will be based strictly on the national university admission criteria. Starting from second intake the Faculty plans to have an Aptitude Test for selection of students. Aptitude Test will be conducted by the University of Moratuwa and selection students will be done by the UGC based on the national policy on university admissions.

Admission direct to the Level 2 of the course for those with recognized academic qualifications would be according to procedures and evaluation of such qualifications by the Senate and the Council of the University.

**Building Space & Equipment**

The Faculty will be located temporarily outside the University of Moratuwa until infrastructure facilities are in place within the University premises.

The proposal for the Building & equipment has already been submitted to ERD through UGC to seek necessary funding.

**Staff Requirements**

In order to cater for 500 students in the total at the beginning of the course leading up to 3000 students when the Faculty is fully operational with students in all batches the Faculty will need the following staff numbers

Staff Category	At the beginning	When fully functional
Senior Academic	10	50
Academic Support	40	200
Non Academic	10	50

At present the following cadre positions have been approved for 2001 by the UGC.

Dean	01
Assistant Registrar	01
Senior Lecturer/ Lecturer	05
Programmer cum System Analyst	02
Secretarial Assistant	01
Clerk Grade III	01
Technical Officer Gr. II Sec. "B"	03

**Annex - 6-3) Curriculum for the Faculty of Information Technology (IT),  
University of Moratuwa**

Computer Application Assistant      03  
Lab Attendant Lower Grade      03

**Budget**

Funds as indicated in the following table are to be generated to conduct the courses in the short, medium and long term.

**Investment to commence and conduct courses on rental accommodation**

Total No. of students	Floor area Requirement (Square meters)	Rental Accommodation cost(Rs. Mn)	Equipment (Rs. Mn)	Recurrent (Rs. Mn)*	Total Approximate Budget (Rs. Million)**
500	4,000	38.00	40.00	60.00	138.00
1000	8,000	76.00	35.00	120.00	231.00
1500	12,000	114.00	35.00	180.00	329.00
2000	14,000	135.00	35.00	240.00	410.00
3000	20,000	192.00	35.00	360.00	587.00
<b>Capital cost to acquire permanent premises (in long term)</b>					
Purchase of land					100.00
Building and infrastructure					250.00

\*Recurrent cost will vary depending on the number of students as follows

Less than 50    Rs. 150,000 per year per student  
50 – 100        Rs. 140,000 per year per student  
100 – 500       Rs. 130,000 per year per student  
over 500        Rs. 120,000 per year per student

\*\*Total cost will proportionately reduce depending on the student number



Annex - 6-3) Curriculum for the Faculty of Information Technology (IT),  
University of Moratuwa

<b>Level 2</b>			
IT 201	Data Structures and Algorithms	Com	3
IT 202	Object Oriented Programming I	Com	3
IT 203	Object Oriented Programming II	Com	3
IT 204	Computer Architecture I	Com	3
IT 205	Computer Architecture II	Com	3
IT 206	Network Programming I	Com	3
IT 207	Network Programming II	Com	3
IT 208	Internetworking	Com	3
IT 209	Database Systems	Com	3
IT 210	Advanced Database Systems	Com	3
IT 211	Basic Web Development (HTML)	Com	3
IT 212	Numerical Techniques	Com	3
IT 213	An Industry based Project on Programming (Non-GPA)	Com	2
<b>Total Credits (36 – GPA and 2- Non-GPA)</b>			<b>38</b>
<b>Level 3</b>			
IT 301	Software Design	Com	3
IT 302	Distributed Computing	Com	3
IT 303	System Analysis and Design	Com	3
IT 304	IT Management	Com	3
IT 305	Logic Programming	Opt	3
IT 306	Computer Security	Opt	3
IT 307	Current operating systems (UNIX, LINUX, WINDOWS)	Opt	3
IT 308	Internet Applications	Opt	3
IT 309	Management Information Systems	Opt	3
IT 310	Human Resource Management	Com	3
IT 311	Project Management	Com	3
IT 312	Cryptography	Opt	3
IT 313	An Industry based Project on Programming (Non-GPA)	Com	3
IT 314	Final Project I	Com	6
	Other Non-GPA Courses	Opt	6
<b>Minimum number of Credits Expected (33-GPA and 4-Non-GPA)</b>			<b>37</b>

**Annex - 6-3) Curriculum for the Faculty of Information Technology (IT),  
University of Moratuwa**

<b>Level 4</b>			
IT 401	Software Project Management	Com	3
IT 402	UNIX System Programming	Com	3
IT 403	High Performance Computing	Opt	3
IT 404	Web Technologies	Opt	3
IT 405	Multimedia Technologies	Opt	3
IT 406	Computer Graphics and Virtual Reality	Opt	3
IT 407	Signal Processing	Opt	3
IT 408	IT Applications I	Opt	3
IT 409	IT Applications II	Opt	3
IT 410	Intellectual Property Law	Opt	3
IT 411	Computer Crime	Opt	3
IT 412	E-business Strategies	Opt	3
IT 413	Theory of Computability and Complexity	Opt	3
IT 414	Final Project 2	Com	6
	Non-GPA courses	Opt	9
<b>Minimum number of Credits Expected (30-GPA 5-Non-GPA)</b>			<b>35</b>

**Degree Offered**

3 Year Degree - Bachelor of Science in Information Technology

4 Year Degree- Bachelor of Science in Information Technology (Special)

**Eligibility Criteria for 2001/ 2002 Intake**

Those who have obtained minimum university entry requirements in the GCE Advanced Level examination held in August 2000 (Old or New Syllabus) with at least a credit pass in any one of the following subjects are eligible to apply.

- Pure Mathematics
- Applies Mathematics
- Mathematics
- Advanced Mathematics
- Combined Mathematics
- Physics

Those who have already secured admission to other university courses based on GCE Advanced Level examination held in August 2000 satisfying above requirements may also apply if he/she prefers this course of study over one he/she has been already selected for.

## **APPENDICES**

### **Annex 6-4)**

**Practical courses schedule  
under Round Robin method**

**Digital Electronics Laboratory**  
**Analog Electronics Laboratory**  
**EN101: Electronic Engineering**  
**Laboratory Themes (Level 1)**

				EN101-1,2 : Digital Lab.			EN101-3,4,5: Analog Lab.										
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	備考	
Group-1	EN101-A			EN101-0	EN101-1	EN101-2	EN101-3	EN101-4	EN101-5								
Group-2				EN101-0	EN101-2	EN101-3	EN101-4	EN101-5	EN101-1								
Group-3				EN101-0	EN101-3	EN101-4	EN101-1	EN101-2		EN101-5							
Group-4				EN101-0	EN101-4	EN101-1	EN101-2		EN101-3		EN101-5						
Group-5				EN101-0				EN101-1	EN101-2	EN101-3	EN101-4	EN101-5					
Group-6				EN101-0						EN101-1	EN101-2	EN101-3	EN101-4	EN101-5			
Group-7				EN101-0							EN101-1	EN101-2	EN101-3	EN101-4	EN101-5		
Group-8	EN101-B			EN101-0	EN101-1	EN101-2	EN101-3	EN101-4	EN101-5								
Group-9				EN101-0	EN101-2	EN101-3	EN101-4	EN101-5	EN101-1								
Grouop-10				EN101-0	EN101-3	EN101-4	EN101-1	EN101-2		EN101-5							
Grouop-11				EN101-0	EN101-4	EN101-1	EN101-2		EN101-3		EN101-5						
Grouop-12				EN101-0				EN101-1	EN101-2	EN101-3	EN101-4	EN101-5					
Grouop-13				EN101-0						EN101-1	EN101-2	EN101-3	EN101-4	EN101-5			
Grouop-14				EN101-0							EN101-1	EN101-2	EN101-3	EN101-4	EN101-5		

Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	EN101-A
14:30-15:30	
15:30-16:30	
16:30-17:30	EN101-B
17:30-18:30	

560	Total Students		550	Targeted number of students	
4	Students/ Lab team				
10	Lab teams/ Lab Group				
7	Lab Group Types				
2	Time slots (cf. Left Time Table)				
20	Tables occupied in Digital Lab.				
20	Tables occupied in Analog Lab.				
EN101-0	Guideline explained and operated by a lecturer				

**Digital Electronics Laboratory**  
**Analog Electronics Laboratory**  
**EN201: Principles of Electronics**

Level 2		EN201-1,2,3,4,5,6: Digital Electronics					EN201-7,8,9: Analog Electronics								
Sep.	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1	EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9						
Group-2	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1			
Group-3	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2			
Group-4	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3			
Group-5	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4			
Group-6	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5			
Group-7	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6			
Group-8	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7			
Group-9	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8			
Group-10				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9			
Group-11			EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				
Group-12		EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9					

Jan.	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1	EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9						
Group-2	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1			
Group-3	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2			
Group-4	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3			
Group-5	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4			
Group-6	EN201-6	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5			
Group-7	EN201-7	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6			
Group-8	EN201-8	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7			
Group-9	EN201-9				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8			
Group-10				EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9			
Group-11			EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9				
Group-12		EN201-1	EN201-2	EN201-3	EN201-4	EN201-5	EN201-6	EN201-7	EN201-8	EN201-9					

Hour	Sep.	Jan.
08:30-09:30		E201
09:30-10:30		
10:30-11:30		
11:30-12:30		
12:30-13:30	Interval	Interval
13:30-14:30		
14:30-15:30		
15:30-16:30	E201	
16:30-17:30		
17:30-18:30		

288	Total Students		250	Targeted number of students
4	Students/ Lab team			
3	Lab teams/ Lab Group			
12	Lab Group Types			
2	Sesters			

18	Tables occupied in Digital Lab.		
9	Tables occupied in Analog Lab.		
3	more Lab Theme can be added in Analog Lab.		

## Telecommunication Laboratory

### EN203 : Introduction to communication systems

### EN204: Signals and Systems

### Laboratory Themes (Level 2)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1	EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02								
Group-2	EN203-02	EN203-02	EN203-04	EN203-05	EN204-01	EN204-02								EN203-01	
Group-3	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02								EN203-01	EN203-02	
Group-4	EN203-04	EN203-05	EN204-01	EN204-02								EN203-01	EN203-02	EN203-03	
Group-5	EN203-05	EN204-01	EN204-02								EN203-01	EN203-02	EN203-03	EN203-04	
Group-6	EN204-01	EN204-02								EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	
Group-7	EN204-02								EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	
Group-8								EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02	
Group-9							EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02		
Group-10						EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02			
Group-11					EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02				
Group-12				EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02					
Group-13			EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02						
Group-14		EN203-01	EN203-02	EN203-03	EN203-04	EN203-05	EN204-01	EN204-02							

Annex -6-4)

Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	
16:30-17:30	E203,204
17:30-18:30	

#### EN203 :

112	Total Students	100	Targeted number of students
4	Students/ Lab team		
2	Lab teams/ Lab Group		
14	Lab Group Types		

10	Tables occupied		
0	more Lab themes can be added		

#### EN204 :

168	Total Students	145	Targeted number of students
4	Students/ Lab team		
3	Lab teams/ Lab Group		
14	Lab Group Types		

6	Tables occupied		
1	more Lab themes can be added		

Annex - 6-4) Practical courses schedule under Round Robin method

**Digital Electronics Laboratory**  
**Analog Electronics Laboratory**  
**EN301: Electronics**  
**Laboratory Themes (Level 3,4)**

			EN301-1,2,7: Digital Lab.			EN301-3,4,5,6,8: Analog Lab.									
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	備考
Group-1	EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8							
Group-2	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8							EN301-1	
Group-3	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8							EN301-1	EN301-2	
Group-4	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8							EN301-1	EN301-2	EN301-3	
Group-5	EN301-5	EN301-6	EN301-7	EN301-8							EN301-1	EN301-2	EN301-3	EN301-4	
Group-6	EN301-6	EN301-7	EN301-8							EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	
Group-7	EN301-7	EN301-8							EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	
Group-8	EN301-8							EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	
Group-9							EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8	
Group-10						EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8		
Group-11					EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8			
Group-12				EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8				
Group-13			EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8					
Group-14		EN301-1	EN301-2	EN301-3	EN301-4	EN301-5	EN301-6	EN301-7	EN301-8						

Hours	
08:30-09:30	EN301
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	
16:30-17:30	
17:30-18:30	

EN301 : Digital Electronics Laboratory

168	Total Students	160	Targeted number of students
4	Students/ Lab team		
3	Lab teams/ Lab Group		
14	Lab Group Types		

EN301 : Analog Electronics Laboratory

112	Total Students	100	Targeted number of students
4	Students/ Lab team		
2	Lab teams/ Lab Group		
14	Lab Group Types		

9	Tables occupied in Digital Lab.	
10	Tables occupied in Analog Lab.	
3	more Lab Theme can be added in Digital Lab.	
5	more Lab Theme can be added in Analog Lab.	

**Telecommunication Laboratory**  
**EN302: Communications**

**Laboratory Themes (Level 3,4)**

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1	EN302-01	EN302-02	EN302-03	EN302-04	EN302-05										
Group-2	EN302-02	EN302-03	EN302-04	EN302-05										EN302-01	
Group-3	EN302-03	EN302-04	EN302-05										EN302-01	EN302-02	
Group-4	EN302-04	EN302-05										EN302-01	EN302-02	EN302-03	
Group-5	EN302-05										EN302-01	EN302-02	EN302-03	EN302-04	
Group-6										EN302-01	EN302-02	EN302-03	EN302-04		
Group-7									EN302-01	EN302-02	EN302-03	EN302-04			
Group-8								EN302-01	EN302-02	EN302-03	EN302-04				
Group-9							EN302-01	EN302-02	EN302-03	EN302-04					
Group-10						EN302-01	EN302-02	EN302-03	EN302-04						
Group-11					EN302-01	EN302-02	EN302-03	EN302-04							
Group-12				EN302-01	EN302-02	EN302-03	EN302-04								
Group-13			EN302-01	EN302-02	EN302-03	EN302-04									
Group-14		EN302-01	EN302-02	EN302-03	EN302-04										

Hours	
08:30-09:30	EN302
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	EN302
16:30-17:30	
17:30-18:30	

224	Total Students	210	Targeted number of students
4	Students/ Lab team		
2	Lab teams/ Lab Group		
14	Lab Group Types		
2	Time slots (cf. Left Time Table)		

8	Tables occupied		
6	more Lab Theme can be added		



Analog Electronics Laboratory

EN304: Advanced Analog Electronics  
Laboratory Themes (Level 3,4)

EN304-1,2,3: Analog Lab.															
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1	EN304-1	EN304-2	EN304-3												
Group-2	EN304-2	EN304-3												EN304-1	
Group-3	EN304-3												EN304-1	EN304-2	
Group-4												EN304-1	EN304-2	EN304-3	
Group-5										EN304-1	EN304-2	EN304-3			
Group-6									EN304-1	EN304-2	EN304-3				
Group-7								EN304-1	EN304-2	EN304-3					
Group-8							EN304-1	EN304-2	EN304-3						
Group-9							EN304-1	EN304-2	EN304-3						
Group-10						EN304-1	EN304-2	EN304-3							
Group-11					EN304-1	EN304-2	EN304-3								
Group-12				EN304-1	EN304-2	EN304-3									
Group-13			EN304-1	EN304-2	EN304-3										
Group-14		EN304-1	EN304-2	EN304-3											

Annex -6-4)

Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	
16:30-17:30	EN304
17:30-18:30	

168	Total Students	145	Targeted number of students
4	Students/ Lab team		
3	Lab teams/ Lab Group		
14	Lab Group Types		

0	Tables occupied in Digital Lab.		
9	Tables occupied in Analog Lab.		
3	more Lab Theme can be added in Analog Lab.		

Optoelectronics Laboratory  
EN307: Optoelectronics

Laboratory Themes (Level 3,4)

	Week1	Week2	Week3	Week4	Week5	Week6	Week7	Week8	Week9	Week10	Week11	Week12	Week13	Week14	Remarks
Group-1	EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8							
Group-2	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8							EN307-1	
Group-3	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8							EN307-1	EN307-2	
Group-4	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8							EN307-1	EN307-2	EN307-3	
Group-5	EN307-5	EN307-6	EN307-7	EN307-8							EN307-1	EN307-2	EN307-3	EN307-4	
Group-6	EN307-6	EN307-7	EN307-8							EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	
Group-7	EN307-7	EN307-8							EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	
Group-8	EN307-8							EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	
Group-9							EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8	
Group-10						EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8		
Group-11					EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8			
Group-12				EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8				
Group-13			EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8					
Group-14		EN307-1	EN307-2	EN307-3	EN307-4	EN307-5	EN307-6	EN307-7	EN307-8						

Annex -6-4)

Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	EN307
16:30-17:30	
17:30-18:30	

56	Total Students	50	Targeted number of students
4	Students/ Lab team		
1	Lab teams/ Lab Group (except CL202-03)		
14	Lab Group Types		

5	Tables occupied		
0	more Lab themes can be added		

## Telecommunication Laboratory

### EN308 : Communication Theory

#### Laboratory Themes (Level 3,4)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1	EN308-01	EN308-02	EN308-03	EN308-04											
Group-2	EN308-02	EN308-03	EN308-04											EN308-01	
Group-3	EN308-03	EN308-04											EN308-01	EN308-02	
Group-4	EN308-04											EN308-01	EN308-02	EN308-03	
Group-5										EN308-01	EN308-02	EN308-03	EN308-04		
Group-6									EN308-01	EN308-02	EN308-03	EN308-04			
Group-7								EN308-01	EN308-02	EN308-03	EN308-04				
Group-8							EN308-01	EN308-02	EN308-03	EN308-04					
Group-9						EN308-01	EN308-02	EN308-03	EN308-04						
Group-10					EN308-01	EN308-02	EN308-03	EN308-04							
Group-11				EN308-01	EN308-02	EN308-03	EN308-04								
Group-12			EN308-01	EN308-02	EN308-03	EN308-04									
Group-13		EN308-01	EN308-02	EN308-03	EN308-04										
Group-14	EN308-01	EN308-02	EN308-03	EN308-04											

2 Lab teams do the same experiment together.

Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	EN308
16:30-17:30	
17:30-18:30	

EN308 :

112	Total Students	100	Targeted number of students
4	Students/ Lab team		
2	Lab teams/ Lab Group (Except EN308-01, 04)		
14	Lab Group Types		

8	Tables occupied		
1	more Lab Theme can be added		

Microwave Laboratory  
EN309: Antenna & Propagation

Laboratory Themes (Level 3)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1			EN309-1	EN309-2	EN309-3	EN309-4		EN309-5							
Group-2			EN309-2	EN309-3	EN309-1		EN309-4		EN309-5						
Group-3			EN309-4			EN309-1	EN309-2	EN309-3		EN309-5					
Group-4				EN309-4		EN309-2	EN309-3	EN309-1			EN309-5				
Group-5						EN309-4			EN309-1	EN309-2	EN309-3	EN309-5			
Group-6							EN309-4		EN309-2	EN309-3	EN309-1		EN309-5		
Group-7					EN309-5				EN309-4			EN309-1	EN309-2	EN309-3	
Group-8								EN309-5		EN309-4		EN309-2	EN309-3	EN309-1	

EN309-1,2,3	2 out of 3 can done at a time (by PC quantity)
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Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	
16:30-17:30	EN309
17:30-18:30	

128	Total Students	100	Targeted number of students
4	Students/ Lab team		
4	Lab teams/ Lab Group		
8	Lab Group Types		

12	Tables occupied		
2	more Lab themes can be added		

**Microwave Laboratory**  
**EN310: Electromagnetics**

**Laboratory Themes (Level 3)**

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1			EN310-1	EN310-2	EN310-3	EN310-4									
Group-2			EN310-2	EN309-3	EN310-1		EN309-4								
Group-3			EN310-4			EN310-1	EN310-2	EN310-3							
Group-4				EN310-4		EN310-2	EN309-3	EN310-1							
Group-5						EN310-4			EN310-1	EN310-2	EN310-3				
Group-6							EN310-4		EN310-2	EN309-3	EN310-1				
Group-7									EN310-4			EN310-1	EN310-2	EN310-3	
Group-8										EN310-4		EN310-2	EN309-3	EN310-1	

EN310-1,2,3	2 out of 3 can done at a time (by PC quantity)
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Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	EN310
16:30-17:30	
17:30-18:30	

128	Total Students	100	Targeted number of students
4	Students/ Lab team		
4	Lab teams/ Lab Group		
8	Lab Group Types		

6	Tables occupied		
0	more Lab themes can be added		

**Telecommunication Laboratory**  
**EN312: Digital Signal Processing**

**Laboratory Themes (Level 3,4)**

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1					EN312-01	EN312-02	EN312-03	EN312-04							
Group-2				EN312-01	EN312-02	EN312-03	EN312-04								
Group-3			EN312-01	EN312-02	EN312-03	EN312-04									
Group-4		EN312-01	EN312-02	EN312-03	EN312-04										
Group-5	EN312-01	EN312-02	EN312-03	EN312-04											
Group-6	EN312-02	EN312-03	EN312-04											EN312-01	
Group-7	EN312-03	EN312-04											EN312-01	EN312-02	
Group-8	EN312-04											EN312-01	EN312-02	EN312-03	
Group-9											EN312-01	EN312-02	EN312-03	EN312-04	
Group-10										EN312-01	EN312-02	EN312-03	EN312-04		
Group-11									EN312-01	EN312-02	EN312-03	EN312-04			
Group-12								EN312-01	EN312-02	EN312-03	EN312-04				
Group-13							EN312-01	EN312-02	EN312-03	EN312-04					
Group-14						EN312-01	EN312-02	EN312-03	EN312-04						

Hours	
08:30-09:30	EN312
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	
16:30-17:30	
17:30-18:30	

EN312 :			
112	Total Students	100	Targeted number of students
4	Students/ Lab team		
2	Lab teams/ Lab Group		
	(Except EN312-01, 04)		
14	Lab Group Types		
8	Tables occupied		
1	more Lab Theme can be added		

**Telecommunication Laboratory**  
**EN401: Broadcast Technologies**

**Laboratory Themes (Level 4)**

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1			EN401-01	EN401-02	EN401-03										
Group-2			EN401-01	EN401-03	EN401-02										
Group-3						EN401-01	EN401-02	EN401-03							
Group-4						EN401-01	EN401-03	EN401-02							
Group-5									EN401-01	EN401-02	EN401-03				
Group-6									EN401-01	EN401-03	EN401-02				
Group-7												EN401-01	EN401-02	EN401-03	
Group-8												EN401-01	EN401-03	EN401-02	

2 Lab teams do the same experiment together.  
 EN401-01 cannot do at the same time with EN401-02, -03 as the same equipments used.

Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	E401
16:30-17:30	
17:30-18:30	

64	Total Students	50	Targeted number of students
4	Students/ Lab team		
2	Lab teams/ Lab Group (except EN305-01)		
8	Lab Group Types		

2	Tables occupied		
6	more Lab themes can be added		

## Digital Electronics Laboratory

### EN404: Industrial & Medical Electronics

### EN408: Microelectronics

### Laboratory Themes (Level 7, 8)

EN404-1,2,EN408-1,2: Digital Lab.															
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1								EN404-1	EN404-2	EN408-1	EN408-2				
Group-2								EN404-2	EN408-1	EN408-2				EN404-1	
Group-3								EN408-1	EN408-2				EN404-1	EN404-2	
Group-4								EN408-2				EN404-1	EN404-2	EN408-1	
Group-5											EN404-1	EN404-2	EN408-1	EN408-2	
Group-6										EN404-1	EN404-2	EN408-1	EN408-2		
Group-7									EN404-1	EN404-2	EN408-1	EN408-2			

Hours	
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	
16:30-17:30	EN404,408
17:30-18:30	

#### EN404

56	Total Students		50	Targeted number of students	4	Tables occupied in Digital Lab.
4	Students/ Lab team				0	Tables occupied in Analog Lab.
2	Lab teams/ Lab Group				1	more Lab Theme can be added
7	Lab Group Types considering the progress of lecture					in Analog Lab.

#### EN408

112	Total Students		100	Targeted number of students	8	Tables occupied in Digital Lab.
4	Students/ Lab team				0	Tables occupied in Analog Lab.
4	Lab teams/ Lab Group				1	more Lab Theme can be added
7	Lab Group Types considering the progress of lecture					in Analog Lab.



