APPENDICES

APPENDIX

1. (1) Minutes of Discussions on April 26, 1987

   (2) Minutes of Discussions on October 29, 1987

2. Member List

3. Schedule

4. Personnel with whom the Study Team Met

5. Proposed Study Programme Set in the College

6. Subjects of Experiments to be Undertaken in Each Laboratory

7. Outline of the Equipment Requested by Pakistan Side

8. Rough Estimation of Electricity Consumption

Appendix-1-(1) Minutes of Discussions on April 26, 1987

MINUTES OF DISCUSSIONS
ON
THE PROJECT FOR PROVISION OF
LABOLATORY AND EDUCATIONAL EQUIPMENT
FOR BALUCHISTAN ENGINEERING COLLEGE, KHUZDAR
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

In response to the request of the Government of the Islamic Republic of Pakistan, the Government of Japan has decided to conduct a basic design study on the Project for Provision of Laboratory and Educational Equipment for Baluchistan Engineering College, Khuzdar and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Pakistan the study team headed by Dr. Susumu Yamashiro, Professor, Kitami Institute of Technology from April 18th to May 8th, 1987.

S.Y

The team had series of discussions on the Project with the concerned officials of the Government of the Islamic Republic of Pakistan and conducted a field survey in Karachi and Khuzdar.

As a result of the study, both parties agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

Islamabad, April 26, 1987

Susumu Yamashiro

Dr. Susumu Yamashiro
Leader
Basic Design Study Team
Japan International
Cooperation Agency

Mr. Munir Ahmed
Joint Educational Advisor
Ministry of Education
Government of Pakistan.

ATTACHMENT

1. Project Title

The Project for Provision of Laboratory and Educational Equipment for Baluchistan Engineering College, Khuzdar.

2. Objective of the Project

The objective of the project is to provide the necessary laboratory and educational equipment for the departments of civil engineering, electrical engineering and mechanical engineering in Baluchistan Engineering College, Khuzdar (the College).

3. Objectives of Establishment of the College

1) To provide facilities for the engineering education to the students in Baluchistan province where no such facilities are available.

2) Three (3) departments, namely, civil engineering, electrical engineering and mechanical engineering, will be established in the College. The College will also provide basic science courses common to three departments.

3) The College will offer four (4) years degree course after twelve (12) years education, and will have annual enrollment capacity of thirty (30) students in each department.

4. *Sponsoring Agency and Executing Agency*

1) Ministry of Education is sponsoring, and is responsible for financing the capital expenditure of establishment of the College.

2) Education Department, Government of Baluchistan will be the executing agency for the implementation of the Project, and the College will be responsible for its operation and maintenance after completion of the Project. Pakistan side ensured that the necessary budget for proper and effective operation and maintenance of the equipment provided under the Grant Aid program will be allocated along with adequate number of the Pakistan personel with sufficient knowledge and experience.

5. Responsibility of the Counterpart Board

The Counterpart Board shall be responsible for preparation of the Project and for handing over the draft report confirmed by both sides to the sponsoring and the executing agencies.

6. Equipment requested by Pakistan Side

1) Pakistan side emphasized their desire for Japan's Grant Aid for providing the laboratory and educational equipment for the College.

Pakistan side has presented three volumes (volume I, II, and III) of the list of equipment required for the College. These lists are approved by the Government of Pakistan. The outline of the ammended equipment requested to be provided from Japan is shown in Annex 1 attached.

2) The team stated curriculum and list of experiment etc. set in the College will be carefully examined and the adequate laboratory and educational equipment will be recommended on the basis of the said examination results.

7. Project Site

1) The College is under construction. Pakistan side assured that all construction work will be completed by June, 1989.

2) Pakistan side ensured that construction work of the proposed academic section and laboratory buildings for installing the equipment to be completed by July, 1987 with electricity lines, water supply and other utilities.

8. Schedule of Establishment of the College

1) The College has appointed six (6) members of teaching staff as follows:

One (1) professor	:	Civil Engineering
One (1) associate professor	:	Electrical Engineering
Three (3) lecturers	:	Civil Engineering Electrical Engineering Chemistry

appointed and
The professor of mechanical engineering has not yet reported.

The college will complete to recruit 26 members of teaching staff including above appointed staff and 31 technicians by the end of July, 1987.

2) The Curricula Committee has prepared the curricula to be taught in the college as attached Annex 2.

3) The College will start educational activities from October, 1987.

9. Grant Aid Programme

1) Pakistan side has understood Japan's Grant Aid System and the principle for use of a Japanese consultant firm and Japanese contractors for the implementation of the Project.

2) The Study team will convey to the Government of Japan desire of the Government of Pakistan that the former takes necessary measures to cooperate in implementing the Project and provide necessary equipment under Japan's Grant Aid Programme.

3) The Government of Pakistan will take necessary measures as follows with respect to the Grant Aid by the Government of Japan to be extended to the Project.

a) To arrange the appropriate buildings with facilities of electricity, water supply, drainage etc before commencement of installation work.

b) To ensure prompt unloadings, tax exemption, customs clearance at ports of disembarkation in Pakistan and prompt internal transportation of the equipment provided under the Grant Aid.

c) To exempt Japanese nationals involved in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Pakistan with respect to the supply of the equipment and services under the verified contracts.

d) To accord Japanese nationals whose services may be required in connection with the supply of the equipment and the services under the verified contract such facilites as may be necessary for their entry into the Pakistan and stay therein for the execution of the Project.

3.4

ANNEXURE-1

OUTLINE OF THE EQUIPMENT REQUIRED FOR THE BALUCHISTAN ENGINEERING COLLEGE, KHUZDAR, PAKISTAN

		No. of Items
Mechanical Engineering Department		
1.	Hydraulic laboratory Section	67
2.	Material testing section	47
3.	Precision measuring Section	99
4.	Workshop Section	87
5.	Heat engine Section	24
6.	Air Conditioning & Refrigeration Section	26
7.	Heat Treatment Section	76
8.	Automotive Workshop Section	18
9.	Drawing room section	6
	Total:	450
Electrical Engineering Department		
1.	Electricity section	168
2.	Electronics Section	76
3.	Telecommunication Section	44
4.	Workshop Section	20
5.	Drawing room section	6
6.	Computer Section	6
	Total:	320
Civil Engineering Department		
1.	Structural and concrete section	79
2.	Soil mechanics Section	174
3.	Road and highway Section	85
4.	Sanitary and irrigation section	126
5.	Survey Section	50
6.	Drawing Section	6
	Total:	520

Common Educational Equipment

1.	Applied Physics Section	138
2.	Applied Chemistry Section	140
3.	Language Laboratory Equipment	1
	Total:	279
	Grand Total:	1569

1. Quantity and Priority tables will be provided in the prescribed Table No.2 alongwith Table No.1 on or before 7th May as decided in the meeting held on 21.4.1987 at N.E.D. University of Engineering and Technology, Karachi.

2. Pakistan Government desires that proper training service for operation of equipment be included in the equipment, if necessary.

RE ARRANGING THE PROPOSED LABORATORIES
ACCORDING TO PC-1 of BALUCHISTAN ENGINEERING COLLEGE, KHUZDAR.

A. CIVIL ENGINEERING DEPARTMENT

1. Structural and Concrete Section

(a) Testing of Materials Labs.
(b) Concrete Lab.

2. Soil Mechanics Section

(a) Geological Engineering Lab.
(b) Soil Mechanics Lab.

3. Road and Highway Section

(a) Building and Roads Lab.

4. Sanitary Engineering & Irrigation Section

(a) Fluid Mechanics Lab.
(b) Hydraulics Lab.
(c) Sanitary Engineering Lab.

5. Surveying Section

Surveying Lab.

6. Drawing Room Section

Drawing Labs.

B. COMMON EDUCATIONAL EQUIPMENT

1. Applied Physics Section.

Physics Lab.

2. Applied Chemistry Section

Chemistry Lab.

3. Language Laboratory Equipment

C. MECHANICAL ENGINEERING DEPARTMENT

1. Hydraulic Laboratory Section

(a) Fluid Mechanics
(b) Gas dynamics Lab.

2. Material Testing Section

(a) Metallurgy, Metallography and Material Testing Lab.

3. Predision measuring Section

(a) Mechanics I & II.