Microwave Laboratory

EN409: Microwave Communication

Laboratory Themes (Level 4)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1	EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9						
Group-2	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9						EN409-1	
Group-3	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9						EN409-1	EN409-2	
Group-4	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9						EN409-1	EN409-2	EN409-3	
Group-5	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9						EN409-1	EN409-2	EN409-3	EN409-4	
Group-6	EN409-6	EN409-7	EN409-8	EN409-9						EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	
Group-7	EN409-7	EN409-8	EN409-9						EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	
Group-8	EN409-8	EN409-9						EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	
Group-9	EN409-9						EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	
Group-10						EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9	
Group-11					EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9		
Group-12				EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9			
Group-13			EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9				
Group-14		EN409-1	EN409-2	EN409-3	EN409-4	EN409-5	EN409-6	EN409-7	EN409-8	EN409-9					

Hours	
08:30-09:30	EN409
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	EN409
16:30-17:30	
17:30-18:30	

112	Total Students	100	Targeted number of students
4	Students/ Lab team		
1	Lab teams/ Lab Group		
14	Lab Group Types		
2	Time slots		

9	Tables occupied		
0	more Lab themes can be added		

## Telecommunication Laboratory

### EN410 : Telecommunication Transmission and Switching

### EN411 : Wireless Communications

### Laboratory Themes (Level 4)

EN410	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Remarks
Group-1	EN410-01									EN411-01			EN411-03	EN411-02	
Group-2	EN410-02	EN410-01								EN411-02	EN411-01			EN411-03	
Group-3	EN410-03	EN410-02	EN410-01							EN411-03	EN411-02	EN411-01			
Group-4	EN411-01	EN410-03	EN410-02	EN410-01							EN411-03	EN411-02			
Group-5	EN411-02	EN411-01	EN410-03	EN410-02	EN410-01							EN411-03			
Group-6	EN411-03	EN411-02	EN411-01	EN410-03	EN410-02	EN410-01									
Group-7		EN411-03	EN411-02	EN411-01	EN410-03	EN410-02	EN410-01								
Group-8	EN410-01		EN411-03	EN411-02	EN411-01	EN410-03	EN410-02	EN410-01							
Group-9	EN410-02	EN410-01		EN411-03	EN411-02	EN411-01	EN410-03	EN410-02	EN410-01						
Group-10	EN410-03	EN410-02	EN410-01		EN411-03	EN411-02	EN411-01								
Group-11		EN410-03	EN410-02	EN410-01		EN411-03	EN411-02	EN411-01							
Group-12			EN410-03	EN410-02	EN410-01		EN411-03	EN411-02	EN411-01						
Group-13				EN410-03	EN410-02	EN410-01		EN411-03	EN411-02				EN411-01		
Group-14					EN410-03	EN410-02	EN410-01		EN411-03				EN411-02	EN411-01	

Annex -6-4)

Hours	Sep.
08:30-09:30	
09:30-10:30	
10:30-11:30	
11:30-12:30	
12:30-13:30	Interval
13:30-14:30	
14:30-15:30	
15:30-16:30	
16:30-17:30	EN410, 411
17:30-18:30	

#### EN410 :

112	Total Students	100	Targeted number of students
4	Students/ Lab team		
2	Lab teams/ Lab Group		
14	Lab Group Types		

6	Tables occupied		
2	more Lab themes can be added		

#### EN411 :

56	Total Students	50	Targeted number of students
4	Students/ L's		
1	Lab teams/ Lab Group		
14	Lab Group Types		

3	Tables occupied		
2	more Lab themes can be added		

Annex - 6-4) Practical courses schedule under Round Robin method

## **APPENDICES**

### **Annex 6-5)**

**Equipment calculation in compliance  
with the experiments schedule**

## Digital Electronics Laboratory

[illegible]

Analog Electronics Laboratory

Ne w	Subject		Practical Code		Laborat ory	Target No. students	person per team	Lab team	Lab group type	Seme ster	Time slots	Max capacity	Required Equipments	Lab team	Require d	Plan	Necessary	Lab	Maximum number of equipment necessary for each lab	Exsis ting	Necess ary	Initial Request Letter				
N	EN101	Electronic Engineering	EN101-3	Introduction to Bipolar Junction Transistor (BJT) Amplifier	ENE Analog	CC 550	4	10	7	1	2	560	Dual trace oscilloscope	10	1	10	Oscilloscope	20	ENE Ana	Dual Power supply	20	10	10	BAE01	Dual Power Supply	20
													Multimeter	10	1	10	Analog multimeter	20		Oscilloscope	20	0	20	BAE02	Oscilloscope	20
													Audio signal generator	10	1	10	Audio signal generator	10		Analog multimeter	20	27	0	BAE03	Analog Multimeter	20
													Proto board	10	1	10	Proto board	20		Proto board	* 40	0	40	BAE04	Protoboard	40
													Power supply	10	1	10	Dual Power supply	20		Function Generator	10	3	7	BAE05	Function Generator	20
													Basic Lab bench	10	1	10	Step-down transformer	10		Electronic Thermometer	2	0	2	AEH01	Electronic Thermometer	2
													Stool	10	4	40	Function Generator	10		Clip-On Current Meter (ac/dc)	2	0	2	AEH02	Clip-On Current Meter (ac/dc)	5
N	EN101	Electronic Engineering	EN101-4	Design of a simple regulated DC Power supply	ENE Analog	CC 550	4	10	7	1	2	560	Oscilloscope	10	1	10	Logic probe	10		Variable Frequency LCR Meter	3	0	3	AEH03	Variable Frequency LCR Meter	2
													Multimeter	10	1	10	Basic Lab bench	20		Spectrum Analyzer	3	0	3	AEH04	Spectrum Analyzer (low freq.)	2
													Proto board	10	1	10	Stool	80		Storage Oscilloscope	3	0	3	AEH05	Digital Storage Oscilloscope	2
													Step-down transformer	10	1	10			Audio signal generator	10	5	5	AEH06	Audio signal generator	5	
													Basic Lab bench	10	1	10			Digital multimeter	2	0	2	AEH07	Digital Multimeter	2	
													Stool	10	4	40			Variac	* 5	0	5	AEH08	Variacs	5	
N	EN101	Electronic Engineering	EN101-5	Combinational and Sequential Logic circuits	ENE Analog	CC 550	4	10	7	1	2	560	Function Generator	10	1	10			Personal Computer + GPIB	8	1	7	AEL01	Lab Bench Computer	20	
													Logic probe	10	1	10			UPS	* 1	0	1				
													Proto board	10	1	10			Dot Matrix printer	* 1	0	1	AEL02	Dot Matrix printer	5	
													Power supply	10	1	10			Basic Lab bench	20	0	20	AEL03	Basic Lab bench	20	
N	EN201	Principles of Electronics	EN201-4	Logic Families									Multimeter	3	4	12	Oscilloscope	9		Stool	80	0	80	AEL04	Stools	80
													Breadboard	3	4	12	Audio signal generator	6		First Aid panel	0	0	0	AEL05	First Aid panel	1
													Power supply	3	4	12	Bread board	6		Tool kit for students	* 2	0	2	AEL06	Tool kit for students	2
N	EN201	Principles of Electronics	EN201-7	Transistor Characteristics	ENE Analog	CC 250	4	3	12	2	1	288	Dual trace oscilloscope	3	1	3	Dual Power supply	9		White board	0	0	0	AEL07	White Board	2
													Audio signal generator	3	1	3	Basic Lab bench	9		Storage cupboards and racks	* 2	0	2	AEL08	Storage Cupboards and Racks	2
													Breadboard	3	1	3	Stool	36		Display Boards	0	0	0	AEL09	Display Boards	2
													Power supply	3	1	3			Logic probe	10	0				1	
													Basic Lab bench	3	1	3			SPICE(SW)	2	0				2	
													Stool	3	4	12			AC generator (5V/50Hz)	2	2				2	
N	EN201	Principles of Electronics	EN201-8	Clipping & Clamping Circuits	ENE Analog	CC 250	4	3	12	2	1	288	Oscilloscope	3	1	3			AVO Meter	1	0				2	
													Breadboard	3	1	3			Amplifier	4	4				2	
													Power supply	3	1	3			Digital frequency counter	4	1					
													Basic Lab bench	3	1	3										
													Stool	3	4	12										
N	EN201	Principles of Electronics	EN201-9	Introduction to Operational Amplifier	ENE Analog	CC 250	4	3	12	2	1	288	Logic probes	3	4	12										
													Proto board	3	4	12										
													Power supply	3	4	12										
N	EN201	Principles of Electronics	EN201-2	Combinational Logic Circuits									Signal generator	3	1	3										
													Dual trace oscilloscope	3	1	3										
													Dual power supply	3	1	3										
													Basic Lab bench	3	1	3										
													Stool	3	4	12										
N	EN301	Electronics	EN301-3	Emitter Follower and Unity Gain Phase Splitter	ENE Analog	SE 100	4	2	14	1	1	112	Oscilloscope	2	1	2	Oscilloscope	10								
													Multimeter	2	1	2	Analog multimeter	2								
													Audio signal generator	2	1	2	Audio signal generator	2								
													Dual power supply	2	1	2	Dual Power supply	10								
													Basic Lab bench	2	1	2	Function Generator	8								
													Stool	2	4	8	Digital multimeter	2								
N	EN301	Electronics	EN301-4	Multistage Amplifier and Frequency Response	ENE Analog	SE 100	4	2	14	1	1	112	Oscilloscope	2	1	2	Clip on current meter	2								
													Function generator	2	1	2	Electronic Thermometer	2								
													Digital multimeter	2	1	2	Amplifier	2								
													Personal Computer + GPIB	2	1	2	Personal Computer + GPIB	8								
													Dual power supply	2	1	2	Digital Frequency counter	2								
													Digital Frequency counter	2	1	2	Basic Lab bench	10								
													Basic Lab bench	2	1	2	Stools	40								
													Stool	2	4	8										
N	EN301	Electronics	EN301-5	Feedback Amplifier	ENE Analog	SE 100	4	2	14	1	1	112	Oscilloscope	2	1	2										
													Function generator	2	1	2										
													Personal Computer + GPIB	2	1	2										
													Dual power supply	2	1	2										
													Basic Lab bench	2	1	2										
													Stool	2	4	8										
N	EN301	Electronics	EN301-6	Power Amplifier	ENE Analog	SE 100	4	2	14	1	1	112	Oscilloscope	2	1	2										
													Function generator	2	1	2										
													Dual power supply	2	1	2										
													Electronic Thermometer	2	1	2										
													Amplifier	2	1	2										
													Personal Computer + GPIB	2	1	2										
													Clip on current meter	2	1	2										
													Basic Lab bench	2	1	2										
													Stool	2	4	8										
N	EN301	Electronics	EN301-8	ADC and DAC Circuits	ENE Analog	SE 100	4	2	14	1	1	112	Oscilloscope	2	1	2										
													Function generator	2	1	2										
													Personal Computer + GPIB	2	1	2										
													Dual power supply	2	1	2										
													Basic Lab bench	2	1	2										
													Stool	2	4	8										
N	EN304	Advanced Analog Electronics	EN304-1	Opamp Circuit Design	ENE Analog	GC 145	4	3	14	1	1	168	Oscilloscope	3	1	3	Oscilloscope	3								
													Function generator	3	1	3	Storage Oscilloscope	3								
													Dual power supply	3	1	3	Function generator	6								
													Basic Lab bench	3	1	3	Dual Power supply	6								
													Stool	3	4	12	Analog multimeter	3								
N	EN304	Advanced Analog Electronics	EN304-2	Active Filters	ENE Analog	GC 145	4	3	14	1	1	168	Digital storage oscilloscope	3	1	3	Spectrum Analyzer	3								
													Multimeter	3	1	3	PC	3								
													Function generator	3	1	3	SPICE(SW)	3								
													Dual power supply	3	1	3	Variable Frequency LCR Meter	3								
													Spectrum Analyzer	3	1	3	Basic Lab bench	9								
													Variable Frequency LCR Meter	3	1	3	Stools	36								
													Basic Lab bench	3	1	3										
													Stool	3	4	12										
N	EN304	Advanced Analog Electronics	EN304-3	Simulation using SPICE	ENE Analog	GC 145	4	3	14	1	1	168	PC													

Analog Electronics Laboratory

New	Subject	Practical Code	Laboratory	Target No. students	person per team	Lab team	Lab group type	Semester	Time slots	Max capacity	Required Equipments	Lab team	Required	Plan	Necessary	Lab	Maximum number of equipment necessary for each lab	Existing	Necessary	Initial Request Letter
UEN201	Analog & Digital Electronics	UEN201-1	Diode Characteristics and Applications								Oscilloscope	1	1	1	Oscilloscope	7				
											AC generator (5V/50Hz)	1	1	1	AC generator (5V/50Hz)	2				
											Multimeter	1	1	1	Multimeter	4				
											Dual power supply	1	1	1	Dual power supply	7				
UEN201	Analog & Digital Electronics	UEN201-2	Design of Simple 5V/500 mA voltage stabilized DC power supply								Oscilloscope	1	1	1	Audio signal generator	4				
											AC generator (5V/50Hz)	1	1	1	Basic Lab bench	7				
											Dual power supply	1	1	1	Stool	28				
UEN201	Analog & Digital Electronics	UEN201-3	Common Emitter Transistor Amplifier								Oscilloscope	1	1	1						
											Multimeter	1	1	1						
UEN201	Analog & Digital Electronics	UEN201-4	Bipolar junction Transistor and its characteristics								Audio signal generator	1	1	1						
											Dual power supply	1	1	1						
											Oscilloscope	1	1	1						
											Multimeter	1	1	1						
											Oscillator	1	1	1						
											Dual power supply	1	1	1						
UEN201	Analog & Digital Electronics	UEN201-5	Field Effect Transistor								Oscilloscope	1	1	1						
											Multimeter	1	1	1						
											Audio signal generator	1	1	1						
											Transistor curve tracer	1	1	1						
											Dual power supply	1	1	1						
UEN201	Analog & Digital Electronics	UEN201-6	Operational Amplifier								Dual trace oscilloscope	1	1	1						
											Signal generator	1	1	1						
											Dual power supply	1	1	1						
UEN201	Analog & Digital Electronics	UEN201-7	Introduction to Sequential Logic Families								Oscilloscope	1	1	1						
											Signal generator	1	1	1						
											Logic probe	1	1	1						
											Dual power supply	1	1	1						
UEN301	Analog Electronics	UEN301-1	Combinational Logic Design								Logic probe	1	1	1	Logic probe	1				
											Dual power supply	1	1	1	Dual power supply	8				
UEN301	Analog Electronics	UEN301-2	Introduction to Logic Families								Oscilloscope	1	1	1	Oscilloscope	7				
											Multimeter	1	1	1	Multimeter	3				
											Dual power supply	1	1	1	Audio signal generator	4				
UEN301	Analog Electronics	UEN301-3	Emitter Follower and Unity Gain Phase Splitter								Dual trace oscilloscope	1	1	1	Proto board	1				
											Multimeter	1	1	1	Variac	1				
											Audio signal generator	1	1	1	AVO meters	1				
											Dual power supply	1	1	1						
UEN301	Analog Electronics	UEN301-4	Feedback Amplifiers								Oscilloscope	1	1	1						
											Signal generator	1	1	1						
											Dual power supply	1	1	1						
UEN301	Analog Electronics	UEN301-5	Power Amplifiers								Oscilloscope	1	1	1						
											Multimeter	1	1	1						
											Dual power supply	1	1	1						
UEN301	Analog Electronics	UEN301-6	Oscillators								Dual trace oscilloscope	1	1	1						
											Dual power supply	1	1	1						
											Proto board	1	1	1						
											Variac	1	1	1						
UEN301	Analog Electronics	UEN301-7	Operational Amplifier								Oscilloscope	1	1	1						
											Signal generator	1	1	1						
											Dual power supply	1	1	1						
UEN301	Analog Electronics	UEN301-8	Darlington & Differential Amplifier Circuits								Oscilloscope	1	1	1						
											Signal generator	1	1	1						
											AVO meters	1	1	1						
											Dual power supply	1	1	1						
UEN302	Digital Electronics	UEN302-1	Debounced Circuit								Dual power supply	1	1	1	Dual Power supply	3				
											Frequency Counter	1	1	1	Frequency Counter	1				
											Oscilloscope	1	1	1	Oscilloscope	3				
UEN302	Digital Electronics	UEN302-2	Introduction to Sequential Circuit Design								Dual power supply	1	1	1	Logic probe	1				
											Oscilloscope	1	1	1	Function Generator	1				
											Logic Probe	1	1	1	Multimeter	1				
											Function Generator	1	1	1						
UEN302	Digital Electronics	UEN302-3	Design of a Traffic Light Controller								Multimeter	1	1	1						
											Oscilloscope	1	1	1						
											Dual power supply	1	1	1						

Telecommunication Laboratory

New	Subject		Practical Code		Laboratory	Target No. students	person per team	Lab team	Lab group type	Semester	Time slots	Max capacity	Required Equipments				Necessary		Lab	Maximum number of equipment necessary for each lab		Existing	Necessary	Initial Request Letter																
N	EN203	Introduction to communication systems	EN203-01	Signal Analysis Using the Spectrum Analyzer	ENT	SE 100	4	2	14	1	1	112	Spectrum analyzer	2	1	2	Spectrum analyzer	10	ENT	Dual Power supply	* 10	0	10	BTC01	Dual power supply	20	* Common use													
													Oscilloscope	2	1	2	Oscilloscope	8		Oscilloscope	7	0	7	BTC02	Oscilloscope	20														
													Signal generator	2	1	2	Audio signal generator	8		Multimeter	7	0	7	BTC03	Multimeter	20														
													LCR filter	2	1	2	LCR filter	2		High frequency signal generator	*5	0	5	BTC04	High Frequency Signal Generator/AMFM Modulator/Function	20	* 5 units for laboratory													
													Signal amplifier	2	1	2	Signal amplifier	4		Audio signal generator	6	8	0	BTC05	Audio Signal Generator	20	* Common use													
													DC Power supply	2	1	2	DC Power supply	16		Frequency counter	3	2	1	BTC06	Frequency counter	20														
													Basic lab bench	2	1	2	Random noise generator	2		Protoboard	*40	0	40	BTC07	Protoboard	40														
													Stools	2	4	8	Frequency counter	4		ASK/PSK/FSK Modulator	4	0	4	TCH01	ASK/PSK/FSK Modulator	5	** duplicated with TCH27													
													Oscilloscope	2	1	2	Digital Interface tuart	2		Signal amplifier	4	0	4	TCH02	Signal Amplifier	8														
													Random noise generator	2	1	2	AM FM modulator / demodulator	4		Spectrum analyzer	10	0	10	TCH03	Spectrum Analyser	8														
N	EN203	Introduction to communication systems	EN203-02	Effect of Noise in Analog Signals	ENT	SE 100	4	2	14	1	1	112	Signal generator	2	1	2	dB Meter	2		Pattern generator	** 0	0	0	TCH04	Pattern Generator	2	** duplicated with TCH27													
													Spectrum analyzer	2	1	2	Digital counter	2		LCR meter	2	0	2	TCH05	LCR Meter	2														
													Frequency counter	2	1	2	Digital signal decoder	2		Color TV Trainer panel	4	0	4	TCH06	Colour TV trainer panel	4														
													DC Power supply	2	1	2			Black & White trainer panel	0	0	0	TCH07	Black & White TV trainer panel	0	* Common use														
													Basic lab bench	2	1	2	Digital test signal generator	2		Color TV Receiver	4	1	3	TCH08	Colour TV receiver		5													
													Stools	2	4	8			Black & White TV panel receiver	0	0	0	TCH09	Black & White TV receiver	5															
													N	EN203	Introduction to communication systems	EN203-03	Study of Tone Modulation in AM and FM	ENT	SE 100	4	2	14	1	1	112	Spectrum analyzer	2	1	2	PC	6		dB Meter	2	0	2	TCH10	dB Meter	2	* Common use
																										Oscilloscope	2	1	2	MATLAB(SW)	3		Pseudo Random Sequence Generator	0	0	0	TCH11	Pseudo Random Sequence Generator	2	
																										Communication signal generator	2	1	2	MATHCAD(SW)	3		Random noise generator	6	4	2	TCH12	Random Noise Generator	8	
																										Frequency counter	2	1	2	Auto transformer	2		Frequency Counter	4	2	2	TCH13	Frequency Meter	2	* Common use
AM FM demodulator panels	2	1	2	VHF/UHF Yagi antenna	2		Small telephone switch	4	1	3	TCH14	Small Telephony switch														1														
Audio signal generator	2	1	2	FM Yagi antenna	2		Telephone line simulator	2	0	2	TCH15	Telephone line simulator														2														
Baffle	2	1	2	Baffle	4		Measuring receiver	4	1	3	TCH16	Measuring receiver														2	* Common use													
Synoscope with frame	2	1	2	Synoscope with frame	2		GPS	3	0	3	TCH17	GPS Receiver System														1														
DC Power supply	2	1	2			DSP Development kit	2	0	2	TCH18	DSP Trainer kit	5																												
N	EN203	Introduction to communication systems	EN203-04	Effect of Noise in AM and FM	ENT	SE 100	4	2	14	1	1	112														Basic lab bench	2	1	2	Printer	6		Modulation domain analyzer	2	0	2	TCH19	Modulation Domain Analyzer	1	* Common use
													Stools	2	4	8	Acoustic circuit trainer	3		BER Tester	0	0	0	TCH20	BER Tester	2														
													Spectrum analyzer	2	1	2	Impedance bridge	3		Digital video generator	4	0	4	TCH21	Digital video generator	1														
													Oscilloscope	2	1	2	Experimental AM	2		High frequency DSO	4	0	4	TCH22	High Frequency Storage Oscilloscope	2	* Common use													
													Communication signal generator	2	1	2	Basic lab bench	16		High Frequency Spectrum Analyzer	2	0	2	TCH23	High Frequency Spectrum Analyzer	2														
													AM FM modulator/demodulator panels	2	1	2	Stools	64		Video signal analyzer	2	0	2	TCH24	Video Signal Analyzer	1														
													Digital Counter	2	1	2			Transmission line measurement kit	2	0	2	TCH25	Transmission line measurement kit	1	* Common use														
													Digital signal decoder	2	1	2			Error control coding test kit	2	0	2	TCH26	Error Control Coding test kit	1															
													Digital test signal generator	2	1	2			TV pattern generator	2	0	2	TCH27	TV Pattern Generator	1															
													Random noise generator	2	1	2			AM FM modulator / demodulator	4	0	4	TCH28	FM/AM Modulator Deodulator Trainer panel	1	* Common use														
Experimental AM	2	1	2			PAM/PWM/PPM/PCM Trainer panel	2	0	2	TCH29	PAM/PWM/PPM/PCM Trainer panel	1																												
Baffle	2	1	2			ASK/PSK/FSK/ Demodulator	4	0	4	TCH30	ASK/PSK/FSK Modulator-Demodulator Trainer Panel	1																												
N	EN203	Introduction to communication systems	EN203-05	Analysis of Spectra of Commercial Communication	ENT	SE 100	4	2	14	1	1	112	DC Power supply	2	1	2			MPEG Generating equipment	2	0	2	TCH31	MPEG Generating Equipment	1	* Common use														
													Basic lab bench	2	1	2			MPEG Analyzer	2	0	2	TCH32	MPEG Analyzer	1															
													Stools	2	4	8			Antenna Design software	2	0	2	TCS01	Antenna Design software	1															
													FM Yagi antenna	2	1	2			Filter Design Software	2	0	2	TCS02	Filter Design Software	1	* Common use														
													VHF/UHF Yagi antenna	2	1	2			Digital signal processing software	* 2	0	2	TCS03	Digital Signal Processssing Software	1															
													Spectrum analyzer	2	1	2			Personal Computer	6	0	6	TEN01	Personal Computer	6															
													Digital interface tuart	2	1	2			UPS	* 1	0	1				* Common use														
													Auto transformer	2	1	2			Dot Matrix Printer	* 1	0	1	TEN02	Dot Matrix Printer	1															
													dB meter	2	1	2			Basic Lab bench	*20	0	20	TEN03	Basic Lab bench	20															
													Signal amplifier	2	1	2			Stool	*80	0	80	TEN04	Stools	80	* Common use														
DC Power supply	2	1	2			First Aid Panel	0	0	0	TEN05	First Aid Panel	1																												
Basic lab bench	2	1	2			White Board	0	0	0	TEN06	White Board	2																												
N	EN202	Introduction to communication systems		Signal Analysis Using the Spectrum Analyzer	ENT	SE 100	4	2	14	1	1	112	Stools	2	4	8			Display Boards	0	0	0	TEN07	Display Boards	2	* Common use														
													Spectrum analyzer	2	1	2			Storage cupboards and racks	* 2	0	2	TEN08	Storage Cupboards and Racks	2															
													Oscilloscope	2	1	2			Baffle	4	2																			
													Signal generator	2	1	2			Acoustic circuit trainer	2	1																			
													LCR filter	2	1	2			AM Meter AC	4	1																			
													Basic lab bench	2	1	2			Impedance bridge	2	1																			
													Stools	2	4	8			DC Power supply	16	8																			
													PC	3	1	3			CRT Terminal	1	1																			
													MATLAB(SW)	3	1	3			Amplifier DC	4	2																			
													Acoustic circuit trainer	3	1	3			Amplifier Power	4	2																			
Printer	3	1	3			Digital Counter	2	2																																
DC Power supply	3	1	3			Auto transformer	2	1																																
Basic lab bench	3	1	3			Synoscope with probe	2	1																																
Stools	3	4	12			Digital interface tuart	2	1																																
N	EN204	Signals and Systems	EN204-01	Analysis of Linear Continuous Time Systems using Simulations	ENT	GE 145	4	3	14	1	1	168	PC	3	1	3			LCR filter	4	0					* Common use														
													MATLAB(SW)	3	1	3			AM FM modulator	1	0																			
													Acoustic circuit trainer	3	1	3			Digital test signal generator	2	1																			
													Printer	3	1	3			Impedance bridge	2	1																			
													DC Power supply	3	1	3			DC Power supply	16	8																			
													Basic lab bench	3	1	3			CRT Terminal	1	1																			
													Stools	3	4	12			Amplifier DC	4	2																			
													PC	3	1	3			Amplifier Power	4	2																			
													MATLAB(SW)	3	1	3			Digital Counter	2	2																			
													Impedance bridge	3	1	3			Auto transformer	2	1																			
DC Power supply	3	1	3			Synoscope with probe	2	1																																
Printer	3	1	3			Digital interface tuart	2	1																																
Basic lab bench	3	1	3			LCR filter	4	0																																
Stools	3	4	12			AM FM modulator	1	0																																
N	EN302	Communications	EN302-01	Analysis of Noise in CW Modulation	ENT	CE 210	4	2	14	1	2	224	Random noise generator	2	1	2	ASK/PSK/FSK Modulator	2		VHF/UHF Yagi Antenna	2	2				* Common use														
													Frequency counter	2	1	2			Liquid cristal protector	2	1																			
													Oscilloscope (low frequency)	2	1	2	PAM/PWM/PPM/PCM Trainer panel	2		FM Yagi antenna	2	2																		
													PCM trainer panel	2	1	2	High frequency DSO	2		Dual Power supply	6	0																		
													Telecommunication kit	2	1	2	Telecommunication kit	10		Video screen with stand	1	1																		
													Power supply	2	1	2	Power supply	4		PCM Trainer panel	4	0																		
													Liquid crystal protector	2	1	2	Liquid cristal protector	2		Filter trainer panel	2	0																		
													Basic lab bench	2	1	2	Frequency counter	2		A/D converter	1	0																		
													Stools	2	4	8	Oscilloscope (low frequency)	4		Vectorscope	2	1																		
													N	EN302	Communications	EN302-02	Analog Filters	ENT	CE 210	4	2	14	1	2	224	High frequency signal generator	2	1	2	PCM trainer panel	2		Satellite receiver system	1	0				* Common use	
LCR meter	2	1	2	Random noise generator	6		Error counter	2	2																															
Oscilloscope (low frequency)	2	1	2	High frequency signal generator	6		Telephone hand set	1	0																															
Filter trainer panels	2	1	2	LCR meter	2		Protocol analyzer	2	0																															
High Frequency Spectrum Analyzer	2	1	2	Filter trainer panels	2		Turned circuit trainer panel	2	0																															
Telecommunication kit	2	1	2			Telecommunication kit	10	17																																
Basic lab bench	2	1	2	High Frequency Spectrum Analyzer	2		Trainer panel PAC8	1	0																															
Stools	2	4	8	PC	2		Trainer panel PAC6	1	0																															
PC	2	1	2	Filter design Software	2		Trainer panel PAC2	1	0																															
Filter design SW	2	1	2	Modulation domain analyzer	2		LF Signal generator	1	0																															
Error counter	2	1	2	Error counter	2		ATOOL(SW)	1	0																															
Printer	2	1	2	AM/FM modulators	2		Antenna system demonstrator	1	1																															
Telecommunication kit	2	1	2			Isolating transducer	2	1																																
Basic lab bench	2	1	2	VHF Yagi antenna	2		RF Generator	1	1																															
Stools	2	4	8	Printer	2		FSK Generator	1	0																															
N	EN302	Communications	EN302-04	Study of Modulation using the Modulation Domain Analyzer	ENT	CE 210	4	2	14	1	2	224	Modulation domain analyzer	2	1	2	Wave analyzer	4		PLL Panel	1	0				* Common use														
													AM/FM modulators	2	1	2	Basic lab bench	8		TEKNIKIT PCM Module 296F	1	0																		
													Random noise generator	2	1	2	Stools	32		EHT Probe	2	0																		
													High frequency signal generator	2	1	2			AVO Meters	1	0																			
													VHF Yagi antenna	2	1	2			Trainer panel	1	1																			