4. Workshop Section

(a) Machineshop
(b) Sheet Metalshop
(c) Weldingshop
(d) Foundryshop
(e) Carpentary shop
(f) Fabrication shop

5. Heat Engine Section

(a) Internal Combustion Laboratory
(b) Steam Laboratory

6. Airconditioning and Refrigeration Section

(a) Heat Transfer Laboratory

7. Heat Treatment Section

(a) Fuel Combustion Laboratory
(b) Lubrication Laboratory

8. Automotive Workshop Section

(a) Automotive workshop

9. Drawing Room Section

(a) Engineering Drawing Laboratory

D. ELECTRICAL ENGINEERING DEPARTMENT

1. Electricity Section

(a) First year Electrical Engineering equipment
(b) Elementary General purpose Laboratory
(c) Electrical Research Laboratory

(d) Electrical Machines Laboratory

(e) Advance Elect. Machine Laboratories.

2. Electronic Section

(a) Electronics control Laboratory

3. Telecommunication Section

(a) Measurements and Telecommunication Laboratory

4. Workshop Section

(a) Electric Workshop Laboratory

5. Drawingroom Section

(a) Engineering Drawing Laboratory (As in Mechanical).

5.4

6. Computer Section

ANNEX 2

The curriculum set in the College is as follows*-

Bi-Annual Programme, Civil Engineering Department

TERMS	I		II		III		IV		V		VI		VII		VIII	
SUBJECTS	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr
MS 104 Applied Physics	4	4														
MS 105 Mathematics-I	4	-														
CE 101 Engineering Drawing-I	4	4														
ME 104 Workshop Practice	-	4														
HS 102 Islamic Studies-I	2	-														
CE 102 Engineering Machanics	4	4														
MS 112 Mathematics-II			4	-												
CE 103 Surveying-I			4	4												
MS 106 Applied Chemistry			4	4												
ME 201 Thermodynamics			4	4												
HS 101 English			4	-												
CE 201 Surveying-II					4	4										
EE 201 Electrical Techology					4	4										
CE 104 Strength of Materials-I					4	4										
HS 211 Mathematics-II					4	-										
CE 202 Engineering Materials					4	2										
MS 212 Mathematic-IV							4	-								
CE 203 Engineering Drawing-II							4	4								
CE 204 Flui Mechanics-I							4	4								
CE 205 Concrete Technology							2	4								
CE 206 Theory of Structures-I							4	-								
HS 201 Islamic Studies-II							2	-								
MS 311 Mathematics-V									4	-						
CE 301 Strength of Materials-II									4	-						
CE 302 Transportation Engineering-I									4	2						
CE 303 Engineering Construction									4	-						
CE 304 Reinforced Concrete-I									4	4						
MS 301 Engineering Economics									4	-						
CE 305 Soil Machanics-I.											4	2				
CE 306 Engineering Geology											4	4				
CE 307 Quantity Surveying & Costing											4	4				
CE 308 Theory of Structure-II											4	-				
CE 309 Reinforeced Conorete-II											4	2				
HS 302 Islamic Studies-III											2	-				
CE 401 Steel Structures													4	-		
CE 402 Structural Design													4	2		
CE 403 Soil Mechanics-II													4	2		
CE 404 Sanitary Engineering-I													4	4		
CE 405 Fluid Mechanics-II													4	4		
CE 411 Civil Engineering Project													-	-		
CE 406 Construction Management															2	-
CE 407 Transportation Engineering-II															4	2
CE 408 Water Resources Engineering															4	2
CE 409 Archetecture & Town Planning															4	-
CE 410 Sanitary Engineering-II															4	4
CE 411 Civil Engineering Project															-	12
TOTALS	18	16	20	12	20	14	20	12	24	6	22	12	20	12	18	20
TOTAL CREDIT HOURS	26		26		27		26		27		28		26		28	