Telecommunication Laboratory

Ne w	Subject		Practical Code		Laborat ory	Target No. students	person per team	Lab team	Lab group type	Seme ster	Time slots	Max capacity	Required Equipments			Lab team	Require d	Plan	Necessary		Lab	Maximum number of equipment necessary for each lab		Exsis- ting	Necess- ary	Initial Request Letter				
													Telecommunication kit	2	1	2						Digital tester	1	1						
													Wave analyzer	2	1	2						TEKNIKIT 296G module	1	0						
													Basic lab bench	2	1	2						Wave analyzer	2	1						
													Stools	2	4	8						Network analyzer	1	0						
N	EN302	Communications	EN302-05	Band pass digital transmission systems	ENT	CE 210	4	2	14	1	2	224	ASK/PSK/FSK Modulator	2	1	2						Color Video Camera	1	1						
													High frequency signal generator	2	1	2						Color Video cassette	2	2						
													PAM/PWM/PPM/PCM Trainer panel	2	1	2						Optical fiber trainer kit	1	0						
													High frequency DSO	2	1	2						Optical power meter	1	0						
													Telecommunication kit	2	1	2						Universal bridge	4	1						
													Random noise generator	2	1	2						Variable optical attenuator	1	0						
													Wave analyzer	2	1	2						A/D converter	4	2						
													Power supply	2	1	2						White noise generator	4	1						
													Basic lab bench	2	1	2						Digital signall decoder	2	1						
													Stools	2	4	8						Digital test signal	2	1						
N	EN308	Communication Theory	EN308-01	PAM/PWM/PPM/PCM Techniques	ENT	SE 100	4	2	14	1	1	112	PAM/PWM/PPM/PCM Trainer panel	2	1	2	PAM/PWM/PPM/PCM Trainer panel	2				Logic troubleshooting	4	1						
													Power supply	2	1	2	Power supply	6				Oscilloscope (low freq.)	4	1						
													Signal generator	2	1	2	Signal generator	6				Experimental AM	2	3						
													A/D converter	2	1	2	A/D converter	2				Diode bridge	1	1						
													Oscilloscope (low frequency)	2	1	2	Oscilloscope (low frequency)	2				Extender board	2	1						
													Logic trouble shooting	2	1	2	Logic troubleshooting	2				Splitter	6	6						
													Splitter	2	1	2	Splitter	6				Field circuit trainer	1	1						
													Spectrum analyzer	2	1	2	Spectrum analyzer	2				Generator Sweamer	4	2						
													AM Meter AC	2	1	2	AM Meter AC	2				Pulse modulator	4	1						
													Pulse and switching	2	1	2	Pulse and switching	6				Isolating transformer	2	2						
													White noise generator	2	1	2	White noise generator	2				Field level meter	1	1						
													Basic lab bench	2	1	2	PC	2				Pulse and switching	6	7						
													Stools	2	1	2	MATLAB(SW)	2				Rheostat	3	6						
N	EN308	Communication Theory	EN308-02	DM/ADPCM and LPC Techniques	ENT	SE 100	4	2	14	1	1	112	PC	2	1	2	ASK/PSK/FSK Modulator	4				Loud speaker box	2	2						
													Antenna design software	2	1	2	ASK/PSK/FSK Demodulator	4				Stimulate system	2	1						
													ASK/PSK/FSK Modulator	2	1	2	PCM trainer panel	2				Sweep oscillator	2	1						
													ASK/PSK/FSK Demodulators	2	1	2	Extender board	2				Sweeper main frame	2	1						
													Generator Swemar	2	1	2	Generator Swemar	2				Volt meter	6	3						
													Extender board	2	1	2	Isolating transformer	2				Filter trainer panel	2	1						
													Pulse and switching	2	1	2	Pulse modulator	2												
													Splitter	2	1	2														
													Basic lab bench	2	1	2	High Frequency DSO	2												
													Stools	2	4	8	Error Correction Coding test kit	2												
N	EN308	Communication Theory	EN308-03	Analog Transmission of Digital Signals	ENT	SE 100	4	2	14	1	1	112	ASK/PSK/FSK Modulator	2	1	2	Antenna design software	2												
													Signal generator	2	1	2	Digital tester	2												
													PCM trainer panel	2	1	2	Volt meter	2												
													Power supply	2	1	2	Basic lab bench	8												
													High Frequency DSO	2	1	2	Stools	32												
													ASK/PSK/FSK Demodulators	2	1	2														
													Pulse and switching	2	1	2														
													Splitter	2	1	2														
													Basic lab bench	2	1	2														
													Stools	2	4	8														
N	EN308	Communication Theory	EN308-04	Error Correction Coding	ENT	SE 100	4	2	14	1	1	224	Error Correction Coding test kit	2	1	2														
													Signal generator	2	1	2														
													Isorating transformer	2	1	2														
													Pulse modulator	2	1	2														
													Digital tester	2	1	2														
													Power supply	2	1	2														
													Volt meter	2	1	2														
													Basic lab bench	2	1	2														
													Stools	2	4	8														
N	EN312	Digital Signal Processing	EN312-01	Introduction to Digital Signal Processing Using Matlab	ENT	SE 100	4	2	14	1	1	112	PC	2	1	2	PC	6												
													MATLAB(SW)	2	1	2	MATLAB(SW)	4												
													Sweep oscillator	2	1	2	Sweep oscillator	2												
													Sweeper main frame	2	1	2	Sweeper main frame	2												
													Isorating transducer	2	1	2	Isorating transducer	2												
													Pattern generator	2	1	2	Pattern generator	2												
													Universal bridge	2	1	2	Universal bridge	2												
													Basic lab bench	2	1	2	MATHCAD(SW)	2												
													Stools	2	4	8	Stimulate system	2												
N	EN312	Digital Signal Processing	EN312-02	Z-transform Techniques	ENT	SE 100	4	2	14	1	1	112	PC	2	1	2	DSP Development kit	2												
													MATHCAD(SW)	2	1	2	Power supply	2												
													Stimulate system	2	1	2	Basic lab bench	8												
													Basic lab bench	2	1	2	Stools	16												
													Volt meter	2	1	2														
													Stools	2	4	8														
N	EN312	Digital Signal Processing	EN312-03	FIR Filter Design IIR and Other Filter Design	ENT	SE 100	4	2	14	1	1	112	PC	2	1	2														
													MATLAB(SW)	2	1	2														
													Basic lab bench	2	1	2														
													Stools	2	4	8														
N	EN312	Digital Signal Processing	EN312-04	Filter Implementation on DSP Kit	ENT	SE 100	4	2	14	1	1	112	DSP Development kit	2	1	2														
													Power supply	2	1	2														
													Basic lab bench	2	1	2														
													Stools	2	4	8														
N	EN401	Broadcast Technologies	EN401-01	PAL TV Systems	ENT	SE 50	4	2	8	1	1	64	Colour TV trainer Panel	2	1	2	Colour TV trainer Panel	4												
													Colour TV receiver	2	1	2	Colour TV receiver	4												
													Digital video generator	2	1	2	Digital video generator	4												
													Video signal analyzer	2	1	2	Video signal analyzer	2												



## Telecommunication Laboratory

New	Subject			Practical Code	Laboratory	Target No. students	person per team	Lab team	Lab group type	Semester	Time slots	Max capacity	Required Equipments	Lab team	Requirement	Plan	Necessary	Lab	Maximum number of equipment necessary for each lab	Existing	Necessary	Initial Request Letter																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
													Colour TV receiver Color video cassette Amplifier DC Amplifier power Basic lab bench Stools	2 2 2 2 2 2	1 1 1 1 1 4	2 2 2 2 2 8																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														</

**Telecommunication Laboratory**

No w	Subject		Practical Code		Laborat ory	Target No. students	person per team	Lab team	Lab group type	Seme ster	Time slots	Max capacity	Required Equipments			Necessary		Lab	Maximum number of equipment necessary for each lab			Exis- ting	Necess ary	Initial Request Letter				
													Lab team	Require d	Plan													
	UEN402 II	Communication theory II	UEN402-03	Color Television	ENT								Stools	1	1	1	PC	2										
													Dual trace oscilloscope	1	1	1	MATLAB(SW)	1										
													Multimeter	1	1	1	Trainer panel	1										
													Color pattern generator	1	1	1	Teknikit 296G module	1										
													Color TV receiver	1	1	1	MATHCAD(SW)	1										
													EHT Probe	1	1	1	Network analyzer	1										
													Basic lab bench	1	1	1	Optical fiber trainer kit	1										
													Stools	1	1	1	Optical power meter	1										
	UEN402 II	Communication theory II	UEN402-04	Monochrome television receiver	ENT								Dual trace oscilloscope	1	1	1	Variable optical attenuator	1										
													AVO meters	1	1	1	Basic lab bench	10										
													Multimeter	1	1	1	Stools	40										
													Pattern generator	1	1	1												
													Monochrome TV receiver	1	1	1												
													EHT Probe	1	1	1												
													Basic lab bench	1	1	1												
													Stools	1	1	1												
	UEN402 II	Communication theory II	UEN402-05	Digital filters	ENT								PC	1	1	1												
													MATLAB(SW)	1	1	1												
													Multimeter	1	1	1												
													Basic lab bench	1	1	1												
													Stools	1	1	1												
	UEN402 II	Communication theory II	UEN402-06	Error detection and correction	ENT								Trainer panel	1	1	1												
													Power supply	1	1	1												
													Multimeter	1	1	1												
													Basic lab bench	1	1	1												
													Stools	1	1	1												
	UEN402 II	Communication theory II	UEN402-07	To study delta & delta-sigma modulation and demodulation principals	ENT								Teknikit 296G module	1	1	1												
													Dual power supply	1	1	1												
													Multimeter	1	1	1												
													Basic lab bench	1	1	1												
													Stools	1	1	1												
	UEN402 II	Communication theory II	UEN402-08	Simulation of intersymbol interference	ENT								PC	1	1	1												
													MATHCAD(SW)	1	1	1												
													Multimeter	1	1	1												
													Basic lab bench	1	1	1												
													Stools	1	1	1												
	UEN402 II	Communication theory II	UEN402-09	Network analyzer	ENT								Network analyzer	1	1	1												
													Multimeter	1	1	1												
													Basic lab bench	1	1	1												
													Stools	1	1	1												
	UEN402 II	Communication theory II	UEN402-10	Study of optical fibers	ENT								Optical fiber trainer kit	1	1	1												
													Optical power meter	1	1	1												
													Variable optical attenuator	1	1	1												
													Basic lab bench	1	1	1												
													Stools	1	1	1												

Microwave Laboratory

No w	Subject		Practical Code		Laborat ory	Target No. students	person per team	Lab team	Lab group type	Seme ster	Time slots	Max capacity	Required Equipments	Lab team	Require d	Plan	Necessary	Lab	Maximum number of equipment necessary for each lab	Exis- ting	Necess ary	Initial Request Letter					
	EN409	Microwave Communication	EN409-1	Properties of Electromagnetic Waves	MW	SE	4	1	14	1	2	112	Synthesized Sweep Signal Geneartor	1	1	1	Synthesized sweep signal generator	2	MW	Klystron	0	0	0	MWH01	Klystron, Power Supply and Wave guide Components	3	* Common use
													Microwave receiver with audible indication	1	1	1	Microwave receiver with audible indication	1		Magnetron	2	0	2	MWH02	Magnetron	2	
													Reflecting metal plates	1	1	1	Reflecting metal plates	1		Gun Oscillator with power supply	4	1	3	MWH03	Gunn Oscillator, Power supply and wwave guide components	3	
													Metal reed screen	1	1	1	Metal reed screen	1		Spectrum Analyzer	4	0	4	MWH04	Spectrum Analyzer	1	
													Paraffin prism	1	1	1	Paraffin prism	1		Synthesized sweep signal generator	2	0	2	MWH05	Synthesized Sweep Signal Generator	2	
													Interfacing testing metal plate	1	1	1	Interfacing testing metal plate	1		Frequency counter	3	3	0	MWH06	Frequency Counter	2	
													AVO meters or Multimeter	1	1	1	AVO meters or Multimeter	1		SWR meter	3	0	3	MWH07	SWR Meter	2	
													Connectors	1	1	1	Connectors	2		Microwave Tx and Rx System with Dish Antenna and LNA	1	0	1	MWH08	Microwave Tx and Rx System with Dish antenna and LNA	1	
													Basic Lab bench	1	1	1	Gun Oscillator with power supply	4		Antenna Trainer kit	* 1	0	1	MWH09	Antenna Trainer Kit	2	
													Stool	1	4	4	Frequency counter	3		Satelite Receiver System	1	0	1	MWH10	Satellite Receiver System	1	
													Gun Oscillator with power supply	1	1	1	Sliding Screw Tuner	2		Field Strength Meter	4	0	4	MWH11	Field Strength Meter	2	
													Frequency Counter	1	1	1	Matched detector	2		Experimental Rader kit	1	0	1	MWH12	Experimental Radar kit	1	
Sliding Screw Tuner	1	1	1	Microwave transistor max. 1GHz	5		Microwave Transistor max. 1GHz	* 10	0	10	MWH13	Microwave Transistors - Max Frequency 1GHz	10	* Common use													
	EN409	Microwave Communication	EN409-2	Measurement of Wavelength & Attenuation	MW	SE	4	1	14	1	2	112	Synthesized Sweep Signal Geneartor	1	1	1	Microwave transistor max. 10GHz	5		Microwave Transistor max. 10 GHz	* 10	0	10	MWH14	Microwave Transistors - Max Frequency 10GHz	10	* Common use
													Matched detector	1	1	1	Rotary attenuator	3		Zero bias Schottky Detector diodes	* 10	0	10	MWH15	Zero bias Schottky Detector diodes	10	* Common use
													Slotted Line and SWR meter	1	1	1	Short termination, Variable short termination	4		PIN Diodes	* 5	0	5	MWH16	PIN Diodes	5	* Common use
													Rotary attenuator	1	1	1	Matched load	2		Impedance Bridge	* 1	0	1	MWH17	Impedance Bridge	1	* Common use
													Short termination, Variable short termination	1	1	1	Isolator	1		Cable Connectors	* 5	0	5	MWH18	Cable Connectors	5 each	* Common use
													Matched load	1	1	1	Circulator	1		Antenna Design	***1	0	1	MWS01	Antenna Design	1	*** 1 software for lab
													Basic Lab bench	1	1	1	Directional coupler	2		Microwave Circuit Design	***1	0	1	MWS02	Microwave Circuit Design	1	*** 1 software for lab
													Stool	1	4	4	SWR meter	3		Radar Cross Section	***1	0	1	MWS03	Radar Cross Section	1	*** 1 software for lab
													Gun Oscillator with power supply	1	1	1	Variable attenuuator	1		Personal computer	8	1	7	MWL01	Personal computer	4	* Common use * Common use * Common use * Common use
													Isolator	1	1	1	Hybrid T junction	1		UPS	* 1	0	1				
													Circulator	1	1	1	Ferritr Isolator	2		Dot Matrix Printer	* 1	0	1	MWL02	Dot Matrix Printer	1	
													Directional coupler	1	1	1	Detector	2		Basic Lab Bench	* 16	0	16	MWL03	Basic Lab Bench	10	
Frequency Counter	1	1	1	50 ohm termination	1		Stools	* 64	0	64	MWL04	Stools	40														
Sliding Screw Tuner	1	1	1	Function Generator	1		First Aid Panel	0	0	0	MWL05	First Aid Panel	1														
Matched detector	1	1	1	Varactor tuned oscillator	1		White Board	0	0	0	MWL06	White Board	1														
SWR meter	1	1	1	Horn antennas	1		Display Boards	0	0	0	MWL07	Display Boards	1														
Variable attenuator, Calibrated attenuator	1	1	1	Wave-guide carrier, waveguide clamp	1		Storage Cabinets and Racks	* 1	0	1	MWL08	Storage Cabinets and Racks	1	* Common use													
Short termination, Variable short termination	1	1	1			RF Generator	4	0																			
Matched load	1	1	1	Oscilloscope	1		MATLAB(SW)	8	0																		
Basic Lab bench	1	1	1	T-piece BNC connector	1		Sliding Screw Tuner	2	0																		
Stool	1	4	4	Microwave Tx and Rx System with Dish Antenna and LNA	1		Matched detector	2	0																		
	EN409	Microwave Communication	EN409-3	Study of Isolators, Circulators & Directional Couplers	MW	SE	4	1	14	1	2	112	Gun Oscillator with power supply	1	1	1	Satelite Receiver System	1		Rotary attenuator	3	0					
													SWR meter	1	1	1	Experimental Rader kit	1		Short termination, Variable short termination	4	0					
													Hybrid T junction	1	1	1			Matched load	2	0						
													Ferritr Isolator	1	1	1	Zero Bias Schottoky Detector diode	1		Isolator	1	0					
													Detector	1	1	1	Field Strength Meter	1		Circulator	1	1					
													50 ohm termination	1	1	1	Rader Cross Section (SW)	1		Directional coupler	2	2					
													Directional coupler, 10dB	1	1	1	PC	1		Variable attenuator	1	1					
													Wave-guide carrier, waveguide clamp	1	1	1	Basic Lab bench	10		Hybrid T junction	1	0					
													Rotary value attenuator	1	1	1	Stools	40		Ferritr Isolator	2	2					
													Short termination, Variable short termination	1	1	1			Detector	2	2						
													Basic Lab bench	1	1	1			50 ohm termination	1	1						
													Stool	1	4	4			Function Generator	1	1						
	EN409	Microwave Communication	EN409-4	Wave-guide Hybrid-T junctions	MW	SE	4	1	14	1	2	112	Gun Oscillator with power supply	1	1	1			Varactor tuned oscillator	1	0						
													Function generator	1	1	1			Horn antennas	1	1						
													Varactor tuned oscillator	1	1	1			Wave-guide carrier, waveguide clamp	1	0						
													Ferrite isolator	1	1	1			Oscilloscope	1	0						
													Frequency meter	1	1	1			MATHCAD(SW)	4	0						
													Horn antennas (2)	1	1	1											
													Detector	1	1	1											
													Wave-guide carrier, waveguide clamp	1	1	1											
													Rotary value attenuator	1	1	1											
													Short termination, Variable short termination	1	1	1											
													Dual trace oscilloscope	1	1	1											
													T-piece BNC Connector (2)	1	1	1											
Basic Lab bench	1	1	1																								
Stool	1	4	4																								
	EN409	Microwave Communication	EN409-5	A simple frequency-modulated microwave link	MW	SE	4	1	14	1	2	112	Gun Oscillator with power supply	1	1	1											
													Function generator	1	1	1											
													Varactor tuned oscillator	1	1	1											
	EN409	Microwave Communication	EN409-6	Measurement on a Microwave Terrestrial Link	MW	SE	4	1	14	1	2	112	Microwave Tx. And Rx. System with Dish Antenna and LNA	1	1	1											
													Basic Lab bench	1	1	1											
													Stool	1	4	4											
	EN409	Microwave Communication	EN409-7	Measurement on a Sattelite Receiver System	MW	SE	4	1	14	1	2	112	Satellite Receiver System	1	1	1											
													Basic Lab bench	1	1	1											
													Stool	1	4	4											
	EN409	Microwave Communication	EN409-8	Study on a Rader System	MW	SE	4	1	14	1	2	112	Experimental Rader Kit	1	1	1											
													Basic Lab bench	1	1	1											
													Stool	1	4	4											
	EN409	Microwave	EN409-9	Design of an Active Antenna for the X-band	MW	SE	4	1	14	1	2	112	Microwave Transistor max. 1GHz	1	5	5											
													Microwave Tansistor max. 10GHz	1	5	5											
													Zero Bias Schottoky Detector Diode	1	1	1											
													Field Strength Meter	1	1	1											
													Connectors	1	1	1											
													Basic Lab bench	1	1	1											
		Microwave	EN409-10	Study of Rader Cross Section	MW	SE	4	1	14	1	2	112	PC	1	1	1											
													Rader Cross Section(SW)	1	1	1											
													Basic Lab bench	1	1	1											
	EN310	Electromagnetics	EN310-1	Reflection Coefficient of Electromagnetic Waves at a interface	MW	SE	4	4	8	1	1	128	PC	4	1	4	PC	8									
													MATHCAD(SW)	4	1	4	MATHCAD(SW)	4									
													Basic Lab bench	4	1	4	MATLAB	4									
													Stool	4	4	16	Magnetron	4									
	EN310	Electromagnetics	EN310-2	Electromagnetic wave propagation through rectangular waveguides	MW	SE	4	4	8	1	1	128	PC	4	1	4	Zero Bias Schottoky Detector diode	4									
													Microwave Circuit Design	4	1	4	Microwave Circuit Design	2									
													Basic Lab bench	4	1	4	Basic Lab bench	10									
													Stool	4	4	16	Stools	40									

Microwave Laboratory

No	Subject		Practical Code		Laboratory	Target No. students	person per team	Lab team	Lab group type	Semester	Time slots	Max capacity	Required Equipments				Lab team	Requirement	Plan	Necessary				Lab	Maximum number of equipment necessary for each lab				Existing	Necessary	Initial Request Letter			
	EN310	Electromagnetics	EN310-3	Microstrip Transmission Line Characteristic	MW	SE 100	4	4	8	1	1	128	MATLAB	4	1	4																		
													MATHCAD(SW)	4	1	4																		
													Basic Lab bench	4	1	4																		
													Stool	4	4	16																		
	EN310	Electromagnetics	EN310-4	Design of Microwave Oven	MW	SE 100	4	4	8	1	1	128	Magnetron	4	1	4																		
													Zero Bias Schottoky Detector Diode	4	1	4																		
													Basic Lab bench	4	1	4																		
													Stool	4	4	16																		
	EN309	Antenna & Propagation	EN309-1	Radiation Patterns of Dipole Antennas using Mathcad	MW	SE 100	4	4	8	1	1	128	PC	4	1	4	Personal Computer	12																
													Antenna Design Software	4	1	4	MATHCAD(SW)	2																
													Basic Lab bench	4	1	4	MATLAB(SW)	8																
													Stool	4	4	16	RF Generator	4																
	EN309	Antenna & Propagation	EN309-2	Current distribution of a thin wire antenna	MW	SE 100	4	4	8	1	1	128	PC	4	1	4	Spectrum Analyzer	4																
													MATLAB(SW)	4	1	4	Field Strength Meter	4																
													Basic Lab bench	4	1	4	Connectors	4																
													Stool	4	4	16	Antenna Design software	8																
	EN309	Antenna & Propagation	EN309-3	Near field and far field of a dish antennas	MW	SE 100	4	4	8	1	1	128	PC	4	1	4	Antenna Trainer kit	4																
													MATLAB	4	1	4	Basic Lab bench	20																
													MATHCAD(SW)	4	1	4	Stools	80																
													Basic Lab bench	4	1	4																		
													Stool	4	4	16																		
	EN309	Antenna & Propagation	EN309-4	Design and Implementation of Practical Wire Antennas	MW	SE 100	4	4	8	1	1	128	RF Generator	4	1	4																		
													Spectrum Analyzer	4	1	4																		
													Field Strength Meter	4	1	4																		
													Connectors	4	1	4																		
													Basic Lab bench	4	1	4																		
													Stool	4	4	16																		
	EN309	Antenna & Propagation	EN309-5	Antenna Design Project	MW	SE 100	4	4	8	1	1	128	PC	4	1	4																		
													Antenna Design Software	4	1	4																		
													Antenna Trainer kit	4	1	4																		
													Basic Lab bench	4	1	4																		
													Stool	4	4	16																		