BE-ANNUAL PROGRAMME, MECHANICAL ENGINEERING DEPARTMENT

TERMS	I		II		III		IV		V		VI		VII		VIII			
SUBJECTS	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr		
ME 101 Engineering Mechanics-I	4	4																
CE 103 Surveying -I	3	3																
MS 115 Calculus-I	4	-																
MS 107 Chemistry	4	4																
MS 101 English	4	-																
ME 102 Engineering Mechanics-II			4	4														
ME 103 Engineering Drawing			4	6														
ME 104 Workshop Practice			-	4														
MS 116 Calculus-II			4	-														
MS 104 Physics			4	4														
MS 105 Pakistan Studies-I			2	-														
ME 201 Thermodynamics					4	4												
ME 202 Solid Mechanical					4	4												
ME 205 Production Engineering-I					4	4												
ME 212 Electrical Technology-I					4	4												
MS 215 Differential Equations					4	-												
ME 203 Fluid Mechanical-I									4	4								
ME 204 Elements of MACHINE Dynamics and Design									4	4								
EE 214 Electronics									4	4								
MS 216 Mathematical Methods									4	-								
MS 204 Islamic Studies -I OR (for Muslims)									2	-								
MS 205 Pakistan Studies-II (for Non-Muslims)									2	-								
ME 301 Internal Combustion Engines											4	4						
ME 302 Steam Generation and Steam Turbines											4	4						
ME 303 Solid Mechanics-II											4	4						
ME 309 Metallurgy											4	4						
MS 315 Numerical Analysis											3	-						
MS 303 Engineering Economics											4	-						
ME 304 Fluid Mechanics-II													4	4				
ME 305 Machine Design													4	4				
ME 306 Mechanical Vibrations													4	4				
ME 307 Heat Transfer - I													4	4				
ME 311 Production Engineering-II													4	4				
MS 318 Probability and Statistics													2	-				
MS 304 Islamic Studies-II OR (for Muslims)													2	-				
MS 306 Ethical Behaviour (for Non Muslims)													2	-				
ME 401 Stress Analysis															4	4		
ME 402 Gas Dynamics															4	4		
ME 404 Heat Transfer-II															4	4		
ME 405 Refrigeration & Air Conditioning															4	4		
MS 415 Advanced Mathematics Technique															2	-		
ME 407 Gas Turbines																	4	4
ME 406 Nuclear Power																	4	4
ME 407 Lubrication																	4	4
ME 411 Industrial Engineering																	4	4
Me 409 Mechanical Engineering Design Project																	-	6
TOTAL	19	11	18	18	20	16	18	12	23	16	24	20	18	16	16			
TOTAL CREDIT HOURS	24.5		27		28		24		31		34		26		27			

5-4

Bi-Annual Programme, Electrical Engineering Department

TERMS	I		II		III		IV		V		VI		VII		VIII	
SUBJECTS	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr
EE 113 Basic Electrical Engineering	4	2														
ME 101 Engineering Mechanics-I	4	2														
MS 113 Mathematics-I	4	-														
MS 102 Physics	2	1														
MS 101 English	4	-														
HS 102 Islamic Studies-I OR HS 103 Pakistan Studies-I	2	-														
EE 114 Basic Circuit Theory			4	2												
EE 132 Basic Electronics			4	2												
ME 103 Engineering Drawing			4	-												
ME 104 Workshop Practics			-	4												
MS 213 Mathematics-II			4	-												
MS 105 Chemistry			4	2												
EE 221 Electrical Measuring Instrument					4	2										
EE 233 Electronics-I					4	2										
EE 241 Basic Electrical Machines					4	2										
ME 102 Engineering Mechanics-II					4	2										
MS 214 Mathematics-III					4	-										
HS 201 Islamic Studies-II OR HS 202 Pakistan Studies-II					2	-										
EE 222 Electrical Measurements							4	2								
EE 234 Electronics -II							4	2								
EE 242 Electrical Machines-I							4	2								
ME 201 Thermodynamics							4	2								
CS 202 Fortan-IV Programming							4	2								
MS 313 Mathematics-IV							4	-								
EE 315 Network theory									4	2						
EE 335 Power Electronics									4	2						
EE 343 Electrical Machines-II									4	2						
EE 352 Electrical Power Systems-I									4	2						
MS 315 Mathematics - V									4	-						
HS 303 Engineering Economics									4	-						
EE 336 Industrial Electronics											4	2				
EE 344 Electrical Machine Design & Drawing											4	-				
EE 372 Linear Control System-I											4	2				
EE 361 Logic Design & Switching Theory											4	2				
EE 382 Electromagnetic Field - I											4	2				
HS 105 Pakistan Studies - I OR HS 306 Ethical Behaviour											2	-				
EE 445 Generalised electrical Machines Theory													4	2		
EE 453 Electrical Power System -II													4	-		
EE 462 Analog & Digital Techniques													4	2		
EE 451 Energy Conversion													4	2		
EE 492													4	2		
EE 401 Electrical Engineering Project															-	8
EE 454 Electrical Power System-III (Analysis Protection)															4	2
EE 464 Computer Architecture & Organisation															4	2
EE 473 Linear Control Systems-II															4	2
EE 483 Electromagnatic Fields-II															4	2
EE 493 Telecommunications-II															4	2
TOTAL	20	5	20	10	22	8	24	10	24	8	22	8	20	18		
TOTAL CREDIT HOURS	25		30		30		34		32		30		38			

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Appencix-1-(2) Minutes of Discussions on October 29, 1987

MINUTES OF DISCUSSIONS
ON
THE PROJECT FOR PROVISION OF
LABORATORY AND EDUCATIONAL EQUIPMENT
FOR BALUCHISTAN ENGINEERING COLLEGE, KHUZDAR
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

In response to the request of the Government of the Islamic Republic of Pakistan, the Government of Japan has decided to conduct a basic design study on the Project for Provision of Laboratory and Educational Equipment for Baluchistan Engineering College, Khuzdar and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Pakistan the Basic Design Study Team headed by Prof. Dr. Susumu Yamashiro, Kitami Institute of Technology from April 18 to May 8, 1987. The Team had a series of discussions on the Project with the officials concerned of the Government of the Islamic Republic of Pakistan and conducted a field survey in Karachi and Khuzdar.

As a result of the study, JICA prepared a draft report and dispatched a team to explain and discuss the report from October 24 to October 30, 1987.

Both parties had a series of discussions on the Report and agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

Islamabad, October 29, 1987

Prof. Dr. Susumu Yamashiro
Leader
Basic Design Study Team
Japan International
Cooperation Agency

Mr. Munir Ahmad
Joint Educational Adviser
Ministry of Education
Government of Pakistan

ATTACHMENT

1. The Pakistan side has agreed in principle to the basic design proposed in the Draft Report with minor but appropriate alternation to be incorporated in the Final Report.

2. The Final Report (10 copies in English) on the Project will be submitted to the Pakistan side by the end of December, 1987.

3. The Pakistan side understood Japan's grant aid system and confirmed that the necessary measures will be taken by the Pakistan side as shown in ANNEX-1 and as mentioned in the item 9-3) of the Attachment to Minutes of Discussions on the Project signed on April 26, 1987, on condition that the grant aid by the Government of Japan be extended to the Project.

4. The Pakistan side ensured that the necessary budget for proper and effective operation and maintenance of the equipment provided under the Grant Aid will be allocated along with adequate number of the Pakistani personnel with sufficient knowledge and experience.

5. The Pakistan side assured that the schedule for the completion of civil works including electricity lines, water supply and other utilities for installing the equipment are as follows;

(a) Civil, mechanical, electrical and basic science laboratory buildings

Although the construction work has been completed, the connecting work to utilities main is to be completed by December 1987.

(b) *Workshop*

Construction work is to be completed by May 1988 with connecting work to utilities main.

6. Ministry of Education, the Government of Pakistan is the sponsoring agency, and Baluchistan Engineering College, Khuzdar (the College) is the executing agency for the implementation of the Project.

7. The progress on establishment of the College is as follows;

(a) The admission procedures have started in October, 1987.

(b) The academic session will start with effect from February 15, 1988.

(c) The College has assigned 25 teaching staff and 15 technical staff as attached in ANNEX-2.

(d) The further programme to recruit teaching staff of the College is shown in ANNEX-3.

8. The Team stated that the implementation of the 2nd phase of the Project may be considered on condition that the recruitment plan in 1988 shown in 7-(d) be fulfilled.

9. The Pakistan side requested such equipment as shown in ANNEX-4 to be added to the equipment list in the Basic Design Draft Report.

The Team stated that the above requested equipment will be further examined whether admittable to the above list.

ANNEX-1

NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF PAKISTAN

1. To arrange the appropriate buildings with facilities of electricity, water supply, drainage, etc., before commencement of installation work.

2. To ensure prompt unloading, tax exemption, customs clearance at ports of disembarkation in Pakistan and prompt internal transportation of the equipment provided under the Grant Aid.

3. To exempt Japanese nationals involved in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Pakistan with respect to the supply of the equipment and services under the verified contracts.