Optoelectronics Laboratory

Ne w	Subject		Practical Code		Laborat ory	Target No. students	person per team	Lab team	Lab group type	Seme ster	Time slots	Max capacity	Required Equipments				Necessary		Lab	Maximum number of equipment necessary for each lab		Exsis- ting	Necess ary	Initial Request Letter		
N	EN307	Optoelectronics	EN307-1	Light Emitting Diode and Light Dependent Resistor	Opto	SE 50	4	1	14	1	1	56	Dual Power Supply	1	1	1	Dual Power Supply	8	OPT	Dual Power Supply	* 8	0	8	BOP01	Dual Power Supply	8
													Multimeter	1	1	1	Oscilloscope	1		Oscilloscope	1	1	0	BOP02	Oscilloscope	8
													Logic Probe	1	1	1	Multimeter	2		Multimeter	2	1	1	BOP03	Multimeter	8
													Protoboard	1	1	1	Logic Probe	2		Logic Probe	2	1	1	BOP04	Logic Probe	8
													Laser Diodes	1	5	5	Audio signal generator	1		Audio signal generator	1	2	0	BOP05	Audio signal generator	8
													Photo Diodes	1	5	5	Protoboard	8		Protoboard	* 16	0	16	BOP06	Protoboard	16
													LCD Panel	1	1	1	Laser Pointer	1		Laser Pointer	1	12	0	OPH01	Laser Pointer	10
													Basic Lab Bench	1	1	1	Fiber Optic Educator Kit	1		Fiber Optic Educator Kit	1	0	1	OPH02	Fibre Optic Educator Kit	5
													Stools	1	4	4	Fiber Optic Monitor Kit	1		Fiber Optic Monitor Kit	1	0	1	OPH03	Fibre Optic Monitor Kit	5
N	EN307	Optoelectronics	EN307-2	Photo-transistor and Opto Isolator	Opto	SE 50	4	1	14	1	1	56	Dual Power Supply	1	1	1	Optical Power Meter	2		Optical Power Meter	2	0	2	OPH04	Fibre Optic Power Meter	1
													Multimeter	1	1	1	LCD Panel	2		LCD Panel	2	0	2	OPH05	LCD Panel	2
													Logic Probe	1	1	1	Laser Diodes	5		Laser Diodes	** 0	0	0	OPH06	Laser Diodes	20
													Protoboard	1	1	1	LDR	20		LDR	* 50	0	50	OPH07	LDR	50
													Optocouplers	1	5	5	Photo Diodes	10		Photo Diodes	* 20	0	20	OPH08	Photo Diodes	20
													Basic Lab Bench	1	1	1	Opto couplers	10		Opto couplers	* 20	0	20	OPH09	Optocouplers	20
													Stools	1	4	4	Lux meter	1		Ellipsometer	*** 0	0	0	OPH10	Ellipsometer	2
N	EN307	Optoelectronics	EN307-3	Introduction to Fiber Optic Communication	Opto	SE 50	4	1	14	1	1	56	Fiber Optic Educator Kit	1	1	1	Optical Spectrum Analyzer	2		Lux meter	1	0	1	OPH11	Lux meter	2
													Fiber Optic Monitor Kit	1	1	1	Erbiam Doped fibre amplifier	1		Optical Spectrum Analyzer	2	0	2	OPH12	Optical Spectrum Analyzer	2
													Protoboard	1	1	1	1550nm DFB Laser	2		Erbiam Doped fibre amplifier	1	0	1	OPH13	Erbiam Doped fibre amplifier	1
													Personal computers	1	1	1	1310nm FP Laser	2		1550nm DFB Laser	* 0	0	0	OPH14	1550nm DFB Laser	1
													Dual Power Supply	1	1	1	Personal computers	2		1310nm FP Laser	* 0	0	0	OPH15	1310nm FP Laser	1
													Basic Lab Bench	1	1	1	Basic Lab Bench	8		Basic Lab Bench	8	0	8	OPL01	Basic lab bench	8
													Stools	1	4	4	Stools	32		Stools	32	0	32	OPL02	Stools	32
N	EN307	Optoelectronics	EN307-4	Characteristics of Semiconductor Laser for Communications	Opto	SE 50	4	1	14	1	1	56	Dual Power Supply	1	1	1			Personal computers	2	0	2	OPL03	Personal coomputer	4	
													Optical Spectrum Analyzer	1	1	1			UPS	* 1	0	1				
													Optical Power Meter	1	1	1			Dot matrix printer	* 1	0	1	OPL04	Dot matrix printer	1	
													Protoboard	1	1	1			First Aid panel	0	0	0	OPL05	First Aid panel	1	
													1550nm DFB Laser	1	1	1			White board	0	0	0	OPL06	White board	1	
													1310nm FP Laser	1	1	1			Display boards	0	0	0	OPL07	Display boards	1	
													Basic Lab Bench	1	1	1			Storage cupboard and racks	* 1	0	1	OPL08	Storage Cupboard and racks	1	
													Stools	1	4	4										
N	EN307	Optoelectronics	EN307-5	Characteristics of Erbium Doped Fiber Amplifier	Opto	SE 50	4	1	14	1	1	56	Dual Power Supply	1	1	1										
													Optical Spectrum Analyzer	1	1	1										
													Optical Power Meter	1	1	1										
													Protoboard	1	1	1										
													Erbiam Doped fibre amplifier	1	1	1										
													Basic Lab Bench	1	1	1										
													Stools	1	4	4										
		Optoelectronics	EN307-6	Project	Opto	SE 50	4	1	14	1	1	56	1550nm DFB Laser	1	1	1										
													1310nm FP Laser	1	1	1										
													Dual Power Supply	1	1	1										
													Laser Pointer	1	1	1										
													Protoboard	1	1	1										
													Basic Lab Bench	1	1	1										
													Stools	1	4	4										
		Optoelectronics	EN307-7	Project	Opto	SE 50	4	1	14	1	1	56	LDR	1	20	20										
													Photo Diodes	1	10	10										
													Optocouplers	1	10	10										
													Personal computers	1	1	1										
													Dual Power Supply	1	1	1										
													Protoboard	1	1	1										
													Basic Lab Bench	1	1	1										
													Stools	1	4	4										
		Optoelectronics	EN307-8	Project	Opto	SE 50	4	1	14	1	1	56	Audio signal generator	1	1	1										
													Oscilloscope	1	1	1										
													Protoboard	1	1	1										
													Dual Power Supply	1	1	1										
													Lux meter	1	1	1										
													LCD Panel	1	1	1										
													Basic Lab Bench	1	1	1										
													Stools	1	4	4										

## **APPENDICES**

### **Annex 6-6)**

**Recommended Time table by level 1 to 4,**

**The Department of**

**Electronics & Telecommunication Engineering**

**University of Moratuwa, Faculty of Engineering,  
the Department of Electronics and Telecommunication**


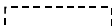

**1st year (1st, 2nd semester)**

**Semester 1**

Hours	Mon.		Tue.		Wed.		Thu.		Fri.	
08:30-09:30										
09:30-10:30										
10:30-11:30										
11:30-12:30										
12:30-13:30	Interval									
13:30-14:30										
14:30-15:30										
15:30-16:30										
16:30-17:30										
17:30-18:30										

**Semester 2**

Hours	Mon.		Tue.		Wed.		Thu.		Fri.	
08:30-09:30	<b>EN101 Electronics Engineering (L) (550)</b> <b>Digital / Analogue Electronics Lab.</b>									
09:30-10:30										
10:30-11:30										
11:30-12:30										
12:30-13:30	Interval									
13:30-14:30	<b>EN101 Electronics Engineering (P) (275)</b> <b>Digital / Analogue Electronics Lab.</b>									
14:30-15:30										
15:30-16:30	<b>EN101 Electronics Engineering (P) (275)</b> <b>Digital / Analogue Electronics Lab.</b>									
16:30-17:30										
17:30-18:30	<b>EN101 Electronics Engineering (P) (275)</b> <b>Digital / Analogue Electronics Lab.</b>									

 (P): Practical course  
 (L): Lecture  
 Same contents

\* Figure in parenthesis is the number of targetted students

**University of Moratuwa, Faculty of Engineering,  
the Department of Electronics and Telecommunication**

**2nd year (3rd, 4th semester)**

**Semester 3**

Hours	Mon.	Tue.	Wed.	Thu.	Fri.
08:30-09:30					
09:30-10:30					
10:30-11:30					
11:30-12:30					
12:30-13:30	Interval				
13:30-14:30		<b>EN201 Principles of Electronics (L) (125)</b>		<b>EN202 Computer Organizations (L) (100)</b>	
14:30-15:30		Digital / Analogue Electronics Lab.		Computer Systems Lab.	
15:30-16:30		<b>EN201 Principles of Electronics (P) (125)</b> Digital / Analogue Electronics Lab		<b>EN202 Computer Organizations (P) (100)</b> Computer Systems Lab.	
16:30-17:30					
17:30-18:30					

**Semester 4**

Hours	Mon.	Tue.	Wed.	Thu.	Fri.
08:30-09:30	<b>EN201 Principles of Electronics (L) (125)</b> Digital / Analogue Electronics Lab.	<b>EN201 Principles of Electronics (P) (125)</b> Digital / Analogue Electronics Lab			
09:30-10:30					
10:30-11:30	<b>EN203: Introduction to Communication systems (L) (100)</b> Telecommunication Lab.				
11:30-12:30					
12:30-13:30	Interval				
13:30-14:30	<b>EN204: Signals and Systems (L) (145)</b> Telecommunication Lab.		<b>EN205 Applied Electronics (L) (100)</b>		
14:30-15:30			Digital Electronics Lab.		
15:30-16:30	<b>EN203: Introduction to communication systems (P) (100)</b> <b>EN204: Signals and Systems (P) (145)</b> Telecommunication Lab.		<b>EN205 Applied Electronics (P) (100)</b> Digital Electronics Lab.	<b>EN204: Signals and Systems (P) (145)</b> Computer Systems Lab.	
16:30-17:30					
17:30-18:30					



**University of Moratuwa, Faculty of Engineering,  
the Department of Electronics and Telecommunication**

**3rd year (5th, 6th semester)**

Semester 5									
Hours	Mon.	Tue.		Wed.		Thu.	Fri.		
08:30-09:30	<div><u>EN301 : Electronics (L) (160)</u></div>	<div><u>EN301: Electronics (P) (160)</u></div> <div>Digital and Analogue Electronics Lab.</div>		<div><u>EN304 : Advanced Analog Electronics (P) (145)</u></div> <div>Telecommunication Lab.</div>		<div><u>EN302 : Communication (P) (210)</u></div> <div>Telecommunication Lab.</div>		<div><u>EN309: Antenna &amp; Propagation (P) (50)</u></div> <div>Microwave Lab.</div>	
09:30-10:30	<div>Digital and Analogue Electronics Lab.</div>								
10:30-11:30	<div><u>EN304 : Advanced Analog Electronics (L) (145)</u></div>								
11:30-12:30	<div>Analog Electronics Lab.</div>								
12:30-13:30	Interval								
13:30-14:30	<div><u>EN307 : Optoelectronics (L) (50)</u></div>	<div><u>EN309: Antenna &amp; Propagation (L) (145)</u></div> <div>Communication Lab.</div>		<div><u>EN308 : Communication Theory (L) (100)</u></div> <div>Telecommunication Lab</div>		<div><u>EN302 : Communication Theory (L) (210)</u></div> <div>Telecommunication Lab.</div>		<div><u>EN305 : Digital System Design (P) (130)</u></div> <div>Computer Systems Lab.</div>	
14:30-15:30	<div>Optoelectronics Lab.</div>								
15:30-16:30	<div>EN307: Optoelectronics (P) (50)</div> <div>Optoelectronics Lab</div>	<div><u>EN309: Antenna &amp; Propagation (P) (145)</u></div> <div>Computer systems Lab.</div>		<div><u>EN308 : Communications Theory (P) (100)</u></div> <div>Telecommunication Lab.</div>		<div><u>EN302 : Communication (P) (210)</u></div> <div>Telecommunication Lab.</div>		<div><u>EN305 : Digital System Design (P) (130)</u></div> <div>Computer Systems Lab.</div>	
16:30-17:30									
17:30-18:30									

Semester 6					
Hours	Mon.	Tue.	Wed.	Thu.	Fri.
08:30-09:30	<b>ME301 : Control Theory (L)(200)</b> Mechanical Engineering Dept.	<b>ME301 : Control Theory (P)(200)</b> Mechanical Engineering Dept.	<b>EN311: Information Theory and Coding (L) (145)</b> Computer Systems Lab.	<b>EN312 : Digital Signal Processing (P) (100)</b> Telecommunication Lab.	<b>EN311: Information Theory and Coding (P) (145)</b> Computer Systems Lab.
09:30-10:30					
10:30-11:30					
11:30-12:30			<b>EN312 : Digital Signal Processing (L) (100)</b> Telecommunication Lab.		
12:30-13:30	Interval				
13:30-14:30	<b>EN303 : Electronic Measurement and Instrumentation (L)(270)</b> Computer Sys. Lab.		<b>EN309: Antenna &amp; Propagation (L) (100)</b> Microwave Lab.	<b>EN310: Electromagnetics (L) (100)</b> Microwave Lab.	<b>EN306 : Physical Electronics (L)</b> Digital / Analogue Electronics Lab.
14:30-15:30					
15:30-16:30					
16:30-17:30	<b>EN303 : Electronic Measurement and Instrumentation (P)(270)</b> Computer Systems Lab.	<b>EN304 : Advanced Analog Electronics (P) (145)</b> Analog Electronics Lab.	<b>EN309: Antenna &amp; Propagation (P) (50)</b> Microwave Lab.	<b>EN310: Electromagnetics (P) (100)</b> Microwave Lab.	<b>EN306 : Physical Electronics (P)</b> Digital / Analogue Electronics Lab.
17:30-18:30					

**University of Moratuwa, Faculty of Engineering,  
the Department of Electronics and Telecommunication**

**4th year (7th, 8th semester)**

**Semester 7**

Hours	Mon.	Tue.	Wed.	Thu.	Fri.
08:30-09:30		<u>EN409: Microwave Communication (P) (50)</u> Microwave Lab.		<u>EN404:</u> <u>Industrial &amp; Medical Electronics (L) (50)</u> Digital / Analogue Electronics Lab.	<u>EN499 Projects (20)</u> Digital / Analogue Electronics Lab. Telecommunication Lab. Microwave Lab. Optoelectronics Lab.
09:30-10:30					
10:30-11:30					
11:30-12:30					
12:30-13:30			Interval		
13:30-14:30	<u>EN402 :</u> <u>Computer Aided Circuit Design (L) (95)</u> CAD Lab.	<u>EN409: Microwave Communication (L) (100)</u> Microwave Lab.	<u>EN407 : Optical Communication (L) (100)</u> Optoelectronics Lab.	<u>EN408:</u> <u>Microelectronics (L) (100)</u> Digital / Analogue Electronics Lab.	<u>EN499 Projects (20)</u> Digital / Analogue Electronics Lab. Telecommunication Lab. Microwave Lab. Optoelectronics Lab.
14:30-15:30					
15:30-16:30	<u>EN402 : Computer Aided Circuit Design (P) (95)</u> CAD Lab.	<u>EN409: Microwave Communication (P) (50)</u> Microwave Lab.	<u>EN407 : Optical Communication (P) (100)</u> Optoelectronics Lab.	<u>EN404: Industrial &amp; Medical Electronics (P) (50)</u> <u>EN408:</u> <u>Microelectronics (P) (100)</u> Digital Electronics Lab.	
16:30-17:30					
17:30-18:30					

**Semester 8**

Hours	Mon.		Tue.		Wed.		Thu.		Fri.	
08:30-09:30									<u>EN499 Projects (20)</u> Digital / Analogue Electronics Lab. Telecommunication Lab. Microwave Lab. Optoelectronics Lab.	
09:30-10:30										
10:30-11:30	<u>EN406 : Robotics (L) (95)</u> CAD Lab.		<u>EN411 : Wireless Communication (L) (50)</u> <u>Telecommunication Lab</u>		<u>EN401: Broadcast Technologies (L) (50)</u> Telecommunication Lab.		<u>EN410 : Telecom. Transmission and Switching (L) (100)</u> Telecommunication Lab.			
11:30-12:30										
12:30-13:30	Interval									
13:30-14:30	<u>EN406 : Robotics (P) (95)</u> Mechanical Engineering Dept.				<u>EN401: Broadcast Technologies (P) (50)</u> Telecommunication Lab.		<u>EN410 : Telecom. Transmission and Switching (P) (100)</u> <u>EN411 : Wireless Communication (P) (50)</u> Telecommunication Lab.		<u>EN499 Projects (20)</u> Digital / Analogue Electronics Lab. Telecommunication Lab. Microwave Lab. Optoelectronics Lab.	
14:30-15:30										
15:30-16:30										
16:30-17:30										
17:30-18:30										

## **APPENDICES**

### **Annex 6-7)**

**Current situation of the supplied equipment under  
Grant Aid of the year 1987**

## Annex -6-7) Current situation of the supplied equipment under Grant Aid of the year 1987

Item No.	Description	Q'ty	Specifications	Number of remaining	Manufacturer name	Model No.	Present situation of remaining equipment						Reparation place			Problem for maintenance	Frequency in practical use	Name of safekeeping laboratory
							Function of hardware				Practicality of software		Workshop in University	Reparation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
EE-01	Clip on AC power meter	6	Digital display, ranges	6	Ogawa Seiki	OSK5924, TYPE B							6				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-15h/w)	Machines Lab (MC) Power Systems Lab (PS) Measurement Lab (MS)
EE-02	Gauss meter	1	20-20,000 gauss	1	Ogawa Seiki	OSK6348							1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-16h/w)	MS
EE-03	Gauss meter probes	1	1ea. Flat for measurement in narrow gaps 1ea. Sturdy flat probe 1ea. Axial probe	1	Ogawa Seiki	OSK6349-01/02/03							1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-17h/w)	MS
EE-04	Search coil for electronic flux meter	1	Inside are of coil : 1ea. 25cm2 (40turn) 1ea. 6cm2 (100 turn) 1ea. 3cm2 (10 turn)	1	Ogawa Seiki	OSK6357, 6361,- 01/02/03							1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-18h/w)	MS
EE-05	Electrostatic voltmeter	1	Portable type, 2KV, AC and DC	1	Ogawa Seiki	OSK4901(2KV)							1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-19h/w)	PS
EE-06	Electostatic voltmeter	1	Portable type, 5KV, AC and DC	1	Ogawa Seiki	OSK4901(5KV)							1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-20h/w)	PS
EE-08	Galvanometer	3	0.9A/div, 540V/div	3	Ogawa Seiki	OSK5224							3				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-21h/w)	MS
EE-10	Precision double bridge Measuring probes Clamp device	1	0,1mohm-111.1 ohm	1	Ogawa Seiki	OSK5494/5495/5496				1			1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-22h/w)	MS
EE-11	Pocket tachometer	2	Touchless, using a photo probe, 2000-20,000rpm	2	Ogawa Seiki	OSK5988							2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-23h/w)	MC/PS
EE-12	Pocket tachometer	2	Touch, using a contact rubber tips, 2000-20,000rpm	2	Ogawa Seiki	OSK5989							2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-24h/w)	MC
EE-13	Pocket tachometer	2	Touchless, using a photo probe, 2000-20,000rpm with probe fixture and analog output lead	2	Ogawa Seiki	OSK5990							2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-25h/w)	MC
EE-14	Single-phase power transducer	2	Input 110VAC, 5A Output 0-5VDC with watt meter	2	Yokogawa	228551AFA, 210130AFAB L				2			2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-26h/w)	PS
EE-15	Three-phase four-wire power transducer	2	Input 110VAC, 5A Output 0-5VDC with watt meter	2	Yokogawa	228571AFA, 210130AFAB L				2			2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-27h/w)	PS
EE-16	Single-phase power factor transducer	2	Input 110VAC, 5A Output 0 - +/-1V with p.f. meter	2	Yokogawa	228790/Z, 210130-AFG				2			2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-28h/w)	PS
EE-17	Insulation polytester	1	500V/100Mohm, 0-15/150/1500 ohm	1	Ogawa Seiki	OSK6455				1			1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-29h/w)	PS
EE-18	Portable lux meter	1	0 - 3,000 lux	1	Ogawa Seiki	OSK5974							1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-30h/w)	MS
EE-19	Portable wheatstone bridge	2	With murray and varley loop tester, 1 ohm - 10 Mohm	2	Ogawa Seiki	OSK5497				2			2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-31h/w)	MS

## Annex -6-7) Current situation of the supplied equipment under Grant Aid of the year 1987

Item No.	Description	Q'ty	Specifications	Number of remaining	Manufacturer name	Model No.	Present situation of remaining equipment						Reparation place			Problem for maintenance	Frequency in practical use	Name of safekeeping laboratory
							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
EE-20	Analog multimeter	6	AC-DC voltage 1000V, DC current 500mA	6	Ogawa Seiki	OSK6712			6				6				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-32h/w)	MS
EE-21	DC power supply	6	0 - 32V, 0.5A	6	Ogawa Seiki	OSK3578 32-0.5		6					6				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-33h/w)	MC/PS/MS
EE-22	Function generator	2	0.0001Hz-20Hz Sine, triangular and square	2	Kikusui	4502		2					2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-34h/w)	MS
EE-23	Oscilloscope	10	20MHz, 2 channel	10	Kikusui	COS5020TM		10					10				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-35h/w)	MC/PS/MS
EE-24	Digital storage-scope	3	20MHz, 2 channel, memory capacity 1KB	3	Kikusui	COM7061A/DSS5020A			3				3				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-36h/w)	MC/PS
EE-25	Clip on ammeter	4	15-300A AC	4	Ogawa Seiki	OSK6722		4					4				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-37h/w)	MC/PS
EE-26	Metric wire gauge	2	BWG0-36	2	Fuji-Enterprise	BWG-036		2					2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-38h/w)	Wiring Diagrams Lab (WD)
EE-27	Micrometer	2	0.25mm (range) in 0.01mm (grad.)	2	Ogawa Seiki	OSK11289-401		2					2				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-39h/w)	WD
EE-28	Insulated termiknals	1,000	10A, 200 each of black, red, yellow, pblue, brown	1,000	Fuji-Enterprise												daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-40h/w)	MC/PS/MS
EE-29	Digital millisecond counter	1	0-999.9 sec., for measuring, operating and reset times of relay and contacts	1	Ogawa Seiki	OSK6758		1			1		1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-41h/w)	PS
EE-33	Induction voltage regulator	1	Output 30KVA Input 400V, 3 phase, 50Hz	1	Fuji-Enterprise	KVR-315-1		1					1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-42h/w)	MC
EE-35	Microcomputer controlled DC motor training unit	1	CPU Z80A, with DC motor training unit and DC power supply unit	1	Fuji-Enterprise	KENTAC 800ZMK2		1					1				1 - 2 h/w	Power Electronics Lab (PE)
EE-36	Phase sequence detectgor	3	110-480V, 40-70Hz	3	Hioki	3122		3					3				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-44h/w)	MC
EE-37	Power electronics basic demonstration set	1	For studying phase shift control, rectification, switchine, etc.	1	Ogawa Seiki	OSK288		1					1				1 - 2 h/w	PE
EE-38	Plstic coated white steel morning board	1	Wall mountable or movable type (4' x 6')	1	Ogawa Seiki	WB-046		1					1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-46h/w)	MS
EE-39	Thyristor leonard experiment system (Variable speed system of DC Motor)	1	DC motor 2KW	1	Ogawa Seiki	OSK689-2		1			1		1				1 - 2 h/w	PE
EE-40	3-phase controllred DC motor drive	1	Input 400VAC, 50Hz, 3 phase Output 0 - 100VDC, 30A	1	Fuji-Enterprise	AVS-1008		1					1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-48h/w)	PE
EE-41	Chopper driven DC motor	1	DC motor 70/90V, 250W, 1800rpm	1	Ogawa Seiki	osk687-1		1			1		1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-49h/w)	PE
EE-42	Thyristor invertor system trainer	1	Input 400V, 50Hz, 3 phase, rated current 10A	1	Ogawa Seiki	OSK686-B		1			1		1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-50h/w)	PE

## Annex -6-7) Current situation of the supplied equipment under Grant Aid of the year 1987

Item No.	Description	Q'ty	Specifications	Number of remaining	Manufacturer name	Model No.	Present situation of remaining equipment						Reparation place			Problem for maintenance	Frequency in practical use	Name of safekeeping laboratory
							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
EE-43	(Combined with EE-42)	1		1				1				1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-51h/w)	PE	
EE-44	Microprocessor controlled electronics equipment	1	For studyiung transistor inverter drive of AC motor, microprocessor controlled AC/DC motork, etc.	1	Fuji-Enterprise	2200MC		1			1	1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-52h/w)	PE	
EE-45	Portable oil test set	1	0.5kVA, 0 - 60KV	1	Ogawa Seiki	OSK6585		1				1				1 - 2 h/w	High Voltage Lab (HV)	
EE-48	Uninterruptible power supply	1	Output 3kVA, 230VAC, 50Hz Input 230VAC	1	Yamabishi	SSFT-3KE			1			1				daily (BSEng: 25h/w, NDTDip.: 20h/w, PG : 10-54h/w)	PE	
EET-1	Auto transformer	5	Input 1230V, 50Hz 1phase Output 0 - 260V, 3A	5	OGAWA	OSK10234			5			5				Weekly	Electronics Workshop (ENW)/ Telecommunication Lab (ENT)	
EET-3	Model computer training kit with display panel	1	Operating system : binary 8 bits parallel summing system	1	Ogawa Seiki	OSK4378		1			1	1				Weekly	Computer Systems Lab (CS)	
EET-5	Digital multimeters	15	For DCV, ACV, DCA, ACA, R measurements	5	HIOKI	3200				5		5			5		Digital, Analog Electronics Lab (ENE)	
EET-6	Variable DC power supply	8	Dual tracking type	5	LEADER	LDS-151			5			5				Daily	ENE	
EET-7	Four channel oscilloscopes	2	350MHz, with GPIB	2	National	VP5530B			2			2				Moderate	ENW	
EET-8	Function generator	2	0.01Hz-10MHz, Sine, triangular, square, ramp wave, pulse wave	2	LEADER	LFG-1310			2			2				Weekly	ENE	
EET-9	Wideband oscillators	8	2Hz-20Hz, sine	6	OGAWA	OSK6804			6			6				Daily	ENE	
EET-11	Linear IC tester	1	Test items : +/-DUT supply current, input offset volt., etc.	1	OGAWA	OSK6696			1			1				Moderate/ Case based	PG	
EET-12	Transistor circuit trainer	1	Including experimental circuit panel, accessory kit, etc.	1	OGAWA	OSK190				1		1					ENE	
EET-13	Pulse and switching circuit trainer	1	Including multi-vibrator circuit panels, integration panels, etc.	1	OGAWA	OSK293A				1		1				Not in use	ENT	
EET-14	A/D, D/A converter circuit trainer	1	Including A/D and D/A conversion experimental equipment	1	OGAWA	OSK299A OSK299B			1		1	1				Not in use	ENE	
EET-15	Thyristor circuit trainer	1	For studying thyristor operation, phase shift control, rectification, etc.	1	OGAWA	OSK288			1		1	1				Not in use	PG	
EET-16	Power supply circuit trainer	1	For studying rectifying circuit, stabilized circuit, etc.	1	OGAWA	OSK264			1		1	1				Moderately used	ENE	
EET-17	Servomechanism experimental equipment	1	For studying control synchro transmitter, two-phase servo-motor, etc.	1	OGAWA	OSK638			1		1	1				Not in use	PG	
EET-18	Filter circuit trainer	1	Including low-pass filter, high-pass filter, etc.	1	OGAWA	OSK455			1			1				Not in use	ENT	
EET-19	Digital system trainer	1	For studying binary number calculation and basic logic	1	OGAWA	OSK159A				1		1				Not in use	ENE	
EET-22	White noise generator	1	50KHz	1	OGAWA	OSK6816			1			1				Daily	ENT	
EET-23	Network/spectrum analyzer	1	100KHz-2GHz	1	ANRITSU	MS620J			1			1				daily	MW	
EET-26	Modulation/demodulation circuit trainer	1	Including AM, FM modulator/demodulator, etc.	1	OGAWA	OSK453A/B			1		1	1				Not in use	ENT	
EET-27	Sweep oscillators	1	5.9 - 12.4GHz	1	KIKUSUI	KSG4500			1			1				daily	ENT	
EET-31	VHF signal generator	1	100KHz-2GHz	1	ANRITSU	MSG2630A			1			1				Frequently	MW	
EET-32	Pulse generator	2	10Hz-50MHz	2	ANRITSU	MG418A			2			2				Not in use	ENT	
EET-33	LCR Meter	1	1KHz-100Hz with GPIB	1	OGAWA	OSK6314			1			1				Weekly	ENW	

## Annex -6-7) Current situation of the supplied equipment under Grant Aid of the year 1987

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							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
EET-34	Dual trace oscilloscope	4	40MHz	4	KIKUSUI	CD5040		3	1				4				daily	ENE
EET-35	Analyzing recorder	1	4ch., 32K words/ch. With GPIB	1	OGAWA	OSK6923			1		1		1			1	moderate	ENW
EET-37	Color TV trainer+D46	1	For studying high-frequency circuit experiment, etc.	1	OGAWA	OSK695		1				1	1				Frequently	ENT
EET-38	Uninterruptible power supply	2	3KVA, 230VAC, 50Hz	2	Yamabisi	SFT3KE			2				2				Continuous	CS/EE
EET-40	Acoustic circuit trainer	1	Including power amplifier, voltage amplifier, condenser microphone, etc.	1	OGAWA	OSK-696				1			1				Not in use	ENT
EET-41	Dual trace oscilloscope	1	Specification same as EET-34	1	KIKUSUI	CD5040			1				1				In use	ENT
EET-45	Digital plotter	1	8pen, RS232C & HPIB, 80cm/s	1	HP	HP7550				1			1			1	not in use	PG
EET-47	Miniature portable oscilloscope	1	Dual trace, 40MHz	1	LEADER	LBO324			1				1				case based	ENW
EET-48	Digital storage oscilloscope	1	60MHz, GPIB programmable	1	KIKUSUI	7061		1					1				Daily	PG
EET-49	Robotics teaching experimenting kit	1	Articulated robot, 5 axis	1	FUJI+	XR-3			1				1				moderate	CS
EET-50	Ferrite experimental equipment set	1	Including Faraday rotation apparatus, square circular transition wave guide, etc.	1	OGAWA	OSK902		1					1				moderate	MW
EET-51	Optical fiber system	1	System includes optical fiber cables (GI, S), stabilized LD light source, detector, laser diodes, variable attenuator, connectors, adaptors, termination kit, fiber cutter	1	FUJIKURA +	FVA560+		1					1				Weekly	OPTO
EET-57	Dual trace oscilloscopes	3	(Specification same as EET-34)	3	KIKUSUI	CD5040		3					3				Daily	ENE
EET-59	Digital multimeters	1	(Specification same as EET-5. Total quantity included in EET-5)	1	HIOKI	3200				1			1				Not used	ENE
EET-60	RF/AF generators	1	(Specification same as EET-29. Total quantity included in EET-29)	1	KENWOOD	AG203			1				1				Daily	ENE
EET-62	AM/FM standard signal generators	2	100KHz-110MHz	1	OGAWA	OSK6812		1					1				daily	ENT/
EET-66	Frequency counter	1	10Hz-18GHz	1	ANRITSU	MF76A			1				1				moderate	MW
EET-68	Auto transformer	1	Input 230V, 50Hz, 1 phase Output 0 - 260V, 10A	1	OGAWA	OSK10234		1					1				moderate	ENT
EET-71 (N.R.I)	Hand held polaroid oscilloscope Camera (Inclusive of polaroid auto film)	1	For items EET-7 and EET-48	1	ASANWA	M085				1			1				not in use	ENE
EET-72 (N.R.I)	Calibrator, arbitrary standard type	1	Calibrators of DMTs, circuit meters, etc.	1	OGAWA	OSK6801		1					1					ENW
EET-73 (N.R.I)	Precision digital meter	1	+/- 100mV to +/- 1000VDC, 100ohm to 100Mohm, 1V to 500VAC	1	OGAWA	OSK5905		1					1					ENW
EET-75 (N.R.I)	CNC vertical machining center	1		1	TAKISANA	MACDV2E		1			1		1				In use/ Case based	ME/CAD
EEP-2	Venier callipers	6	Range 150mm	6	Ogawa Seiki	OSK11288-201/204		6			6		6					
EEP-3	Micrometer screw gauge	6	Range 0-25mm	6	Ogawa Seiki	OSK11289-301		6			6		6					
EEP-4	Spherometer	6	Range -20 to 0 to +20mm	6	Ogawa Seiki	OSK11605		6			6		6					
EEP-5	Traveling microscope (Measuring microscope)	3	Range 200mm (horizontal), 160mm (vertical)	3	Ogawa Seiki	OSK4685		3					3					
EEP-12	Pulley and comprehensive pulley set	3	Including single pulleys, double pulleys, weights, etc.	3	Ogawa Seiki	OSK11925		3					3					

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Item No.	Description	Q'ty	Specifications	Number of remaining	Manufacturer name	Model No.	Present situation of remaining equipment						Reparation place			Problem for maintenance	Frequency in practical use	Name of safekeeping laboratory
							Function of hardware				Practicality of software		Workshop in University	Repairment at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
EEP-13	Inclined plane with supplementary parts	3	Including slope bench and supplementary parts	3	Ogawa Seiki	OSK11930		3					3					
EEP-15	Katers reversible pendulum	2	Overall length 1,555mm approx.	2	Ogawa Seiki	OSK11989		2					2					
EEP-16	Youngs' modulus of wires apparatus	3	Including body, wall bracket, weights, brass wire etc.	3	Ogawa Seiki	OSK11992		3					3					
EEP-18	Sodium lamp (Line spectrum light source)	3	For studying observation of line spectrum, interference and diffraction	3	Ogawa Seiki	OSK12156		3					3					
EEP-19	Solar cell experimental apparatus	3	Including solar cell, ec	3	Ogawa Seiki	OSK12852		3			3		3					
EEP-20	Light interference apparatus	2	9 slits and 2 parallel slits in the cylinder	2	Ogawa Seiki	OSK5614		2					2					
EEP-26	Spectroscopic prism	6	60	6	Ogawa Seiki	OSK12222		6					6					
EEP-27	Spectrometer	3		3	Ogawa Seiki	OSK7784		3			3		3					
EEP-28	Diffraction grating	3		3	Ogawa Seiki	OSK12224-B		3					3					
EEP-29	Newton ring experimental apparatus	3		3	Ogawa Seiki	OSK12226		3					3					
EEP-30	Filter color plate	3		3	Ogawa Seiki	OSK5703		3					3					
EEP-34	Digital multimeter	3		3	Ogawa Seiki	OSK6218		3					3					
EEP-36	Battery checker	1		1	Ogawa Seiki	OSK11657		1					1					
EEP-37	Low frequency oscillator	2		2	Ogawa Seiki	OSK6805		2					2					
EEP-38	Dual trace oscilloscope	2		2	Kikusui	COS5020TM		2					2					
EEP-43	Electronic Balance	1		1	Chyo Balance	MF-6000		1			1		1					
EEP-44	Microwave basic experimental equipment	1		1	Ogawa Seiki	OSK699		1			1		1					
EEP-45	Radio wave demonstration unit (Microwave)	1		1	Ogawa Seiki	OSK11872		1			1		1					
EEP-46	X'ray apparatus for educational use	1		1	Ogawa Seiki	OSK11861/1771A		1			1		1					
EEP-47	E/m apparatus	1		1	Ogawa Seiki	OSK11854		1			1		1					
EEP-48	Standard tuning forks	2		2	Ogawa Seiki	OSK12117		2					2					
EEP-49	Sonometer large type	2		2	Ogawa Seiki	OSK12129		2			2		2					
EEP-51	Sound level meter	2		2	Kanomax	4001		2			2		2					
EEP-53	Variable AC supply (Auto transformer)	3		3	Ogawa Seiki	OSK10234-06		3			3		3					
EEP-54	DC voltage supply	3		3	Ogawa Seiki	OSK3578 18-5.5		3			3		3					
EOS-1	Host computer system1	1		1	Nihon DEC	JU-360T1-A3				1		1					no longer used	Computer Laboratory (CL)
EOS-2	Host computer system2	1		1	Nihon DEC	JU-360T1-A3				1		1					no longer used	CL
EOS-3	Engineering workstation	1		1	Nihon DEC	JV-VS464-GB				1		1					no longer used	CL
EOS-4	Personal computer system type 1 (5 sets)	5		1	Conform etc	TYPE-3, PRO-3000 etc				5		5					no longer used	CL
EOS-5	Personal computer system type 2 (5 sets)	5		1	Conform etc	TYPE-3, PRO-3000 etc				5		5					no longer used	CL
EOS-6	Personal computer system type 3 (20 sets)	20		1	Conform etc	TYPE-2 PRO-3000 ETC				20		20					no longer used	CL
EOS-7	Network communication server	5		1	Nihon DEC	H4000-000, DSR-AB etc				5		5					no longer used	CL
EOS-8	Network adapter for Micro Vax-II	1		1	Nihon DEC	DELQA-M, BNE 311H-10				1		1					no longer used	CL
EOS-9	Microcomputer software and hardware develop	1		1	Conform etc	TYPE-4, PRO-3000 etc				1		1					no longer used	CL
EOS-10	Digital signal processor development system	1		1	Conform etc	TYPE-3+1FDD, PRO-3000		1			1		1				3h/w	CL
EOS-11	Multiprocessor system	1		1	Conform etc	80286 etc		1			1		1				3h/w	DC



## Annex -6-7) Current situation of the supplied equipment under Grant Aid of the year 1987

Item No.	Description	Q'ty	Specifications	Number of remaining	Manufacturer name	Model No.	Present situation of remaining equipment						Reparation place			Problem for maintenance	Frequency in practical use	Name of safekeeping laboratory
							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
EOS-12	Image processing system	1		1	Conform etc	80286 etc				1		1	1				3h/w	MP
EOS-13	Multipurpose microcomputer exp.system	2		1	Conform etc	TYPE-3+1FDD, PRO-3000		2			2		1				3h/w	CL
EOS-15	Robot	1		1	Rhino	UNY RHINO XR-3			1			1	1				no longer used	DC
EOS-19	Digitizer	1		1	Sun Engineering	DP-5A 1724L etc			2			2	1				no longer used	CW
EOS-20	Plotter	1		1	GRAPHTEC etc	FD-5211 etc		1					1				3h/w	MP
EOS-22	Computer image projector	1		1	ATOM	Flat Screen Overhead		1			1		1				3h/w	CL
EOS-23	LAN analyzer	1		1	Nippon Board	NBC-001-A		1			1		1				3h/w	CL
EOS-24	GP-1B bus monitor	1		1	SEIYU TRADING	LA-1910		1			1		1				3h/w	CL
EOS-25	Logic analyzer	1		1	Iwatsu	SL-4121		1			1		1				3h/w	DC
EOS-26	Digital storage oscilloscope	1		1	Matsushita	VP-5741A		1			1		1				3h/w	CW
EOS-27	Oscilloscope	1		1	Kikusui	COS6150		1			1		1				3h/w	CW
EOS-28	Oscilloscope	6		6	Kikusui	COS5041TM		1			1		6				3h/w	CW
EOS-29	Curve tracer	1		1	Leader	LTC-905		1			1		1				3h/w	CW
EOS-30	Wide function synthesizer	1		1	NF	1930		1			1		1				3h/w	CW
EOS-31	Spectrum analyzer	1		1	Anritsu	MS2601A		1			1		1				3h/w	MP
EOS-32	Sweep/function generator	8		1	Leader	LFG-1300		1			1		1				3h/w	CW
EOS-33	Pulse generator	2		2	Leader	LFG-1310		1					2				3h/w	DC
EOS-34	IC logic tester	1		1	Ogawa Seiki	OSK6694		1			1		1				3h/w	CW
EOS-35	Digital multimeter (Logic probe type)	2		2	Hioki	3218		1					2				3h/w	CL
EOS-36	Digital multimeter	1		1	Keithley	196 SYSTEM DMM		1					1				3h/w	CL
EOS-39	Analog meters (6 sets)	6		1	Ogawa Seiki	OSK4857-03/05		1					1				3h/w	CW
EOS-40	Circuit testers (8 sets)	8		1	Ogawa Seiki	OSK6658/6638		1					1				3h/w	MP
EOS-41	Digital logic probes	10		10	Ogawa Seiki	OSK6697		1					10				3h/w	MP
EOS-42	components	1		1	ASTIC TOTAL SYSTEM			1					1				3h/w	MP
EOS-43	Protboards (52 sets)	52		52	SUNHAYATO	SRH/KS350		52					1				3h/w	MP
EOS-44	IC test clips (9 sets)	9		1	SUNHAYATO	STC		1					1				3h/w	MP
EOS-45	Power supplies (12 sets)	12		1	Leader	LPS-161A/162A/164A		1					1				3h/w	MP
EOS-46	Switching power supply	10		10	Ogawa Seiki	2KMC15-1			10				10				3h/w	CW
EOS-47	Logic trainer	4		4	DENGINE RR	DLT-3		1					4				3h/w	MP
EOS-48	Slow scan computer (3 sets)	3		1	DENGINE RR	DSC-11H/50H		1					1				3h/w	DC
EOS-49	A/D, D/A circuit trainer	1		1	Ogawa Seiki	OSK451		1			1		1				6h/w	MP
EOS-50	Logic circuit experiment system	1		1	Ogawa Seiki	OSK162G		1			1		1				6h/w	MP
EOS-51	z80 Microcomputer training box	2		1	DENGINE RR	DENCOM80z		1					1				6h/w	MP
EOS-52	z80 Interface box	2		2	DENGINE RR	DIF-80z		2					2				6h/w	MP
EOS-53	IC Logic circuit trainer	1		1	Ogawa Seiki	OSK164		1			1		1				6h/w	DC
EOS-54	Microcomputer applications trainer	1		1	Ogawa Seiki	OSK159A M50		1			1		1				6h/w	DC
EOS-56	Computer numerically experiment device	1		1	Ogawa Seiki	OSK3396			1				1				no longer used	DC

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Item No.	Description	Q'ty	Specifications	Number of remaining	Manufacturer name	Model No.	Present situation of remaining equipment						Reparation place			Problem for maintenance	Frequency in practical use	Name of safekeeping laboratory
							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
EOS-59	Desolder cleaner	1		1	CPC	SC-5000		1					1				3h/w	CW
EOS-60	GP-IB-RS232C converter & AC adapter (2 sets)	3		1	Net work supply	GPNET Model 20		1		2			1				3h/w	DC
EOS-61	Centronics bus extender & AC adapter (4 sets)	2		1	Net work supply	GPNET LIST-80		1		1			1				3h/w	DC
EOS-62	Rs-232C cable patching box	1		1	JAPADENT			1					1				3h/w	MP
EOS-63	GP-1B Cable with connectors (5 sets)	5		1	JAPADENT			1		4			1				3h/w	MP
EOS-64	Network cable and RS-232C cable (800m)	800m		1	Nihon DEC	L-BNE2A-ME etc		1					1				3h/w	MP
EOS-65	Transformers	5		5	Ogawa Seiki	OSK10256-06		5					5				3h/w	MP
EOS-66	Uninterruptible power supply	1		1	YAMABISHI	SFT-20S			1				1			no replacement during maintenance	permanently	DC
EOS-67	Air conditioning equipment (12 sets)	5		5	Daikin	W45MV1 etc		5					1				3h/w	DC
EC-1	Process simulation equipment	1		1	Tokyo Meter	PS-1800		1			1		1				once a month	PRC
EC-2	Continuous stirred tank reactor	1		1	Osaka Chemical	4--4299		1					1				3h/w	EGE
EC-4	Spectro Colorimeter	1		1	Tokyo Meter	DSNP-200F		1			1		1				2h/w	PRC
EC-5	Surface area measurement of solid/powder	1		1	ERMA	Photic-100		1					1				1h/w	INC
EC-6	Refrigerated High speed centrifuge	1		1	Sibata	F-700			1				1				2h/w	INC
EC-7	Equipment test bench to study analogy	1		1	Hitachi	SCR20B		1					1				2h/w	PRC
EC-8	Wiped film evaporator	1		1	Osaka Chemical	4--4302			1				1				2h/w	UO
EC-9	Universal Mixer for all liquid system,	1		1	Osaka Chemical	4--4303		1					1				5h/w	UO
EC-10	Filterability index apparatus	1		1	Tokyo Meter	TM		1					1				2h/w	UO
EC-11	Semi pilot scale solid liquid extraction unit	1		1	Tokyo Meter	FP-50200		1					1				1h/w	EGE
EC-12	Apparatus for determining heat loss	1		1	Osaka Chemical	4--4306		1					1				1h/w	UO
EC-13	Apparatus for determining heat loss	1		1	Osaka Chemical	4--4307			1			1	1				1h/w	INC
EC-14	Gas Chromatograph	1		1	Shimadzu	GC-9APTF			1				1				2h/w	INC
EC-15	Atomic Absorption Spectrophotometer	1		1	Hitachi	A-1800		1					1				2h/w	UO
EC-16	Continuous Crystallizing system,		4--4308		Osaka Chemical	4--4308												
ECP-1	Capilograph	1		1	Toyo Seiki	PMD-C			1			1		1			4h/w	PP
ECP-2	Conical Disk Rehometer	1		1	Toyo Seiki	100C			1				1				6h/w	PP
ECP-3	Labo Plastomill	1		1	Toyo Seiki	ME-25			1				1				5h/w	PP
ECP-5	Extruder+Cooling device+Haul-off mechanism	1		1	Moriyama	DI-5		1					1				10h/w	PP
ECP-6	Film Blowing System	1		1	Killion	KL-125		1					1				10h/w	PP
ECP-7	Injection Moulding Machine	1		1	Killion	Adjustable		1					1				4h/w	PP
ECP-8	Cast film Attachment (for the extruder)	1		1	Toshiba Machine	IS30EPN-i1A		1					1				4h/w	PP
ECP-9	Pelletizing Attachment (for the extruder)	1		1	Killion	Cast Film			1				1				3h/w	PP
ECP-10	Blow moulding machine	1		1	Killion	Pelletizer		1					1				7h/w	PP
ECP-11	Blow moulding machine	1		1	The Japan Steel	JB102/P40		1					1				4h/w	PP
EM-1	Scanning Electron Microscope	1		1	Joel	JSM-T220A				1			1			discon?	30h/w	MS
EM-2	Polarizing Microscope	1		1	Nikon	XTP-11, AFX-35		1					1				10h/w	
EM-3	Thermal Analysis Device for Polymers	1		1	Rigaku	TAS-100		1					1				15h/w	
EM-4	IR Spectrophotometer for polymer analyzer	1		1	Hitachi	270-30		1					1				10h/w	
EM-5	X-ray diffractometer	1		1	Rigaku	D/max-11C		1					1	1			2h/w	

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Item No.	Description	Q'ty	Specifications	Number of remaining	Manufacturer name	Model No.	Present situation of remaining equipment						Reparation place			Problem for maintenance	Frequency in practical use	Name of safekeeping laboratory
							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
EM-6	Universal Fatigue Testing Machine	1		1	Shimadzu	UF-15		1					1				5h/w	
ETC-2	Perapiration Tester	1		1	Daiei Kagaku	PS-V		1					1				30h/w	
ETC-3	Iron Tester	1		1	Daiei Kagaku	TA-1		1					1				10h/w	
ETC-4	High Temperature Steaming Tester	1		1	Daiei Kagaku	ST-1S		1					1			High speed card needs a web conveyer.	3h/w	
ETC-5	Pin-Tenter type Thermosoling & baking machine	1		1	Daiei Kagaku	PT-2		1					1				3h/w	
ETC-6	Auto Screen Printing Machine	1		1	Tsuji Dyeing	SP-300		1					1				3h/2	
ETC-7	1 Color Printing Machine	1		1	Tsuji Dyeing	RP-1		1					1				3h/w	
ETC-8	Calendering Machine	1		1	Tsuji Dyeing	CA-350		1					1			cannot run for a long time, probably due to motor heating	3h/w	
ETC-9	Laboratory Jet Dyeing Machine	1		1	TEXAM	Mini Jet P-300-11		1					1				4h/w	
ETC-10	Vertical Drive 8 Color Dyeing Tester	1		1	Daiei Kagaku	ADT-8M		1					1				6h/w	
ETC-12	Electronic Reading analytical balance	1		1	Chyo Balance	JL-180			1				1				daily	
ETC-14	Dry-Cleaning test instrument	1		1	Daiei Kagaku	DC-1		1					1				daily	
ETC-16	Flat bed press	1		1	Daiei Kagaku	FB-2		1					1				3h/w	
ETC-17	Knit Shrinkage Tester	1		1	Daaiei kagaku			1					1				-	
ETC-18	Flammability Speed Tester	1		1	Daiei Kagaku	SFT-30D		1					1				3h/w	
ETC-20	Spray Tester (Water repellency)	1		1	Daiei Kagaku			1					1				6h/w	
ETC-22	Double Beam Colour Difference Meter	1		1	Tokyo Denshoku	TC-1500X				1						discontinuity of product		
ETC-30	Tensile & Shear Tester	1		1	Kato Tech	KES-FB1		1					1				daily	
ETC-33	Mullen Bursting Strength Tester	1		1	Daiei Kagaku	ML-45		1					1			leakage	10h/w	
ETL-2	Industrial Sewing m/c w/needle feeding device	1		1	Tokyo Juki	DLN-415-5-4B/MC-210			1				1			Microp rocessing unit is out of order	20h/w	
ETL-3	Industrial Sewing m/c with bottom & variable	1		1	Tokyo Juki	DLU-5490-6-WB/SC-328		1					1				20h/w	Clothing Lab
ETL-4	Overlock Sewing m/c 2 needles,5 threads	1		1	Tokyo Juki	MO2516E-DD4-30DF/T016		1					1				20h/w	Clothing Lab
ETL-5	Hemming m/c for blindstich	1		1	Tokyo Juki	CB-641		1					1				3h/w	Clothing Lab
ETL-6	Buttom m/c with button feeder	1		1	Tokyo Juki	MB-373/Z045/BR-1		1					1				6h/w	Clothing Lab
ETL-7	Chain Stich m/c single needle,chain stich	1		1	Brother	DT2 B962		1					1				3h/w	Clothing Lab
ETL-8	Cloth Cutting Table hanging-turning type	1		1	N.C.A.			1					1				10h/w	Clothing Lab
ETL-9	Cloth Cutting Device with straight knife	2		2	N.C.A.	SW-3,KA-3,FUJI-A,EBKD		2					2				3h/w	Clothing Lab
ETL-10	Iron Table with vaccum	1		1	Naomoto	FB-700S		1					1				20h/w	Clothing Lab
ETL-11	Steam Iron 4 lbs,electrical	1		1	Naomoto	HYS-6		1					1				20h/w	Clothing Lab

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							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
ETL-12	Implements (set of pneumatic training equip.)	1		1	Ogawa Seiki	OSK14020			1				1			lack of spare parts	3h/w	Clothing Lab
ETL-13	Power punch (5 lbs. 7-1/2" height)	1		1	K.M.	KD-160		1					1				3h/w	Clothing Lab
ETL-14	Industrial Sewing m/c w/thread cutting device	1		1	Tokyo Juki	LBH-780		1					1				20h/w	Clothing Lab
ETL-15	Industrail Sewing m/c for polo shirts	1		1	Brother	DB2 B777		1					1				3h/w	Clothing Lab
ETL-16	Truck Sewing m/c with single needle	1		1	Tokyo Juki	LZ-391N		1					1				20h/w	Clothing Lab
ETL-17	Flat 3 Needle m/c for decoration sewing	1		1	Tokyo Juki	MF/870		1					1				6h/w	Clothing Lab
ETL-18	Cylinder 2 Needles m/c for decoration sewing	1		1	Yamato	VC-2600-148/UT4/ST		1					1				3h/w	Clothing Lab
ETL-19	Pattern-Fixing Pin Table	1		1	N.C.A.			1					1				3h/w	Clothing Lab
ETL-21	Bar Tucking Sewing m/c	1		1	Tokyo Juki	LK-1850		1					1				3h/w	Clothing Lab
ETL-23	Zig/Zag Lock Stich	1		1	Tokyo Juki	LZ-1286/RF-1		1					1				3h/w	Clothing Lab
ETL-25	Industrial Sewing m/c w/auto thread cutting	1		1	Tokyo Juki	DDL-5550-6-WB/SC-328			1				1			Micro processing is out of order	20h/w	Clothing Lab
ETL-26	Industrial Sewing m/c single needle	1		1	Tokyo Juki	DLD-436-5-4B/MC-210			1				1			Micro processing is out of order	20h/w	Clothing Lab
ETL-27	High speed 1-needle,lockstitch m/c	1		1	Tokyo Juki	DLM-522S		1					1			Micro processing is out of order	20h/w	Clothing Lab
ETL-28	Zig-Zag Lock Stich Sewing m/c	1		1	Brother	LZ2 B853		1					1				20h/w	Clothing Lab
ETL-29	Overlock Stich Sewing m/c single needles	1		1	Tokyo Juki	MO-2504E-004-30DF		1					1				20h/w	Clothing Lab
ETL-30	Hemming m/c	1		1	Brother	CM2 B931		1					1				6h/w	Clothing Lab
ETL-31	Bar Tucking m/c 15-20mm length	1		1	Brother	LK3 B430		1					1				6h/w	Clothing Lab
ETL-32	Sewing m/c with compound feed motion	1		1	Tokyo Juki	LH-1162SF		1					1				60h/w	Clothing Lab
ETL-33	Standard Body Snap	1		1	N.C.A.			1					1				daily	Clothing Lab
ETL-34	Flat Seamer m/c,3/needle	1		1	Morimoto	S-6803PDH		1					1				10h/w	Clothing Lab
ETL-35	Wrappers,workroom stand	1		1	N.C.A.			1					1				weekly	Clothing Lab
ETL-36	Implements	1		1	N.C.A.			1					1				weekly	Clothing Lab
ETL-37	High speed,flat bed,2-needle	1		1	Tokyo Juki	MH-380		1					1				10h/w	Clothing Lab
ETL-39	Programming Sewing m/c w/edge sensor	1		1	Tokyo Juki	IDL-555E-5-4B/AK-2		1					1			Micro processing is out of order	20h/w	Clothing Lab
ETL-40	Multiple needles	1		1	Morimoto	DFB-1404PSF		1					1				10h/w	Clothing Lab
ETL-41	Needles Positioner	1		1	Tokyo Juki	DDL-5550-6-WB/SC-20		1					1				10h/w	Clothing Lab
ETL-44	Profile Stitching Unit & Jig cutting m/c	1		1	Nakao	KPT-2 & NO-330		1					1				2h/w	Clothing Lab
ETL-47	Sewing Thread Consumption calculator	1		1	Shiley	MKIII		1					1				1h/w	Clothing Lab
ETL-48	Fabric Examination Table	1		1	N.C.A.			1					1				20h/w	Clothing Lab
ETL-49	Pressing equipment	1		1	Tokyo Juki	JSF-900		1					1				weekly	Clothing Lab
ETS-4	High Speed Card	1		1	Toyoda/Meikin	TM-8S		1					1				15h/w	
ETS-5	Drawing Frame for cotton	1		1	Hara Shokki	DX-500		1					1				15h/w	Spinning Labo
ETS-8	Fly Frame	1		1	F.M.Engineering	Mini-Simplex			1				1			Motor is in out of order	15h/w	SL