4. To accord Japanese nationals whose services may be required in connection with the supply of the equipment and the services udner the verified contract such facilities as may be necessary for their entry into Pakistan and stay therein for the execution of the Project.

ANNEX-2

TEACHING AND TECHNICAL STAFF EMPLOYED
(AS OF OCTOBER, 1987)

1) Teaching Staff

Department			Numbers
Civil Engineering	Professor		1
	Lecturer		3
Mechanical	Professor		1
Engineering	Lecturer		3
Electrical	Associated Professor		1
Engineering	Lecturer		8
Basic Science/	Professor	(Mathematics)	1
Humanities	Lecturer	(Mathematics)	2
		(Physics)	2
		(Chemistry)	2
		(Islamiat)	1

2) Teaching Staff (Laboratory Instructor)

Civil Engineering	4
Mechanical Engineering	4
Electrical Engineering	5
Basic Science	2

ANNEX - 3

RECRUITMENT PLAN OF TEACHING STAFF

Department	Status	Numbers to be Recruited			
		1987 (Present)	1988	1989	Target
Civil Engineering	Professor	1	-	1	2
	Associated Prof.	-	1	-	1
	Assistant Prof.	-	1	1	2
	Lecturer	3	1	-	4
	Technical staff	4+5	-	-	9
Mechanical Engineering	Professor	1	-	1	2
	Associate Prof.	-	1	-	1
	Assistant Prof.	-	1	1	2
	Lecturer	3	1	-	4
	Technical staff	4+10	-	-	14
Electrical Engineering	Professor	-	1	-	1
	Associate Prof.	1	-	1	2
	Assistant Prof.	-	1	1	2
	Lecturer	3(*5)	1	-	4
	Technical staff	5+4	-	-	9
Basic Sciences	Professor	1	-	-	1
	Associate Prof.	-	1	1	2
	Assistant Prof.	-	2	1	3
	Lecturer	7+1	-	-	6
	Technical staff	2+1	-	-	3
Total	Prof. and Assott.Prof. and Asst. Prof.	4	9	8	21
	Lecturer	16+1(*5)	3	-	20
	Technical staff	15+20	-	-	35

Note : * 5 lecturers have been kept as leave reserves as per directions of the Prime Minister.

\+ The posts have been advertised and will be filled by the end of December, 1987.

ANNEX - 4

THE ADDITIONAL EQUIPMENT REQUESTED BY THE PAKISTAN SIDE

1. Civil Engineering Department
   1) Impact strength testing machine
   2) Rock splitting and crushing machine
   3) Single spindle lapping machine
   4) High speed diamond wheel
   5) Apparatus for Atterberg limit of soil samples
   6) Geodetic theodolite

2. Mechanical Engineering Department
   1) Bernoullis principle apparatus
   2) Tool-maker microscope
   3) Hardness tester for wax

3. Electrical Egnineering Department
   1) Single tracer
   2) TV trainer (colour)
   3) Protective relays
   4) Audio-video monitor
   5) Sound and vibration analyser
   6) Corona testing equipment

Appendix-2 Member List

Basic Design Study team (Apr. 18, 1987 - May 8, 1987)

Leader	Dr. Susumu YAMASHIRO	Professor, Department of Electrical Engineering, Kitami Institute of Technology
Grant Aid System	Mr. Naoto YOKOTA	Grant Aid Department, Ministry of Foreign Affairs
Educational Equipment (Mechanical and Electrical Eng.)	Mr. Kikou NAGASAWA	UNICO International Corp.
Educational Equipment (Civil Eng. Cost Estimation)	Mr. Atsushi KAMEDA	UNICO International Corp.
Layout Plan Infrastructure and Utilities	Mr. Arata SATO	UNICO International Corp.

Draft Final Report Explanation Team (Oct. 24, 1987 - Oct. 30, 1987)

Leader	Dr. Susumu YAMASHIRO	Professor, Department of Electrical Engineering, Kitami Institute of Technology
Grant Aid System	Mr. Naoto YOKOTA	Grant Aid Department, Ministry of Foreign Affairs
Educational Equipment (Mechanical and Electrical Eng.)	Mr. Kikou NAGASAWA	UNICO International Corp.

Educational Equipment (Civil Eng. Cost Estimation)	Mr. Atsushi KAMEDA	UNICO International Corp.