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							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
ETS-9	Ring Spinning Frame	1		1	F.M.Engineering	Spinntester		1					1				15h/w	SL
ETS-10	Auto Cone Winder with compressor	1		1	Murata	7R-II Machmini 5Dmm		1					1				15h/w	SL
ETS-11	Double Winder	1		1	Murata	No.23		1					1				15h/w	SL
ETS-12	Two forone Twister	1		1	Murata	No.363		1					1				15h/w	SL
ETS-14	Automatic Cone Winder (Mach Mini)	1		1	Murata	No.6R Mach Mini		1					1				15h/w	SL
ETN-1	Semi Automatic flat knitting machine	1		1	Shima seiki	SFE-161T		1			1		1			out of spare parts	12h/w	Knitting Labo
ETN-3	Single Bed Hand Flat Knitting machine	1		1	Silver seiko	F-270		1					1				daily	KL
ETN-4	Double Bed Hand Flat Knitting machine	1		1	Silver seiko	FRP-70		1			1		1			Needles are not enough	3h/w	KL
ETN-5	Circular Weft Knitting Machine (Interlock)	1		1	Fukuhara	LDR-L		1					1			out of spare parts	6h/w	KL
ETW-1	Auto Pirmwinder	1		1	Muschamp	SS-100		1					1			lack of spare parts	2h/w	
ETW-5	Drawing in m/c	1		1	Todo	BES-V/65 etc		1					1			lack of spare parts	3h/w	Weaving Laboratory
ETW-6	Rapier Loom	1		1	Tsudakoma	R200		1					1			lack of spare parts	8h/w	WL
ETW-7	Dobby-20 shafts,for Rapier Loom & Puknching	1		1	Yamada	EDP-3HM20/16,P M		1					1			lack of spare parts	rarely	WL
ETW-8	Air Jet Loom	1		1	Tsudakoma	ZA-203		1							1	impossible to repair	10h/w	WL
ETW-19	Air Compressor	1		1	Sanko	NSVS-10C		1					1			lack of spare parts	12h/w	WL
ETW-20	Water Jet Loom	1		1	Tsudakoma	ZW-302		1					1			lack of spare parts	8h/w	WL
ETW-21	Sizing machine	1		1	Kakinoki	KHS & MX		1					1			lack of spare parts	5h/w	WL
ETW-22	Warping machine	1		1	Kakinoki	HMS/HB-D		1					1			lack of spare parts	10h/w	WL
CL-1	1)Book Stock Shelving (2 kinds)	5		5	Local Made			5					5				permanently	Library
CL-1	2)Book Stock Shelving (2 kinds)	5		5	Local Made			5					5				permanently	Library
CL-2	Compact Mobile Shelving System	1		1	Kokuyo	MF-K362,MF-M362		1					1				permanently	Library
CL-3	Work Room Shelveing,single type (33)	1		1	Local Made			1					1				permanently	Library
CL-5	Storage Cabinets for Vertical Filing of maps	5		5	Local Made			5					5				permanently	Library
CL-6	Atlas Stands	1		1	Local Made			1					1				permanently	Library
CL-7	Dictionary Stands	5		5	Local Made			5					5				permanently	Library
CL-8	Storage Systems for Microfilm & A-V materials	5		5	Kokuyo	EY-46		5					5				permanently	Library
CL-9	Open Study Carels for 200 readers Type I	40		40	Local Made			40					40				permanently	Library
CL-9	Closed type Study Carels for 200 readers Type I	40		40	Local Made			40					40				permanently	Library
CL-10	Charging Desks	1		1	Local Made			1					1				permanently	Library
CL-11	Book Trucks	20		20	Maruzen	#5009,No.30 2-B		20					20				permanently	Library
CL-12	Card Catalogue Cabinets	2		2	Local Made			2					2				permanently	Library
CL-13	Equipment for Mounting displays of books	1		1	Nihon Filing	BDO-16L/26L		1					1				permanently	Library

## Annex -6-7) Current situation of the supplied equipment under Grant Aid of the year 1987

Item No.	Description	Q'ty	Specifications	Number of remaining	Manufacturer name	Model No.	Present situation of remaining equipment						Reparation place			Frequency in practical use	Name of safekeeping laboratory	
							Function of hardware				Practicality of software		Workshop in University	Repairation at factory, maker agent	factory abroad			Problem for maintenance
							Good	Usable	Repairable, if S/P provided	Irreparable	Usable	No practical use						
CL-14	Microfilm Reader	1		1	Tokyo Minolta	RP-507		1					1				permanently	Library
CL-15	Microfilm Processor	1		1	Tokyo Minolta	Auto 16		1					1				permanently	Library
CL-16	Equipment for a Library binderys	1		1	Nakabayashi	NB-8001		1					1				permanently	Library
CP-3	Sculling Exercise Machine	1		1	Senoh	BF-0112		1					1				5 days/w	Warehouse
CP-8	1)Marine training boat,4 persons + 1 cox	1		1	Senoh			1					1				2 days/w	Warehouse
CP-8	3)Marine training boat,1 persons + 1 cox	1		1	Senoh			1					1				2 days/w	Warehouse
CP-8	4)Additional accessories for rowing boat	1		1	Senoh			1					1				2 days/w	Warehouse

## **APPENDICES**

### **Annex 6-8)**

**Current situation of the existing equipment  
in the laboratories attached to the Department of  
Electronics & Telecommunication Engineering**

Location	Procurement		Item No.	Description	Initial	Remaining	Manufacturer (Serial NO.)	Model No.	Hardware				Software		Repair			Problem in maintenance	Frequency in use
	Supplier	Year							Good	Usable	Repairable	Irreparable or Parts needed	Usable	No practical use	Workshop in University	Repair at local agent	factory abroad		
Office	Metropolitan Agencies Ltd (MeA)	85	1	Electronics Typewriter	1	1	A51216232	AP350		1					1				daily
Office	MeA	86	2	Photocopier	1	1	411972KH	NP155				1		1	1			impossible	daily
Office	MeA	90	3	Cabinet	1	1				1					1				daily
Office	UOM	91	4	Metalic side cupboard	1	1				1					1				daily
Office	University of Moratuwa (UOM)	93	5	Telephone	1	1	1003397	FC7		1					1				daily
Office	CS	93	6	Computer	1	1	Colombia			1			1		1				daily
Office	CS	93	7	Printer	1	1	EPSON	LX800		1			1		1				daily
Office	UOM	93	8	Tables	4	4				4					4				daily
Office	UOM	93	9	Chair	3	3				3					3				daily
Office	UOM	93	10	Paper cutter	1	1				1					1				daily
Office	UOM	93	11	Cupboard - glass	1	1				1					1				daily
Office	UOM	93	12	Filing cabinet	2	2				2					2				daily
Office	EE	97	13	Desktop photocopier	1	1	Toshiba	1536		1					1				daily
Office	EE	97	14	Desktop photocopier	1	1	Toshiba	2050		1					1				daily
Office	UOM	97	15	Stapler machine	1	1	Lion	U-35		1					1				
Office	UOM	00	16	Inkjet Printer	1	1	Epson	BWSV		1					1				
Office	UOM	00	17	Laser Printer	1	1	HP	1100		1					1				
Office	UOM	00	18	Fax machine	1	1	Canon			1					1				
Office	UOM	00	19	Overhead Projector	1	1		ELMO		1					1				
Office	UOM	00	20	Photocopy machine	1	1	Canon	NP-1215		1					1				
Office	UOM	00	21	Puncher	5	5				5					5				
Multimedia room	UOM	99	69	Printer	1	1	Lex Mark	973191274		1					1				
Multimedia room	UOM	99	70	Laser jet printer	1	1	HP	1100		1					1				
CAD Lab	JICA	89	EET-75 (N.R.I)	CNC vertical machining center	1	1	TAKISANA	MACDV2E	1	1					1				In use/ Case based
Computer Systems Lab (CS)	JICA	89	EET-3	Model computer training kit with display panel	1	1	Ogawa Seiki	OSK4378		1					1				Weekly
CS	JICA	89	EET-3	Model computer training kit with display panel	1	1	Ogawa Seiki	OSK4378		1					1				Weekly
CS	JICA	89	EET-49	Robotics teaching experimenting kit	1	1	FUJI+	XR-3		1					1				moderate
CS	JICA	89	EET-49	Robotics teaching experimenting kit	1	1	FUJI+	XR-3		1					1				moderate
CS	JICA	89	EET-38	Uninterruptible power supply	1	1	Yamabisi	SFT3KE		1					1				Continuous
CS	UOM	87	1	PA Processor A	1	1		631-862		1					1				
CS	UOM	87	2	PB Processor B	5	5		631-878		5					5				
CS	UOM	87	3	Watchdog + Controller	1	1		633149		1					1				
CS	UOM	87	4	EP Programmer	1	1	EPROM	631-913		1					1				
CS	UOM	87	5	FEC Floppy disk controller	1	1		633-111		1					1				
CS	UOM	87	6	C-RAM Clock battery	2	2		631-929		2					2				
CS	UOM	87	7	Sercom card	2	2		Sercom-4		2					2				
CS	UOM	87	8	D I/O Card	2	2		631-935		2					2				
CS	UOM	87	9	AI 16 card	1	1		631-941		1					1				
CS	UOM	87	10	SCBI card	5	5		631-957		5					5				
CS	RS Components Ltd	87	11	Drawers storage	8	8		PKOF6		8					8				
CS	RS Components Ltd	87	12	Drawers modular	4	4		4D1		4					4				
CS	RS Components Ltd	87	13	Drawers modular	4	4		8D1		4					4				
CS	RS Components Ltd	87	14	Drawers modular	4	4		8D2		4					4				
CS	UOM	87	15	Drawing board rotating	1	1				1					1				
CS	UOM	87	16	Drawing template	1	1				1					1				
CS	RS Components Ltd	87	17	Exesiser disk drive	1	1				1					1				
CS	RS Components Ltd	87	18	Eraser	1	1	EPROM	424-254		1					1				
CS	RS Components Ltd	90	19	Exposure unit UV	1	1				1					1				
CS	UOM	94	20	Generator pulse	1	1	HP	8005B		1					1				
CS	RS Components Ltd	90	21	Holder PCB	1	1				1					1				
CS	UOM	87	22	Logiana scope	1	1	Toshiba	LA0802		1					1				
CS	UOM	87	23	Measuring tape	1	1				1					1				
CS	RS Components Ltd	87	24	Modem	2	2		V21		2					2				
CS	UOM	87	25	Printer	1	1	EPSON	FX-800		1					1				



Location	Procurement		Item No.	Description	Initial	Remaining	Manufacturer (Serial NO.)	Model No.	Hardware				Software		Repair			Problem in maintenance	Frequency in use
	Supplier	Year							Good	Usable	Repairable	Irreparable or Parts needed	Usable	No practical use	Workshop in University	Repair at local agent	factory abroad		
CS	UOM	87	26	Printer	1	1	EPSON	LX-80		1					1				
CS	UOM	87	27	Printer	1	1	EPSON	LX-86		1					1				
CS	RS Components Ltd	87	28	PSU SM Eurocard RS	1	1		591-764		1					1				
CS	RS Components Ltd	87	29	Power supply	5	5		Bell H		5					5				
CS	RS Components Ltd	87	30	PSU SM Multi O/P	1	1		85W		1					1				
CS	UOM	87	31	PEN SET Rotring	1	1				1					1				
CS	Computer Link Data systems Ltd	88	32	Printer	1	1	EPSON	CG2500+		1					1				
CS	UOM	91	33	Probes digital logic	5	5				5					5				
CS	UOM	93	34	Printer	1	1		Laserjet4		1					1				
CS	RS Components Ltd	95	35	Programmer	1	1		Stratos 2		1					1				
CS	UOM	95	36	Printer	1	1	EPSON	Stylus1000		1					1				
CS	UOM	96	37	Printer	1	1	Canon	Bubblejet		1					1				
CS	UOM	96	38	Power supply	1	1	DELTEC	PRA4002		1					1				
CS	UOM	98	39	Power supply	1	1	DELTEC	PRA22002		1					1				
CS	UOM	87	40	Regulator Line voltage	1	1		LVC250		1					1				
CS	RS Components Ltd	90	41	Rack PCB	2	2				2					2				
CS	RS Components Ltd	87	42	Storage drawer system	1	1		555-184		1					1				
CS	RS Components Ltd	87	43	Storage rack	1	1				1					1				
CS	UOM	87	44	Setsquares rotting	1	1				1					1				
CS	RS Components Ltd	87	45	Scanner	1	1	IBM	256		1					1				
CS	RS Components Ltd	87	46	Terminal Video display	9	6		RS VDT 101		6		3			6				
CS	RS Components Ltd	90	47	Terminal Video display	1	1		RS VDT 102		1					1				
CS	RS Components Ltd	90	48	Tank ueated process	3	3				3					3				
CS	RS Components Ltd	90	49	Tank bubble etch	1	1				1					1				
CS	RS Components Ltd	90	50	Tank spray blash	3	3				3					3				
CS	RS Components Ltd	90	51	Trays PCB	2	2				2					2				
CS	UOM	91	52	Trainer digital systems	2	2	Ogawa			2					2				
CS	UOM	97	53	Computer	12	10	IBM	Pentium350		10		2			10				
CS	RS Components Ltd	87	54	Card	5	5		SCT-1		5					5				
CS	RS Components Ltd	87	55	Card	1	1	STE	Backplane-10		1					1				
CS	RS Components Ltd	87	56	Card	5	5	STE	Backplane-5		5					5				
CS	RS Components Ltd	87	57	Cleaner vaccum	1	1		1700		1					1				
CS	National Instrument	90	58	Card	1	1	National Instrument	GPIO PCII		1					1				
CS	UOM	91	59	Card Plat Hard Disk Controller	1	1				1					1				
CS	Universal Trading Co., Ltd.	91	60	Computer	1	1	IPC	386/20Mhz		1					1				
CS	UOM	93	61	Computer	1	1		Kay Pro 386		1					1				
CS	UOM	94	62	Computer	3	3		DataLink 386SX		3					3				
CS	UOM	95	63	Computer Gestetner	3	3		486Dx2		3					3				
CS	UOM	95	64	Computer	1	1	ACER	ALTOS		1					1				

Location	Procurement		Item No.	Description	Initial	Remaining	Manufacturer (Serial NO.)	Model No.	Hardware				Software		Repair			Problem in maintenance	Frequency in use
	Supplier	Year							Good	Usable	Repairable	Irreparable or Parts needed	Usable	No practical use	Workshop in University	Repair at local agent	factory abroad		
CS	UOM	96	65	Computer	4	2	Ominipro	Pentium350		2		2			2				
Digital, Analog Electronics Lab (ENE)	JICA	89	EET-5	Digital multimeters	15	15	HIOKI	3200				15						15	
ENE	JICA	89	EET-6	Variable DC power supply	8	5	LEADER	LDS-151				8						8	Daily
ENE	JICA	89	EET-8	Function generator	2	2	LEADER	LFG-1310		2					2				Weekly
ENE	JICA	89	EET-9	Wideband oscillators	8	6	OGAWA	OSK6804		6		2		2	6				Daily
ENE	JICA	89	EET-12	Transistor circuit trainer	1	1	OGAWA	OSK190				1			1				
ENE	JICA	89	EET-14	A/D, D/A converter circuit trainer	1	1	OGAWA	OSK299A OSK299B			1				1				Not in use
ENE	JICA	89	EET-16	Power supply circuit trainer	1	1	OGAWA	OSK264		1					1				Moderately used
ENE	JICA	89	EET-19	Digital system trainer	1	1	OGAWA	OSK159A				1			1				Not in use
ENE	JICA	89	EET-34	Dual trace oscilloscope	4	4	KIKUSUI	CD5040		3		1			4				daily
ENE	JICA	89	EET-57	Dual trace oscilloscopes	3	3	KIKUSUI	CD5040		3					3				Daily
ENE	JICA	89	EET-59	Digital multimeters	1	1	HIOKI	3200				1			1				Not used
ENE	JICA	89	EET-60	RF/AF generators	1	1	KENWOOD	AG203		1		1			1				Daily
ENE	JICA	89	EET-71 (N.R.I)	Hand held polaroid oscilloscope Camera (Inclusive of polaroid auto film)	1	1	ASANWA	M085				1			1				not in use
ENE	UOM	85	1	Oscilloscope	3	3	Leader	LBO522		3					3				
ENE	UOM	86	2	Oscilloscope	1	1	Leader	LBO522		1					1				
ENE	UOM	96	3	Oscilloscope	1	1	Leader	1447680			1				1				
ENE	UOM	97	4	Oscilloscope	3	3	Leader	LS1020		3					3				
ENE	UOM	87	5	Amplifier	1	1	Variac			1					1				
ENE	UOM	76	6	Stop clock	1	1	Griffon	S38117		1					1				
ENE	UNDP	68	7	Rheostat 5A	2	2		5A-24.7ohm		2					2				
ENE	UNDP	68	8	Resistance sliding	3	3		5/50/820/0.3		3					3				
ENE	UNDP	68	9	Resistance sliding	2	2		50/3260		2					2				
ENE	UNDP	68	10	Resistance sliding	2	2		50/95/3.3		2					2				
ENE	UNDP	68	11	Rheostat 10A	3	2		6.02ohm		2		1			2				
ENE	UOM	88	12	Rheostat	2	2		10ohm		2					2				
ENE	UOM	98	13	Power supply dual DC	3	3	Protek	3015B		3					3				
ENE	UOM	00	14	Power supply	2	2	Protek	3015B		2					2				
ENE	UOM	00	15	Puncher	1	1		DP600		1					1				
ENE	UOM	00	16	DC Power supply (Dual)	2	2		DPS1303DF		2					2				
ENE	UOM	71	17	Power supply	2	2		L30-1		2					2				
ENE	UOM	86	18	Power supply DC regulated	4	4	Leader	161A		4					4				
ENE	UOM	86	19	Power supply	1	1	Leader	LPS151-212040		1					1				
ENE	UOM	86	20	Power supply	3	2	Leader	LPS163A		2		1			2				
ENE	UOM	92	21	Multimeter analogue	5	5	Sanwa	SP-150		5					5				
ENE	UOM	93	22	Multimeter	1	1	Sanwa	67-926		1					1				
ENE	UOM	00	23	Multimeter digital	2	2	Ryorisu	1008		2					2				
ENE	UOM	00	24	Multimeter analogue	15	15	Sanwa	SP-180		15					15				
ENE	UOM	99	25	Monitor + Keyboard	3	3		AMPGX210 , TA23723		3					3				
ENE	UOM	86	26	Audio Generator	1	1		LAG-27		1					1				
ENE	UOM	97	27	Audio generator	3	3		AG2601		3					3				
ENE	UOM	00	28	Audio generator	3	3		AG2601		3					3				
ENE	UOM	00	29	Fax machine	1	1	Canon			1					1				
ENE	UOM	98	30	Function Generator	4	4		TG-210		4					4				
ENE	UOM	01	31	Eraser	1	1	Eprom	424-254		1					1				
ENE	UOM	85	32	Curue Tracer	1	1	Leader	LPC-905		1					1				
ENE	UNDP	88	33	Crimping vaco tool	1	1				1					1				
ENE	UOM	01	34	Computer	3	3	IBM	Pentium350		3					3				
Telecommunication Lab (ENT)	JICA	89	EET-1	Auto transformer	3	3	OGAWA	OSK10234		3					3				Weekly
ENT	JICA	89	EET-13	Pulse and switching circuit trainer	1	1	OGAWA	OSK293A				1			1				Not in use
ENT	JICA	89	EET-18	Filter circuit trainer	1	1	OGAWA	OSK455				1			1				Not in use
ENT	JICA	89	EET-22	White noise generator	1	1	OGAWA	OSK6816		1					1				Daily
ENT	JICA	89	EET-26	Modulation/demodulation circuit trainer	1	1	OGAWA	OSK453A/B				1			1				Not in use
ENT	JICA	89	EET-27	Sweep oscillators	1	1	KIKUSUI	KSG4500		1					1				daily
ENT	JICA	89	EET-32	Pulse generator	2	2	ANRITSU	MG418A				2			2				Not in use
ENT	JICA	89	EET-37	Color TV trainer	1	1	OGAWA	OSK695		1					1				Frequently
ENT	JICA	89	EET-40	Acoustic circuit trainer	1	1	OGAWA	OSK-696				1			1				Not in use
ENT	JICA	89	EET-41	Dual trace oscilloscope	1	1	KIKUSUI	CD5040		1					1				In use
ENT	JICA	89	EET-62	AM/FM standard signal generators	2	1	OGAWA	OSK6812		1		1			1				daily
ENT	JICA	89	EET-68	Auto transformer	1	1	OGAWA	OSK10234		1					1				moderate
ENT	UNDP	77	1	Frequency Counter	1	1		5383A		1					1				
ENT	UNDP	81	2	Field Level Meter	1	1		LFG944C		1					1				

Location	Procurement		Item No.	Description	Initial	Remaining	Manufacturer (Serial NO.)	Model No.	Hardware				Software		Repair			Problem in maintenance	Frequency in use
	Supplier	Year							Good	Usable	Repairable	Irreparable or Parts needed	Usable	No practical use	Workshop in University	Repair at local agent	Repair at factory abroad		
ENT	UNDP	81	3	Generator Swemar	2	2		LSW-250		2					2				
ENT	UOM	81	4	Isolating Transformer	2	2				2					2				
ENT	UNDP	77	5	Logic Troubleshooting kit	1	1	HP	50IST		1					1				
ENT	UNDP	79	6	Color Video cassette recorder	1	1	SONY	VO-2630				1			1				
ENT	UNDP	79	7	B/W Videocorder	1	1	SONY	AV3670		1					1				
ENT	UNDP	79	8	Color Video Camera	1	1	SONY	DXC16108		1					1				
ENT	UNDP	81	9	Splitters	1	1		22EA		1					1				
ENT	UNDP	81	10	Splitters	1	1	YAGI	WJ-174		1					1				
ENT	UNDP	81	11	Splitters	4	4	YAGI	WF-0671		4					4				
ENT	UOM	81	12	TV Receiver	2	2	Philips	12B711		2					2				
ENT	UOM	81	13	TV Receiver	3	3	Philips	14Tx1000		3					3				
ENT	UNDP	79	14	Universal Bridge	1	1	HP	4260A		1					1				
ENT	UOM	97	15	Volt meters	2	2	YEW	D7917		2					2				
ENT	UOM	97	16	Varial	1	1	(230-240V)			1					1				
ENT	UNDP	79	17	Wave Analyser	1	1	HP	3581A		1					1				
ENT	UOM	85	18	Monitor + Keyboard	1	1		ZM-108		1					1				
ENT	UOM	85	19	Extender board	1	1		EXL-2W		1					1				
ENT	UOM	85	20	Digital interface tuart	1	1		TRTW		1					1				
ENT	UOM	85	21	Digital analogue interface	1	1		D		1					1				
ENT	UOM	85	22	Computer system	1	1	Cromemeco	Z-1		1					1				
ENT	UOM	85	23	CRT Terminal	1	1		CB-308		1					1				
ENT	UOP	85	24	Vectorscope	1	1	Leader	LVS-585		1					1				
ENT	UOP	85	25	Voltmeter AC	1	1	YEW	2013		1					1				
ENT	UOM	99	26	Video screen with stand	1	1		52088		1					1				
ENT	UOM	98	27	Universal counters	4	4		100773		4					4				
ENT	UOM	90	28	Tester Digital	1	1		256690		1					1				
ENT	UOM	86	29	Antenna unit module	1	1		295E		1					1				
ENT	UOM	86	30	Diode Bridge	1	1		295G		1					1				
ENT	UOM	86	31	Telecommunications kit advanced module	1	1		296A		1					1				
ENT	UOM	86	32	Telecommunications kit advanced module	1	1		296B		1					1				
ENT	UOM	86	33	Telecommunications kit advanced module	1	1		296C		1					1				
ENT	UOM	86	34	Telecommunications kit advanced module	1	1		296D		1					1				
ENT	UOM	86	35	Telecommunications kit advanced module	1	1		296E		1					1				
ENT	UOM	86	36	Telecommunications kit advanced module	1	1		296F		1					1				
ENT	UOM	86	37	Telecommunications kit advanced module	1	1		296G		1					1				
ENT	UOM	86	38	Audio unit	2	2				2					2				
ENT	UOM	86	39	Transducer isolating	1	1				1					1				
ENT	UOM	86	40	Telecommunications kit advanced module	1	1		295A		1					1				
ENT	UOM	86	41	Telecommunications kit advanced module	1	1		295B		1					1				
ENT	UOM	86	42	Telecommunications kit advanced module	1	1		295C		1					1				
ENT	UOM	86	43	Telecommunications kit advanced module	1	1		295D		1					1				
ENT	UOM	86	44	Telecommunications kit advanced module	1	1		295E		1					1				
ENT	UOM	86	45	Telecommunications kit advanced module	1	1		295F		1					1				
ENT	UOM	86	46	Telecommunications kit advanced module	1	1		295G		1					1				
ENT	UOM	86	47	Telecommunications kit advanced module	2	2		295H		2					2				
ENT	UOM	86	48	Telecommunications kit advanced module	1	1		295J		1					1				
ENT	UOM	92	49	Stapler	1	1				1					1				
ENT	UOM	95	50	Sweeper main frame	1	1		Z67oc-1626A		1					1				
ENT	NTT	99	51	Syncroscope with probe	1	1		137KG		1					1				