Appendix-3 Schedule

Basic Design Study Team (Apr. 18, 1987 - May 8, 1987)

	Date	Description
1.	April 18th (Sat.)	Leave Tokyo
2.	19th (Sun.)	Arrive at Islamabad - Visit to Ministry of Education (Planning Wing), Explanation of outline of the study and schedule, etc. - Visit to Economic Affairs Division for the briefing outline of the study - Visit to JICA Pakistan Office Explanation of outline of the study and schedule, etc.
3.	20th (Mon.)	Leave Islamabad for Karach
4.	21st (Tue.)	- Visit to NED University Explanation of the object of study, questionaire, etc. Discussion on the curricurum and the equipment for BEC, Khuzdar - Visit to Dawood Engineering College Excursion of laboratories
5.	22nd (Wed.)	Leave Karachi for Quetta - Visit to Baluchistan Government (Planning and Development Department) Explanation of the object of study, questionaire, etc. Explanation of Japan's Grant Aid Program Discussion on the provision of equipment for BEC, Khuzdar

6.	23rd (Thu.)	- Visit to Baluchistan Government (Chief Secretary) Explanation of the Study Leave Quetta for Islamabad - Visit to JICA Pakistan Office Explanation of the study
7.	24th (Fri.)	Tour to Tarvela dam site and hydraurie generation plant
8.	25th (Sat.)	Member meeting on the minutes preparation Draft preparation of Minutes of Discussions
9.	26th (Sun.)	- Visit to Ministry of Education (Planning Wing) Discussion on the Minutes of Discussions - Minutes of Discussions officialy agreed upon and signed by Pakistan and Japan's representatives at the office of Ministry of Education, Islamabad
10.	27th (Mon.)	- Visit to JICA Pakistan Office Report on the Minutes of Discuss exchange Leave Islamabad for Karachi, Team leader leave Karachi for Tokyo
11.	28th (Tue.)	- Member meeting on collected data and materials One member (Mr. Sato) leave Tokyo for Karachi
12.	29th (Wed.)	- Visit to NED University Investigation of mechanical engineering department laboratory
13.	30th (Thu.)	- Visit to NED University Investigation of civil and electrical engineering department laboratories

14.	May	1st (Fri.)	Flight to Quetta was cancelled due to weather condition
15.		2nd (Sat.)	Leave Karachi for Quetta, and drive to Khuzdar
16.		3rd (Sun.)	- Tour each building of the College and construction site Confirmation of the establishment schedule of the College
17.		4th (Mon.)	Drive to Karachi
18.		5th (Tue.)	- Data and materials collection (Transportation company)
19.		6th (Wed.)	- Data and materials collection (NED University)
20.		7th (Thu.)	- Data and materials collection (Constructing Consultant)
21.		8th (Fri.)	Leave Karachi for Tokyo

Draft Final Report Explanation Team (Oct. 24, 1987 -Oct. 30, 1987)

	Date		Description
1.	October	24th (Sat.)	Leave Tokyo
2.		25th (Sun.)	Arrive at Islamabad via Karachi - Visit to JICA Pakistan Office Confirmation on the schedule - Visit to Economic Affairs Division Briefing the outline of the Draft Report - Visit to Ministry of Education Explanation and discussion of the Project, and the schedule of meeting Handed out the Draft Report

		- Visit to Japanese Embassy Briefing the main feature on the Draft Report
3.	26th (Mon.)	- Visit to Ministry of Education Presentation of the Draft Report Confirmation on the description in the Report Discussion on the items of equipment
4.	27th (Tue.)	- Visit to Ministry of Education Discussion on the items of equipment
5.	28th (Wed.)	- Visit to JICA Pakistan Office Report on the progress of the meeting - Visit to Ministry of Education Confirmation of the contents agreed between both parties Discussion on Minutes of Discussions
6.	29th (Thu.)	- Signing of Minutes of Discussions at the office of Ministry of Education - Visit to Japanese Embassy Report on the result of explanation and discussions Leave for Karachi
7.	30th (Fri.)	Leave Karachi for Tokyo

Appendix-4 Personnel with whom the Study Team Met

Basic Design Study Team (Apr. 18, 1987 - May 8, 1987)