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ENT	UOM	99	52	Stimulate system	1	1		HFS9003		1					1				
ENT	UOM	91	53	Receiver TV colour	4	4	Philips	SV009039, etc		4					4				
ENT	UOM	92	54	Receiver TV	2	2	B/W Elite	11747 etc		2					2				
ENT	UOM	98	55	Receiver TV	3	3	National	20"		3					3				
ENT	UOM	98	56	Recorder video cassette	1	1	Singer	SVG200		1					1				
ENT	UOM	84	57	Rheostats	1	1		3260ohm		1					1				
ENT	UOM	84	58	Rheostats	1	1		675ohm		1					1				
ENT	UOM	84	59	Rheostats	1	1		95ohm		1					1				
ENT	UOM	84	60	Rheostats	2	2		24.9ohm		2					2				
ENT	UOM	84	61	Rheostats	1	1		11.25ohm		1					1				
ENT	UOM	95	96	Gestetret Colour monitor	1	1		50304083		1					1				
ENT	UOM	95	97	Gestetret computer	1	1		521010		1					1				
ENT	UOM	95	98	Power supply 30V 3A	4	4	Protek	9004540		4					4				
ENT	UOM	95	99	Power supply DC Tracking	3	3		LPS-151		3					3				
ENT	NTT	99	100	Programmable Digital filter	1	1		8702254018		1					1				
ENT	UOM	83	101	Power supply	1	1	Philips	B2 3304		1					1				
ENT	UOM	83	102	Printer	1	1	Epson	LX80		1					1				
ENT	UOM	95	55	Oscilloscope	2	2	Kikusui	40102781		2					2				
ENT	UOM	96	56	Oscilloscope	3	3	Leader	1447681		3					3				
ENT	UOM	97	57	Oscilloscope	3	3	Leader	1020		3					3				
ENT	UOM	94	58	Oscilloscope	1	1		3502		1					1				
ENT	UOM	94	59	Oscilloscope	1	1		L-202		1					1				
ENT	NTT	99	60	Measuring receiver	1	1		M2 524B		1					1				
ENT	UOM	92	61	Multitester	3	3	Sanwa	SP-15D		3					3				
ENT	UOM	91	62	Loudspeaker box	2	2		94829702		2					2				
ENT	NTT	98	63	Liquid crystal protector	1	1	Sharpp	XV-E306		1					1				
ENT	UOM	97	64	Signal generator	2	2		4160B		2					2				
ENT	UOM	97	65	Generator Audio	3	3		2601A		3					3				
ENT	NTT	99	66	Digital test signal generator	1	1		TG56B1		1					1				
ENT	NTT	99	67	Pulse generator	1	1				1					1				
ENT	UOM	00	68	Pulse generator	1	1	Antitsu			1					1				
ENT	UOM	00	69	Pulse generator	1	1	HP	8005B		1					1				
ENT	UOM	94	70	Pattern generator	2	2	Leader	LCG-412C		2					2				
ENT	UOM	94	71	Audio generator	1	1		LSG-16		1					1				
ENT	UOM	95	72	Audio generator	2	2		LAG27		2					2				
ENT	UOM	95	73	Audio generator	3	3	Loadstar	802483		3					3				
ENT	UOM	97	74	Signal generator	6	6	Loadstar	85099832 etc		6					6				
ENT	UOM	83	75	Pulse generator	1	1		LO1096		1					1				
ENT	UOM	86	76	Generator RF	1	1	Feedback	ASD512		1					1				
ENT	UOP	85	77	Experimental AM modulation/demodltn	1	1	Yamato	EE-80		1					1				
ENT	UOP	85	78	Experimental AM modulation/demodltn	1	1	Yamato	EE-81		1					1				
ENT	UOP	85	79	Experimental AM modulation/demodltn	1	1	Yamato	EE-92		1					1				
ENT	UOP	85	80	Pulse modulator	1	1	Yamato	EE-83		1					1				
ENT	NTT lab	99	81	Error counter	2	2		LN11AGPI B		2					2				
ENT	NTT lab	99	82	Digital AV Mixer	1	1		WJ-MIX50		1					1				
ENT	NTT lab	99	83	Digital signal decoder	1	1		M19438002		1					1				
ENT	UOM	87	84	Cabinet storage	2	2				2					2				

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ENT	UOM	95	85	Frequency meter	1	1	Feedback	DFM662		1					1				
ENT	UOM	93	86	Computer	1	1	Kaypro	21136826		1					1				
ENT	UOM	94	87	Digital counter	1	1		LDC-824		1					1				
ENT	UOM	95	88	Digital counter	1	1		LDC-824		1					1				
ENT	UOM	01	89	Computer	5	5	IBM	350		5					5				
ENT	UOP	85	90	Bridge impedance	1	1	Delica	3496-12K		1					1				
ENT	UOM	91	91	Baffle	2	2		OSK696		2					2				
ENT	UNDP	83	92	AM Meter Micro ampairs	1	1		S-2913		1					1				
ENT	UOP	86	93	AM Meter AC	1	1	YEW	2013-2310-m		1					1				
ENT	UOM	86	94	Antenna Demonotration kit	1	1	Feedback	ASD-512		1					1				
ENT	UOM	95	95	Amplifier power	2	2		5175		2					2				
ENT	UOM	95	96	Amplifier DC	2	2		MHZ5170		2					2				
Electronics Workshop (ENW)	JICA	89	EET-1	Auto transformer	2	2	OGAWA	OSK10234		2					2				Weekly
ENW	JICA	89	EET-7	Four channel oscilloscopes	2	2	National	VP5530B	2			2			2				Moderate
ENW	JICA	89	EET-33	LCR Meter	1	1	OGAWA	OSK6314				1			1				Weekly
ENW	JICA	89	EET-35	Analyzing recorder	1	1	OGAWA	OSK6923				1	1		1			1	moderate
ENW	JICA	89	EET-47	Miniature portable oscilloscope	1	1	LEADER	LBO324			1				1				case based
ENW	JICA	89	EET-72 (N.R.I)	Calibrator, arbitrary standard type	1	1	OGAWA	OSK6801		1					1				
ENW	JICA	89	EET-73 (N.R.I)	Precision digital meter	1	1	OGAWA	OSK5905		1					1				
ENW	UOM	81	1	Antenna mixer	2	0		DK-AN				2		2	0				
ENW	UOM	81	2	Antenna (4 elements)	1	0						1		1	0				
ENW	Electronics body	97	3	Ammeter	3	3	YEW			3					3				
ENW	UOM	98	4	Audio generator	1	1				1					1				
ENW	UNDP	75	5	Calculator	1	0	HP	HP65				1			0				
ENW	UNDP	81	6	Camera B/W	1	1		CH-1400		1					1				
ENW	UNDP	79	7	Digital Multimeter	1	1				1					1				
ENW	UOM	81	8	Isolating Transformer	2	2				2		2			2				
ENW	UOM	97	9	Transformers	1	1	(230V/2kva)			1					1				
ENW	UOM	98	10	Tachometer Digital	1	1		TM300		1					1				
ENW	UNDP	74	11	Meter Calibrator	1	1	HP	69208		1					1				
ENW	UNDP	75	12	Microphone	1	1	AKG Dynamic	D160/E200		1					1				
ENW	UNDP	76	13	Meter AVO	1	1		8MK5		1					1				
ENW	UNDP	81	14	Multitester	5	0		YX360TR				5			0				
ENW	UNDP	81	15	Modulator	1	1		RFK-660UCE		1					1				
ENW	UOM	98	16	Multimeter	1	1		SK6155		1					1				
ENW	UOM	98	17	Multi Tester	3	3		AX313TR		3					3				
ENW	UOM	98	18	Multi Tester	4	4		SP180		4					4				
ENW	UOM	98	19	Oscilloscope	2	2		OS320		2					2				
ENW	UOM	98	20	Oscilloscope	1	1		THS720AS TO		1					1				
ENW	UNDP	78	21	Pulse Generator	1	1	HP	8005B				1			1				
ENW	UOM	97	22	Phone Freedom	1	1		FCT		1					1				
ENW	UOM	98	23	PLC Pressing Unit	1	1				1					1				
ENW	UOM	00	24	Phase sequence indicator	1	1		YF-80		1					1				
ENW	UNDP	81	25	Rejuvenator / CRT Tester	1	1		LCT-910A		1					1				
ENW	UNDP	75	26	Sound Level Meter	1	1		2209		1					1				
ENW	UNDP	78	27	Spectrum Analyzer	1	1		8557A		1					1				
ENW	UNDP	79	28	Slide Projector	1	1		S300		1					1				
ENW	UNDP	79	29	Trinitron Color Receiver	1	1	SONY	CVM1350E		1					1				
ENW	UOM	00	30	Dweegee	1	1		SMD TT226		1					1				
ENW	UNDP	74	31	Universal Digital Instrument	1	1		EU-805AA		1					1				
Microwave Lab (MW)	JICA	89	EET-23	Network/spectrum analyzer	1	1	ANRITSU	MS620J		1					1				daily
MW	JICA	89	EET-50	Ferrite experimental equipment set	1	1	OGAWA	OSK902		1					1				moderate
MW	JICA	89	EET-31	VHF signal generator	1	1	ANRITSU	MSG2630A		1					1				Frequently
MW	JICA	89	EET-66	Frequency counter	1	1	ANRITSU	MF76A			1				1				moderate

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MW	UNDP	77	1	Attenuator Calibration variable	1	1		PM7110X		1					1				
MW	UNDP	77	2	Attenuator Flap	1	1		PM7115X		1					1				
MW	UNDP	77	3	Attenuator Co-axia Pad	1	1		874-310L		1					1				
MW	UNDP	77	4	Attenuator Fixed	1	1		874-G6L		1					1				
MW	UNDP	77	5	Adjustable stub	2	2		874-D20L		2					2				
MW	UNDP	77	6	Adjustable stub	1	1		874-D50L		1					1				
MW	UNDP	77	7	Adjustable stub	1	1		1602PL		1					1				
MW	UNDP	77	8	Adjustable line	1	1		874-LAL		1					1				
MW	UNDP	77	9	Adapter	10	10		874-Q2		10					10				
MW	UNDP	77	10	Adapter	1	1		874-QBJL		1					1				
MW	UNDP	77	11	Adapter	1	1		874-QNPL		1					1				
MW	UNDP	77	12	Adapter	2	2		874-QBJA		2					2				
MW	UNDP	77	13	Adapter	2	1		874-QNJA		1		1			1				
MW	UNDP	77	14	Audio Frequency meter	1	1		1141A		1					1				
MW	UNDP	77	15	Attenuator Fixed	1	1		874G6		1					1				
MW	UNDP	77	16	Adapter	4	3		QNP		3		1			3				
MW	Philips	82	17	Attenuator variable	1	1	Philips	PM7110X		1					1				
MW	Univ. Peladeniya (UOP)	85	18	Attenuator variable	1	1		RO9695		1					1				
MW	UOP	85	19	Attenuation calibration	1	1		Jable		1					1				
MW	UOM	98	20	Analogue Multimeter	4	4				4					4				
MW	UOM	98	21	Digital Multimeter	1	1				1					1				
MW	UOM	99	22	Binding machine	1	1		IB		1					1				
MW	UNDP	77	23	Circulator Broadband 3-port	1	1		PM7050X		1					1				
MW	UNDP	77	24	Coupling probe	1	1		874-MB		1					1				
MW	UNDP	77	25	Coaxial Transition waveguide	1	1		N PM732SX		1					1				
MW	UNDP	77	26	Connector cable	2	2		874-CA		2					2				
MW	UNDP	77	27	Connector cable	11	9		874-C8A		9		2			9				
MW	UNDP	77	28	Connector cable	2	2		874-CLA		2					2				
MW	UNDP	77	29	Connector cable	12	12		874-CS8A		12					12				
MW	UNDP	77	30	Connector cable	2	2		874-CLS8A		2					2				
MW	UNDP	77	31	Connector Panel locking	1	1		874-PL-58A		1					1				
MW	UNDP	77	32	Connector Panel Recessed	1	1		874-PRL-58A		1					1				
MW	UNDP	77	33	Connector basic locking	2	2		874-BBL		2					2				
MW	UNDP	85	34	Circulator	1	1		R096932		1					1				
MW	UNDP	85	35	Crystal Mount	2	2		R096913		2					2				
MW	UOM	98	36	Computer table	3	3				3					3				
MW	UOM	98	37	Computer chair	3	3				3					3				
MW	UOM	98	38	Colour Monitor	1	1	S0304568			1					1				
MW	UOM	98	39	Computer	1	1	S21024			1					1				
MW	UNDP	77	40	Detector crystal tunable	1	1		PM71854		1					1				
MW	UNDP	77	41	Detector Crystal Broadband	1	1		PM71954		1					1				
MW	UNDP	77	42	Directional Coupler 4 port 20dB	1	1		PM72504		1					1				
MW	UNDP	82	43	Directional Coupler 3-port 10dB	1	1		PM7241		1					1				
MW	UNDP	82	44	Detector	2	2		PM7195X		2					2				
MW	UOM	82	45	Detector	1	1		PM-7142X		1					1				
MW	UOP	85	46	Directional coupler	1	1		RO96929		1					1				
MW	UNDP	77	47	Frequency meter 8.2-12.4GHz	1	1		PMT070X		1					1				
MW	UOM	82	48	Frequency meter	1	1		PM7010X/D C		1					1				
MW	UOP	85	49	Frequency meter	1	1		R096910/D2 57810		1					1				
MW	UOM	91	50	Frequency meter	1	1				1					1				
MW	SIDA	87	51	Function generator	1	1		PM9710		1					1				
MW	UOM	98	52	Function generator sweep	1	1		920S		1					1				
MW	UOM	95	53	Gestrer colour monitor	1	1		50304963		1					1				
MW	UOM	95	54	Gestrer computer	1	1		S21024		1					1				
MW	UNDP	77	55	Gumm Oscillator	1	1		PM7015X		1					1				

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MW	UOM	90	56	Gumm Oscillator	1	1		PM7015X		1					1				
MW	UNDP	77	57	Oscilloscope power supply	1	1		PM7813X		1					1				
MW	UOP	85	58	Gumm Oscillator	1	1		8623/CL803		1					1				
MW	UOM	90	59	Gumm Oscillator	1	1		8623/CL803		1					1				
MW	UOM	91	60	Green port kit	1	1				1					1				
MW	UNDP	77	61	HIV Brid Tee	1	1		PM7260X		1					1				
MW	UOP	85	62	Horn antenna	2	2		RO96915		2					2				
MW	UOM	91	63	Horn antenna	2	2		RO96915		2					2				
MW	UOP	85	64	Horn antenna leg	1	1				1					1				
MW	UNDP	77	65	Isolater Ferrite	2	2		PM7045X		2					2				
MW	UNDP	77	66	LF. Amplifier	1	1		1236		1					1				
MW	UNDP	77	67	Insertion Unit	1	1		874-X		1					1				
MW	Sumitomo Corp.	87	68	Insulation Remover	1	1				1					1				
MW	UNDP	77	69	Klystron Oscillator	3	0		PM7011X				3			0				
MW	UNDP	77	70	Klystron power supply	2	0		PM7812X				2			0				
MW	UNDP	78	71	Klystron power supply	1	0		PM7812/04				1			0				
MW	Overseas Telecommunication services	85	72	Klystron NEC	1	1		LO4134B		1					1				
MW	UNDP	77	73	Low pass filter	1	1		874-F1000L		1					1				
MW	UNDP	77	74	Low pass filter	1	1		874-F500L		1					1				
MW	UNDP	77	75	Low pass filter	1	1		874-F2000L		1					1				
MW	UNDP	77	76	L-Joint	1	1		874-ELL		1					1				
MW	UNDP	77	77	L-Joint	1	1		874-EL		1					1				
MW	UNDP	77	78	Matched roads low reflection	3	3		PM7220X		3					3				
MW	UNDP	77	79	Modulator diode	1	1		PM7026X		1					1				
MW	UNDP	77	80	Mixer	1	1		874-MRAL		1					1				
MW	UNDP	77	81	Micrometer vernier	1	1		874-LN		1					1				
MW	UOP	85	82	Magic Tee	1	1		RO96936		1					1				
MW	Feedback (UK)	87	83	Microwave trainer	1	1		MWT530		1					1				
MW	Feedback (UK)	87	84	Barometer	1	1				1					1				
MW	Feedback (UK)	88	85	Directional coupler	1	1				1					1				
MW	Feedback (UK)	89	86	Diode detector	1	1				1					1				
MW	Feedback (UK)	90	87	Frequency meter	1	1				1					1				
MW	Feedback (UK)	91	88	High bride Tee	1	1				1					1				
MW	Feedback (UK)	92	89	Horn antenna	2	2				2					2				
MW	Feedback (UK)	93	90	Registive terminator	1	1				1					1				
MW	Feedback (UK)	94	91	Sloted line for use with detector	1	1				1					1				
MW	Feedback (UK)	95	92	Sloted line tuner	1	1				1					1				
MW	Feedback (UK)	96	93	Short Tee	1	1				1					1				
MW	UOM	97	94	Receiver TV	1	1	National	6222297		1					1				
MW	UOM	84	95	Range box D.C.	1	1		L427787		1					1				
MW	UNDP	77	96	Power meter	1	1		PM7841X		1					1				
MW	UNDP	78	97	Patch cord	4	4		874R22A		4					4				
MW	UNDP	77	98	Patch cord	1	1		874R-34		1					1				
MW	UNDP	77	99	Patch cord	4	4		874R20A		4					4				
MW	UNDP	77	100	Patck cord	3	3		874R22LA		3					3				
MW	UNDP	77	101	Prove tuner	1	1		900DP		1					1				
MW	UOP	85	102	Powermeter bridge	1	1		RO76923		1					1				
MW	UOP	85	103	Power supply for gun oscillator	1	1		R09693		1					1				
MW	UOM	92	104	Power guard	1	1		PJ91		1					1				
MW	UOM	98	105	Power supply	2	2		DPS1302		2					2				
MW	Feedback (UK)	87	106	Service Tee	1	1				1					1				
MW	Feedback (UK)	87	107	Short circuit terminator	2	2				2					2				
MW	Feedback (UK)	88	108	X-band oscillator	1	1		CL8030		1					1				
MW	Feedback (UK)	87	109	Variable attenuator	2	2				2					2				
MW	Feedback (UK)	87	110	Wave guide co-axial adaptor	2	2				2					2				
MW	Feedback (UK)	87	111	Prove detector	1	1				1					1				

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MW	NTT	99	112	Personal FET Analyzer + Digital printer	1	1				1					1				
MW	UOP	85	113	Reflection plate	1	1				1					1				
MW	UOP	85	114	Non reflecting terminator	2	2		RO96925		2					2				
MW	UNDP	77	115	Slotted line WG	1	1		PM7142X		1					1				
MW	UNDP	77	116	Slotted line co-axial	1	1		874LBD		1					1				
MW	UNDP	77	117	Short circuit variable	1	1		PM7216X		1					1				
MW	UNDP	77	118	Sliding screw tuner	1	1		PM7151X		1					1				
MW	UNDP	77	119	Short Tee	1	1		PM7270X		1					1				
MW	UNDP	77	120	Service Tee	1	1		PM7275X		1					1				
MW	UNDP	77	121	Straight wave guide section	1	1		PM7367X		1					1				
MW	UNDP	77	122	Straight wave guide section	1	1		PM7366X		1					1				
MW	UNDP	78	123	SWR Meter	1	1		PM7832		1					1				
MW	UNDP	78	124	Stand	3	3		874-2		3					3				
MW	UOP	85	125	Sliding short	1	1		RO96940		1					1				
MW	UOP	85	126	Standing wave amplifier	1	1		RO96920		1					1				
MW	UOP	85	127	Standing wave detector	1	1		RO96911		1					1				
MW	Telecom	91	128	Soldering socker	1	1				1					1				
MW	UOM	90	129	Soldering socker	1	1		ENT		1					1				
MW	UOM	98	130	Signal level meter	1	1		2557958		1					1				
MW	UNDP	77	131	Thyristor mount	1	1		PM7201X		1					1				
MW	UNDP	77	132	Tee locking	1	1		874TL		1					1				
MW	UNDP	77	133	Termination 50 ohm	1	1		874-W508L		1					1				
MW	UNDP	77	134	Termination open set	4	4		874-WO		4					4				
MW	UNDP	77	135	Termination 50 ohm	3	3		1602-84		3					3				
MW	UNDP	77	136	Tool kit	1	1		874TOK2610		1					1				
MW	UNDP	77	137	Tool kit	1	1		874TOK2611		1					1				
MW	UNDP	77	138	Termination short set	1	1		874-WN3		1					1				
MW	UNDP	77	139	Termination open set	1	1		874-WO3		1					1				
MW	UNDP	77	140	Tronborn adjustable line	1	1		874LTL		1					1				
MW	UNDP	77	141	Tee	2	2		874-T		2					2				
MW	UNDP	77	142	Termination 50 ohm	1	1		874-W50B		1					1				
MW	UOP	85	143	Thermister mount	1	1		RO96921		1					1				
MW	OTS Colombo	85	144	Travelling wave tube	1	1		TWT		1					1				
MW	SIDA	87	145	Transition	1	1		WG-7325X		1					1				
MW	SIDA	87	146	Measuring tape	1	1		SL80509		1					1				
MW	Telecom lac	91	147	Tester Digital	1	1		256690		1					1				
MW	UOM	93	148	Telephone	1	1		1003009		1					1				
MW	Telecom lac	98	149	TV Receiver	1	1				1					1				
MW	UNDP	77	150	UHF Oscillator	1	1		1362438		1					1				
MW	UNDP	77	151	UHF Oscillator	1	1		1362557		1					1				
MW	UNDP	77	152	Unit Oscillator	1	1		1218B1241		1					1				
MW	UNDP	77	153	Unit Oscillator	1	1		121SC		1					1				
MW	UNDP	77	154	UHF Admittance meter	1	1		1602-B		1					1				
MW	UNDP	77	155	U Line section	1	1		874-U		1					1				
MW	UNDP	98	156	UPS Black buffer	1	1		VA984602697		1					1				
MW	UNDP	77	157	Voltmeter Detector	1	1		874-VQ		1					1				
MW	UNDP	77	158	Voltmeter Indicator	1	1		874-VI		1					1				
MW	UNDP	77	159	WG Horn	2	2		PM7320X		2					2				
MW	UNDP	77	160	WG stand	4	4		PM7700X		4					4				
MW	UNDP	77	161	WG clamp	4	4		PM7701X		4					4				
MW	UNDP	77	162	WG H bend	2	2		PM7350X		2					2				



Location	Procurement		Item No.	Description	Initial	Remaining	Manufacturer (Serial NO.)	Model No.	Hardware				Software		Repair			Problem in maintenance	Frequency in use
	Supplier	Year							Good	Usable	Repairable	Irreparable or Parts needed	Usable	No practical use	Workshop in University	Repair at local agent	factory abroad		
MW	UNDP	77	163	WG L Bend	2	2		PM7346X		2					2				
MW	UNDP	77	164	WG stand	1	1		FOA3MY1370		1					1				
MW	Overseas Telecommunication services	85	165	Wave tube NEC	1	1				1					1				
MW	JICA	89	166	Ferrite experimental equipment set	1	1	OGAWA	OSK902		1					1				moderate
Optoelectronic Lab (OPTO)	JICA	89	EET-51	Optical fiber system	1	1	FUJIKURA +	FVA560+	1	1					1				Weekly
OPTO	Sumitomo Corp.	84	1	Fiber cutter	1	1				1					1				
OPTO	UOM	85	2	Triangler optical bench 1m	2	2				2					2				
OPTO	UOM	85	3	Triangler optical bench 0.5m	1	1				1					1				
OPTO	UOM	85	4	Short pillar	4	4				4					4				
OPTO	UOM	85	5	Transvers slide	6	6				6					6				
OPTO	UOM	85	6	Carrier with transvers and short pillar	4	4				4					4				
OPTO	UOM	85	7	Carrier with transvers and vertical slide	6	6				6					6				
OPTO	UOM	85	8	Precision polarizer / analyser	2	2				2					2				
OPTO	UOM	87	9	Adjustable SLT	1	1				1					1				
OPTO	UOM	97	10	Audio generator	1	1		8601928		1					1				
OPTO	UOM	97	11	Audiogenerator	1	1		8601921		1					1				
OPTO	UOM	86	12	Triangular Bench equipment	4	4		Base 65mm		4					4				
OPTO	UOM	86	13	Triangular Bench equipment	6	6		Base 90mm		6					6				
OPTO	UOM	97	14	Chairs	10	10				10					10				
OPTO	NTT	86	15	Fibre phase compensator	2	2	NEC			2					2				
OPTO	UOM	87	16	Gratings screen	1	1				1					1				
OPTO	UOM	87	17	Screens	3	3	Iris Diaphragm			3					3				
OPTO	UOM	86	18	Laser	1	1	Harris	GLG2058		1					1				
OPTO	UOM	86	19	Laser (Compact) with power supply	1	1	He/Ne	HMW-4505		1					1				
OPTO	Dr Arthur C. Clarke	86	20	Laser	1	1	He/Ne	155		1					1				
OPTO	UOM	86	21	Logic Probe	1	1		5080327		1					1				
OPTO	UOM	86	22	Lamp Holders	1	1				1					1				
OPTO	UOM	96	23	Laser pointer	7	7		LP-100		7					7				
OPTO	UOM	98	24	Lens	6	6	Fresnel			6					6				
OPTO	UOM	99	25	Laser Diode	1	1	LDM	45P/633/1		1					1				
OPTO	UOM	99	26	Laser Pointer	5	5		LP-100		5					5				
OPTO	Sumitomo Corp.	84	27	Dummy fiber	1	1				1					1				
OPTO	UOM	86	28	Microscope	1	1	Kyowa	KFS1		1					1				
OPTO	UOM	86	29	Multimeter Digital	1	1		DT860		1					1				
OPTO	Dr Arthur C. Clarke	86	30	Optical power meter	1	1		92006		1					1				
OPTO	UOM	97	31	Oscilloscope	1	1	Leader	0875-9101087637		1					1				
OPTO	UOM	98	32	Power supply	2	2		DC		2					2				
OPTO	UOM	86	33	Short pillar	8	8				8					8				
OPTO	UOM	97	34	Signal generator	1	1		8509889		1					1				
OPTO	UOM	97	35	Signal generator	1	1		8601413		1					1				
OPTO	UOM	86	36	Vertical slide	6	6				6					6				
Post Graduates Lab (PG)	JICA	89	EET-11	Linear IC tester	1	1	OGAWA	OSK6696				1			1				Moderate/ Case based
PG	JICA	89	EET-15	Thyristor circuit trainer	1	1	OGAWA	OSK288				1			1				Not in use
PG	JICA	89	EET-17	Servomechanism experimental equipment	1	1	OGAWA	OSK638				1			1				Not in use
PG	JICA	89	EET-45	Digital plotter	1	1	HP	HP7550				1			1			1	not in use
PG	JICA	89	EET-48	Digital storage oscilloscope	1	1	KIKUSUI	7061		1					1				Daily
PG	UOM		1	Oscilloscope	1	1	LEADER	LBO 522		1					1				
PG	UOM		2	Oscilloscope digital	1	1	KIKUSUI	7061 A		1					1				
PG	UOM		3	Oscilloscope 4ch	1	1	PANASONIC	VP 5530 B		1					1				
PG	UOM		4	Oscilloscope	1	1	TEKTRONIX	204 - 2		1					1				
PG	UOM		5	Thyristor triner	1	1	ANDO	SCR 11		1					1				
PG	UOM		6	Thyristor triner	1	1	ANDO	SCR 12		1					1				
PG	UOM		7	Thyristor triner	1	1	ANDO	SCR 13		1					1				
PG	UOM		8	Thyristor triner	1	1	ANDO	SCR 14		1					1				

Location	Procurement		Item No.	Description	Initial	Remaining	Manufacturer (Serial NO.)	Model No.	Hardware				Software		Repair			Problem in maintenance	Frequency in use
	Supplier	Year							Good	Usable	Reparable	Irreparable or Parts needed	Usable	No practical use	Workshop in University	Repair at local agent	factory abroad		
PG	UOM		9	Thyristor trainer	1	1	ANDO	SCR 15		1					1				
PG	UOM		10	Logic Analyzer	1	1	TEKTRONIX	1240		1					1				
PG	UOM		11	Function Generator	1	1	LEADER	LFG 1300		1					1				
PG	UOM		12	Function Generator	1	1	LEADER	LFG 1310		1					1				
PG	UOM		13	Function Generator	1	1	LEADER	LFG 1310		1					1				
PG	UOM		14	Pen Style volt meter	1	1				1					1				
PG	UOM		15	Servo experiment equipment	1	1				1					1				
PG	UOM		16	Bench meter	1	1	FLUKE	8010 A		1					1				
PG	UOM		17	Hand held meter	1	1	FLUKE	8021 B		1					1				
PG	UOM		18	Hand held meter	1	1	FLUKE	8021 B		1					1				
PG	UOM		19	Power supply unit	1	1	LEADER	LPS 161 A		1					1				
PG	UOM		20	Power supply unit	1	1	LEADER	LPS 161 A		1					1				
PG	UOM		21	Power supply unit	1	1		HC 3033 B		1					1				
PG	UOM		22	Power supply unit	1	1		HC 3033 B		1					1				
PG	UOM		23	X - Y recorder	1	1	YOKOGAWA	45PCP003		1					1				
PG	UOM		24	Digital plotter	1	1	HP	7550 A		1					1				
PG	UOM		25	Analyzer recorder	1	1				1					1				
PG	UOM		26	Digital IC Tester	1	1		250 A		1					1				
PG	UOM		27	Operational amplifier tester	1	1		361		1					1				
PG	UOM		28	Power supply trainer	1	1		94829901		1					1				
PG	UOM		29	Linear IC Tester	1	1				1					1				

## **APPENDICES**

### **Annex 6-9)**

**Questionnaire survey concerning the industries' needs**

## Annex -6-9) Questionnaire survey concerning the industries' needs

Field	Category	Company name	Establishment	Address	Interviewed person	Tel	Fax	e-mail	Top five Services or Products	Total Asset	Numbers of Employee	Breakdown of IT Related vocational classification of employee	Numbers of Fresh graduate from UOM for last three years	Standard average Salary for Engineer for three years employed (net)	Numbers of future recruitment plan for two years	Own evaluation for operational level in IT	Evaluation of fresh graduates of E&T UOM	Requirement for academic curriculum in E&T UOM	Vocational training	Other comments
Fixed Telephony	Privatized	Sri Lanka Telecom Limited		Sri Lanka Telecom, Lotus Road, P.O.Box 503, Colombo 1 Tel : +94-1-329711	Customer Service Mr M.L. Christie ALWIS, Director	+94-1-448507	+94-1-436262	christie@slt.lk	1) Voice, Data transmission line 2) Internet 3) OF Fibre 4) Satellite base communication	more than Rs.100 million	8500	30% are technical staff	Engineers around 250. About 40% is from Moratuwa	Rs 18,000/month	100 - 150 engineers/technicians	A	B	D, E and G	- OJT is proceeded for new employees	In Sri Lanka, UOM is upto the best standard for this field, still yet to develop many for experiences. The practices on latest practices on OF fibre, Data processing, computer are needed.
Fixed Telephony	Private	Suntel Limited		110 Sir James Peiris Mw Colombo 2	Engineering Dept Mr Janaka KUMARASINGHE, General Manager Human Resources Mr Mahinda Ramasundara, Technical Director	+94-1-74-747210	+94-1-74-747300	janaka@suntel.lk	1) Network development (Logistics, Customer planning, Business implementation, Civil engineering Q/C) 2) Operation (Database switching, Radio system network, Maintenance network, Customer premise equipment installation)	US\$150 million	400	1) Electronic designer : 8 2) Tele-communication designer : 4 3) Service engineer : 2 4) Computer engineer : 5 5) System engineer : 10 6) Broadcast engineer : 0 7) Civil engineer : 6	20	Rs 35,000/month	30 including engineers and technician	A	B	E	- Scholarship (3 Engineers benefit by it for 3 years, at present) - Acceptance of Industrial training from Universities (annually 10 engineers for 6 months training, with monthly earning Rp.5,000)	Curriculum needs to meet the industries' requirements. In Sri Lanka, students need to be exposed to latest technologies within the University.
Fixed Telephony	Private	Lanka Bell Limited		78, Grandpass Road, Colombo 14	Mr Nalaka PEIRIS, General Manager	+94-75-339944	+94-75-339915	nalakap@mail.lankabell.com	1) Wireless Local Loop (WLL) 2) Communication Radioringo 3) Communication Radio Program 4) Multi point WLL		350	1) Electronic designer : 0 2) Tele-communication designer : 22 3) Service engineer : 0 4) Computer engineer : 0 5) System engineer : 0 6) Broadcast engineer : 0 7) Civil engineer : 1, Electrical engineer : 1, Telecom technician : 75	5 (lots of UOM graduates have left company)	Rs 25,000/month	some technicians only for a moment. It depends on the current expansion.	A	A	E	- OJT is proceeded for new employees	1) Engineers are required their application skill of their technological knowledge for the planning, making solution, which benefit customer. 2) Telecommunication + Software development knowledge are required for broad band network. 3) Attitude of "contribution to the company" would be most welcome.
Mobile phone operator	Private	Lanka Cellular Service Ltd.		175 Baudhaloka Mw 3		+94-1-501673	+94-1-													
Mobile phone operator	Private	Mobitel Ltd.		240, High Level Road, Colombo 6	Mr Wijaya PERERA, General Manager Engineering & Operations	+94-1-330550	+94-1-	+94-1-342491	1) Cellular Mobile, Operator 2) US TDMA Standard network 3) Switching 4) Base station 5) Radio Frequency design		250	1) Electronic designer : 7 2) Tele-communication designer : 15 3) Service engineer : 0 4) Computer engineer : 0 5) System engineer : 0 6) Broadcast engineer : 0	20	Rs 30,000/month	2	A	A	C, G	OJT is provided	1) Basic subject (Mathematics, Common technology ) shall be applied in all technology
Mobile phone operator	Private	MTN Network Ltd.		475, Union Place, Colombo 2	Mr Upali GAJANAIKE, Head of Operations	+94-1-678700	+94-1-678696	upg@dialog.lk	1) Internet providing, roaming 2) ISP 3) Mobile phone operation 4) Telephone 5) Payphone (Prepaid)	US\$90million (Stock holder : Malaysia Telecom, Mahalaja Telecom)	300	1) Electronic designer : 12 2) Tele-communication designer : 16 3) Service engineer : 0 4) Computer engineer : 3 5) System engineer : 2 6) Broadcast engineer : 0 7) NDT in Telecom, electronics : 15	15	Rs28,000 - 30,000/month	3, 4 engineers	A	A, C	B, G	OJT is provided	1) IT related education (Telecom, Networking, Data base processing, Hardware system analysis) to be strengthened. 2) Exposure to the up dated technologies (both theory and practice) is highly needed. Industrial Training is particularly important in this sence. 3) Presentation in English is also an essential skill to be required.
Data communications	Private	Lanka Communication Services Ltd.		175 Baudhaloka Mw 3		+94-1-501673	+94-1-													
Data communications	Private	Electrotecs		429 D Galle Rd RM		+94-1-637430	+94-1-													
Data communications	Private	Lanka Internet Services		156, Walukkrama road, Colombo 3	Mr Nalin PRIYANTRA SILVA, General Manager Operation	+94-1-565071	+94-75-535637	anpsilva@sri.lanka.net	1) Internet Service Provider for Data communication 2) Internet Service Provider for Voice communication		100	1) Electronic designer : 6 2) Tele-communication designer : 0 3) Service engineer : 0 4) Computer engineer : 2 5) System engineer : 0 6) Broadcast engineer : 0	7	Rs 35,000/month	2 Computer science engineers 2 Eletronics engineers	A	A, B	G	OJT is provided.	1) Basic special subjects including principles of electronics, signals, measurement, data programming, telecommunication are to be learned as much as possible. 2) updated equipments to be used, especially for electronics data transmission, Data base with UNIX, measurement, satellite related subjects. 3) Data communication, TCP/IP shall be included in the curriculum
Internet Provider	Private	Celltel Lanka Limited		78, Mukthar Plaza, Grandpass Rd, Colombo 14	Mr Sanath PILAPITTYA, Senior Manager - Engineering	+94-1-541-541	Tel: +94-1-541-145	sanathp@int.celltelnet.lk	1) MSM Cellular 2) Analogue cellular 3) Prepaid service 4) SMS 5) ISP	Rs 5 million	250	1) Electronic designer : 10 2) Tele-communication designer : 21 3) Service engineer : 12 4) Computer engineer : 0 5) System engineer : 0 6) Broadcast engineer : 1 7) Technicians : 19	11	Rs 30,000 /month	4, 5 (will be more, if broad band divise licence is admitted)	A	A	H	Industrial Training for 3 months every year	Satisfied with the current level of performance of the UOM graduates, and understand that Universities are not equiped enough with updated experimental equipment to meet the industrial needs. Testing skill shall be strengthend in practical course. Commercial, Finance, Management skill shall be strengthened, as well.
Internet Provider	Private	Pan Lanka Networking Limited		to be checked		+94-1-	+94-1-													
Internet Provider	Private	Millaniam Communications Limited		to be checked		+94-1-	+94-1-													
Public Pay Phone	Private	The Payphone		36, S. De S. Jayasinghe Mawatha, Nugegoda 350, Union PI Colombo 2	Mr Chandev W. Abhayaratne	+94-1-341068	+94-1-341067	chandev@fentons.com	1) Pre-paid phone cards 2) Payphones 3) Pay telephone services	Rs 300 million (Stock holder 15% Fenton, 20% Loxley)	30	1) Electronic designer : 3 2) Tele-communication designer : 2 3) Service engineer : 1 4) Computer engineer : 2 5) System engineer : 0 6) Broadcast engineer : 0 7) Technical officers (Telecom) : 6	0	Rp. 17,500 / month	3	C	C & E	A, B, E & G	OJT for 2 years, as it is needed.	1) Due to the fact that University's equipment resources for laboratory & special projects are limited, UOM eng., NDT, KDA students across the board have to share such very limited equipment as well as practical training facilities available throughout their course. 2) As a result of above 1), the overall UOM out put of annual engineering graduates is very low. 3) The Payphone Co., Ltd. suggests that International Companies and manufacturers shall be required to sponsor special project labs / training facilities, for a better preparation of graduates.
Public Pay Phone	Private	Lanka Payphone		Unit 2, 2nd floor, 70, D.S. Senanayake Mawatha, Colombo 8		+94-1-694906, 694963	+94-1-													
Radio Paging	Private	Equipment Traders Ltd.		294 1/1 Galle Rd 4		+94-1-584198	+94-1-													

## Annex -6-9) Questionnaire survey concerning the industries' needs

Field	Category	Company name	Establishment	Address	Interviewed person	Tel	Fax	e-mail	Top five Services or Products	Total Asset	Numbers of Employee	Breakdown of IT Related vocational classification of employee	Numbers of Fresh graduate from UOM for last three years	Standard average Salary for Engineer for three years employed (net)	Numbers of future recruitment plan for two years	Own evaluation for operational level in IT	Evaluation of fresh graduates of E&T UOM	Requirement for academic curriculum in E&T UOM	Vocational training	Other comments
Radio Paging	Private	Fentons Limited		350 Union Place Colombo 2	Mr Senaratna, Director Mr C.W. Abbayaratne, Managing Director	+94-1-448518	+94-1-448517	<a href="mailto:cwa@fentons.com">cwa@fentons.com</a>	1) Key Telephone Systems (PABX) 2) Electrical engineering 3) Structured Network Cabling (LAN/WAN) 4) Fire & Security Systems 5) UPS System	Rs 260 million	250	1) Electronic designer : 2) Tele-communication designer : 3) Service engineer : 4) Computer engineer : 5) System engineer : 6) Broadcast engineer : 7) Technicians :	5		3	B	C & E	B		
Radio Paging	Private	Intercity Paging Services Ltd.		65 Walukarama Rd 3		+94-1-574281	+94-1-													
Trunked Miblie Radio Network Services	Private	Dynacom Engineering Ltd.		451A Kandy Rd KI		+94-1-520703	+94-1-													
Telephone line lease	Private	MTT Network	1993	IBM Building 5th floor, 48, Nawam Mawatha, Colombo 2	Mr Viraj M. DEVAPRIYA, General Manager - Technical	+94-1-441020	+94-1-441025	<a href="mailto:viraj.devapriya@mtt.lk">viraj.devapriya@mtt.lk</a>	1) Transmission in long distance 2) Communication Infrastructure for cellular, WLL 3) Paing, Radio, TV & Data communication 4) Data networking, IP, frame relay on ATM backbone 5) Internet, ISP & ASP (Application service provider)	2000	65	1) Electronic designer : 8 2) Tele-communication designer : 12 3) Service engineer : 1 4) Computer engineer : 0 5) System engineer : 1 6) Broadcast engineer : 0 7) Technicians : 19	4	Rs 15,000 - 20,000 /month after 3 years : Rs 30,000 - 40,000 /month	4 or 5 engineers	C (Lack of documentation skill)	A	B	- Seminar in university (including UOM) - OJT	1) Currently, various technical skills are required to 1 Engineer, not only 1 specialized one. 2) Technocrat is needed for the development of company, then management skill shall be also strengthened. 3) Attitude as Supervisor, as well as Team work mentality is lacking in fresh engineers.
Television	Public	Rupavahini		Independence Sq, Colombo 7	Mr Tharaka MOHOTTY, Director - Engineering Transmission	+94-1-501571	+94-1-500373	<a href="mailto:detx@rupavahini.lk">detx@rupavahini.lk</a>	1) Television, Broadcasting 2) Satellite		Engineering : 110 people	1) Electronic designer : 2 2) Tele-communication designer : 2 3) Service engineer : 1 4) Computer engineer : 1 5) System engineer : 1 6) Broadcast engineer : 5 7) Technical officers : 45, Power Air conditioning : 50	4	Rs 15,000/month	6	A	A	G	- OJT is provided - Industrial training for undergraduates : Broadcasting training	UOM always produces highly qualified graduates, with industrial market oriented education. If they have much laboratory practices with updated industrial equipment in IT, Electronics, Telecommunication fields, it shall benefit Universities' students, teaching staffs, as well as the Industry side.
Computer Software Development	Private (Foreign based)	IFS (Swedish)		177, Galle Road, Colombo 3	Mr Jonas BRIDGWATER, Managing Director Mr Sajith PEIRIS, Software Engineering Director	+94-1-321800	+94-1-321801	<a href="mailto:jonas.bridgewater@ifs.lk">jonas.bridgewater@ifs.lk</a>	1) Software development for Trading, Banking, Logistics, Institutions etc in various fields to find solution in Management, Financing, Marketing, e-commerce, business etc.	Rs 515million	235	1) Electronic designer : 5 2) Tele-communication designer : 0 3) Service engineer : 32 4) Computer engineer : 50 5) System engineer : 30 6) Broadcast engineer : 0 7) GTP (Graduates Training Programme) : 54	38	Rs 20,000 - 30,000/month	6	A	A		- undergraduates scholarship for Industrial training	UOM graduates (mostly from Computer Science) are always skilled in hardware oriented technology, through various laboratory practical courses at University, although their equipment is limited. Colombo Univ. has software oriented education at ICT, which is also in line with IFS's software development activity.
Computer Software Development	Private	Millennium IT	1995	Lan Lib Building, 46/56, Nawam Mawatha, Colombo 2	Mr Ajit SAMARANAYAKE, Director, Software Development Mr Hemantha JAYAWARDENA, Chief Technology Officer	+94-1-341380	+94-1-341384	<a href="mailto:Hemantha@millenniumit.com">Hemantha@millenniumit.com</a> <a href="mailto:Ajit@millenniumit.com">Ajit@millenniumit.com</a>	1) Software development 2) GSM based mobile phone operating 3) Hardware development	Rs 527million	120	1) Electronic designer : 70 2) Tele-communication designer : 0 3) Service engineer : 0 4) Computer engineer : 0 5) System engineer : 25 6) Broadcast engineer : 0 7) Technicians :	1999 : 11 pers 2000 : 6 pers	Rs 80,000 - 120,000/month	15 - 20 engineers	A	A	G	1) Internal vocational training 2) International Certification (system engineer) programme is proceeded 3) Lecture (Products strategy etc) is given at University, as academic activity, once a week.	1) Laboratory practice shall be strengthened with updated equipment, however, number of lecturers is not enough at UOM case. 2) Higher technical skill is needed in all engineers for the competitiveness of the IT industry.
Computer Software	Private	e-Runway				+94-1-	+94-1-													
Computer Software Development	Private	DMS Software Engineering		54 Dharmapala Mawatha, Colombo 3	Mr S. Athithan, Manager - Sales	+94-1-573458	+94-1-574631	<a href="mailto:dmsswe@sri.lanka.net">dmsswe@sri.lanka.net</a>	1) Data management system 2) Distribution of computers (IBM, Compaq, Sisco) 3) Software development, Data center (Microsoft support center), ORCLE  DMS Electronics (separate company) 1) Siricon 2) Hyper compo 3) ATM Switch 4) Tari Printer 5) HP server printer, computer		400	1) Electronic designer : 65 2) Tele-communication designer : 0 3) Service engineer : 70 4) Computer engineer : 20 5) System engineer : 55 6) Broadcast engineer : 0 7) Electric engineer : 30	4	Rs 35,000 - 45,000/month	10	A	A	G	OJT is provided	1) In order to update the University's education, some orientation to the lecturers shall be needed. 2) Undergraduates students have tendencies to be satisfied with their theoretical knowledge in particular fields. It is required to spend time and open mind to the practical application for planning and development.
Computer Software	Private	Informatecs International		65, Walukarama Rd, Colombo 3		+94-1-57-5545	+94-1-													
Electrical Engineering	Private	I-E Technics (Pvt) Ltd	1980	3, Sri Gunaratana Road, Panadura (office, factory) (3 factories in total)	Mr Tisil COORAY, Chairman/Managing director	+94-38-34008	+94-38-34007	<a href="mailto:tisil@ie.lk">tisil@ie.lk</a>	1) TV Antenna, booster 2) Power Generator system, Solar power generating system 3) Electronics Power protection, stabilizer, battery charger 4) PCB manufacturing 5) CAD, CNC milling machine	Rs 134.6 million	283	1) Electronic designer : 3 2) Tele-communication designer : 0 3) Service engineer : 0 4) Computer engineer : 0 5) System engineer : 0 6) Broadcast engineer : 0 7) Mechanical engineers : 3, Technicians : 4	3	Rs 18,000/month	1 Chemical engineer, 2 Electronics engineers, 2 Mechanical engineers	B	B, D	G	Receiving University's student for Industrial training	1) At the occasion of University's industrial training programme, the Lecturers shall accompany with students, so that they can brush up their knowledge regarding the current industrial technologies. 2) Srilankan universities students are in general skilled, and have enlarged knowledge in various engineering fields.
Computer Hardware manufacturing	Private	FDK Lanka		1st factory : Ring Road 3, Phase 2, E.P.Z. Katunayake		+94-1-253492	+94-1-													
Computer Hardware manufacturing	Private (Foreign based)	NEC Business Coordination Center (Singapore) Colombo Liaison office				+94-1-4233565	+94-1-													
Aviation	Public	Airport & Aviation Services (Sri Lanka) Ltd.		Colombo Airport, Ratmalana, Sri Lanka	Mr W. WIMALSHANTHI, Chief Electronics Engineer	+94-1-633488	+94-1-633488	<a href="mailto:ceeaasl@slt.lk">ceeaasl@slt.lk</a>	1) Airport aviation service 2) International and domestic passenger/cargo transport 3) Air traffic control 4) Maintenance of air navigation control, telecommunication (UHF, Microwave, Optical fiber), security system equipment 5) Aviation security and rescue 6) Airport facility designing	112.81	320	1) Electronic designer : 41 2) Tele-communication designer : 1 3) Service engineer : 15 4) Computer engineer : 0 5) System engineer : 0 6) Broadcast engineer : 0 7) Mechanical engineer : 1 8) Electronics Technical officer : 63	7	Rs 15000 - 20,000 /month	about 40, 50 engineers (Airport expansion planned)	A	A	G	1 year OJT is proceeded, after 3 months from the employment. Training in organization abroad is possible	Satisfied with academic level of UOM graduates. However, practical study in laboratory (Testing etc) shall be strengthened, so that the new employees easily get used to the requirement in job in place.

Annex -6-9) Questionnaire survey concerning the industries' needs

Field	Category	Company name	Establishment	Address	Interviewed person	Tel	Fax	e-mail	Top five Services or Products	Total Asset	Numbers of Employee	Breakdown of IT Related vocational classification of employee	Numbers of Fresh graduate from UOM for last three years	Standard average Salary for Engineer for three years employed (net)	Numbers of future recruitment plan for two years	Own evaluation for operational level in IT	Evaluation of fresh graduates of E&T UOM	Requirement for academic curriculum in E&T UOM	Vocational training	Other comments
Aviation	Semi government 51% government 9% employee 40% Emirates	Srilankan Airlines		Level 19-01 to 22-01, East Tower, World Trade Centre Echelon Square, Colombo 1	Mr Panduka WEERARATNE, Manager Network Engineering & Development	+94-1-731606	+94-1-735122	<a href="mailto:weeraratne@srilankan.lk">weeraratne@srilankan.lk</a>	1) Passenger and Cargo transport airline		4000	1) Electronic designer : 0 2) Tele-communication designer : 3 3) Service engineer : 4 4) Computer engineer : 18 5) System engineer : 7 6) Broadcast engineer : 0	25	Rs 35,000/month	System engineer : 2 Computer engineer : 2	A	C	B, G	OJT is provided	1) UOM graduates are basically valued with their skill in rapid understanding of technologies applied. 2) Presentation skill shall be strengthened. 3) Undergraduates shall try to seek maximum of updated technology information worldwide.
Institute	Public	Arthur C Clarke Institute for Modern Technologies	1984	39A, Sumudu Place, Sri Rahula Road Katubedda, Moratuwa 10400	Mr Nihal KULARATNA, Director	+94-1-605395	+94-1-605395	<a href="mailto:dir@accmt.ac.lk">dir@accmt.ac.lk</a>	1) Telecommunication products research & development 2) Government Industry automation 3) Software development 4) Power electrics	150	65	1) Electronic designer : 20 2) Tele-communication designer : 10 3) Service engineer : 0 4) Computer engineer : 0 5) System engineer : 0 6) Broadcast engineer : 0 7) Mechanical engineer : 0 8) Technician : 10	30	Rs 8,000 - 16,000 /month	15 Electronics engineers, 10 Software engineers, 10 NDT engineers	B	A and D (Hardware knowhow is essential)	E and G	- Immersion study courses are given (cost basis) at UOM. - Specialized courses are given (cost basis) for the Laboratories technical officer of University.	1) The department must have an excellent workshop with hardware repair capacity 2) Essential to have industry experienced lecturer & professors at very senior level to give more industry oriented course. 3) As it is, it is very good department (E&T UOM), but they have less hardware, measurement & design resources.
Governmental organization	Public	Telecommunications Regulatory Commission of Sri Lanka	1996	Head office : 276, Elvitigala Mawatha, Colombo 8 3 Regional centers 6 Monitoring stations	Mr Helasiri RANATUNGA, Deputy Director - Spectrum Management	+94-1-683841	+94-1-689341	<a href="mailto:dgtsl@slt.lk">dgtsl@slt.lk</a>	1) Telecommunication directory 2) Frequency assignment for domestic/international communication, registration, licensing	Rs 1.1 billion	160	1) Electronic designer : 10 2) Tele-communication designer : 15 3) Service engineer : 0 4) Computer engineer : 0 5) System engineer : 0 6) Broadcast engineer : 0 7) NDT : 40 8) Technical officer : 15	9	Rs 12,000 + 5,000 (allowance for transport etc)	6	A	A	G	Industrial Training for undergraduates : Frequency management and monitoring	Satisfied with academic level of UOM graduates, who have exposure to Telecommunication field. For an effective industrial development, updated telecommunication and/or satellite facility shall be infrastrucuturized, as well as IT shall be developed. Some related standard framework shall be established, too. For this purpose, huge amount of human resources are needed.

Annex -6-9) Questionnaire survey concerning the industries' needs

Field	Category	Company name	Establishment	Address	Interviewed person	Tel	Fax	e-mail	Top five Services or Products	Total Asset	Numbers of Employee	Breakdown of IT Related vocational classification of employee	Numbers of Fresh graduate from UOM for last three years	Standard average Salary for Engineer for three years employed (net)	Numbers of future recruitment plan for two years	Own evaluation for operational level in IT	Evaluation of fresh graduates of E&T UOM	Requirement for academic curriculum in E&T UOM	Vocational training	Other comments
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- (1) Own evaluation for organization's operational level in the fields of technology including IT environment
- A) Very good in consideration of similar organization in international level
- B) Fairly good in view of domestic market or in international level
- C) Average level in the domestic market
- D) Inferior in view of lack of competitiveness
- E) Poor level in the domestic market
- (2) Evaluation of fresh graduates of Department of Electronics and Tele-communication of Uiversity of Moratuwa (E&T UOM) compared with graduates from other academic institutions
- A) Very good compared with ones from other institutions
- B) Good, but planning skill is lacking
- C) Good, but communication skill is lacking
- D) Good, but practical technique like drawing, cost estimation and engineering are lacking
- E) Good, but English documentation is poor
- (3) Evaluation and requirement for academic curriculum and laboratory practice in E&T UOM
- A) General subjects learning are inefficient among all academic subjects
- B) English learning including communication skill among general subjects is lacking
- C) Basic subject learning including Mathematics, Chemistry and Physics etc. are poor
- D) Basic special subjects learning including Principles of Electronics, Signals and System, Electronic Measurement etc. are lacking
- E) Special subjects are to be more professionalized
- F) Computer System theory learning is to be more deepened
- G) Students laboratory practice is to be strengthened
- H) No requirement on UOM's curriculum including laboratory practice because it is excellently managed.