Ministry of Education, Islamabad

Mr. Munir Ahmad	Joint Educational Advisor
Dr. Perveen Shahid	Deputy Educational Advisor
Mr. Said Ghulam	Assistant Educational Advisor

Economic Affairs Division

Mr. Hassan Zaidi	Deputy Secretary

Government of Baluchistan

Mr. S. R. Poonegar	Chief Secretary
Mr. Fateh Khan Khajjak	Additional Chief Secretary, P and D Department
Mr. Mohammad Anwar Ketheran	Educational Secretary
Mr. Shankat Ali Khan	Additional Educational Secretary
Mr. M. Azam Kasi	Chief (Education), P and D Department
Mr. Edwin Pasha	Assistant Chief (Education), P and D Department

Baluchistan Engineering College, Khuzdar

Mr. Minza Anwar-ul Haq	Project Director, Principal
Prof. Aziz-ul Hasan Khan	Professor of Civil Engineering
Mr. Mushtaq Ahmad Mirani	Associate Professor of Electrical Engineering

NED University of Engineering & Technology

Prof. Dr.-ING. Jameel Ahmed Khan	The Vice Chancellor
Prof. Dr. Mir Wahid Ali	Chairman, Mechanical Engineering
Prof. Dr. S. M. Makhdoomi	Chairman, Civil Engineering
Prof. Dr. Abdul Samad Khan	Civil Engineering
Mr. Abdul Azim Siddiqui	Chairman, Electrical Engineering

Dawood College of Engineering & Technology

Prof. Dr. Haroon H. Jangda	Chairman, Chemical Engineering
Prof. Kausar Bashir Ahmed	Dean Faculty of Architect and Planning, NED Unviersity
Prof. A. Majeed Bugio	Chairman, Electronics Engineering
Prof. Rano Mal Hirani	Chairman, Industrial Engineering
Prof. M. Saleem Khan	Chairman, Metallurgy Engineering
Mr. A. H. Channa	Director, Finance and Administration
Prof. M. Amin Shaikh	Chairman, Arch and Planning
Engr. Shakeeluddim Shaikh	Chemical Engineering

Japanese Embassy

Mr. S. Obu	First Secretary
Mr. S. Karimata	First Secretary

JICA Pakistan Office

Mr. K. Wada	President Representative
Mr. M. Tateishi	Officer

Draft Final Report Exlanation Team (Oct. 24, 1987 - Oct. 30, 1987)

Economic Affairs Division

Mr. Akhtar Iqbal	Deputy Secretary

Ministry of Education, Islamabad

Mr. Munir Ahmad	Joint Educational Advisor
Prof. S.M.H. Mashhadi	Deputy Educational Advisor
Mr. Said Ghulam	Assistant Educational Advisor

Government of Baluchistan

Mr. Ghulam Sarwar Mengal	Deputy Secretary, Department of Education

Baluchistan Engineering College, Khuzdar

Mr. Mirza Anwar-ul Haq	Principal/Project Director
Prof. Aziz-ul Hasan Khan	Professor of Civil Engineering
Dr. Mohammed Hadi	Professor of Mechanical Engineering
Mr. Mushtaq Ahmad Mirani	Associate Professor of Electrical Engineering

Japanese Embassy

Mr. G. Kobayashi	Minister
Mr. S. Obu	First Secretary

JICA Pakistan Office

Mr. K. Tanigawa	Resident Representative

Appendix-5 Proposed Study Programme set in the College

(1) BI-ANNUAL PROGRAMME FOR BACHELORS DEGREE IN CIVIL ENGINEERING

		Credit Hours per Week	
First Term		**Theory**	**Practical**
MS 104	Applied Physics	4	4
MS 105	Mathematics - 1	4	0
CE 101	Engineering Drawing-I	4	4
ME 104	Workshop Practice	0	4
HS 102	Islamic Studies-I	2	0
CE 102	Engineering Mechanics	4	4
		18	16

Total Credit Hours = 26

Second Term

MS 112	Mathematics - II	4	0
CE 103	Surveying - I	4	4
MS 106	Applied Chemistry	4	4
ME 201	Thermodynamics	4	4
HS 101	English	4	0
		20	12

Total Credit Hours = 26

Third Term

CE 201	Surveying - II	4	4
EE 201	Electrical Technology	4	4
CE 104	Strength of Materials - I	4	4
HS 211	Mathematics - II	4	0
CE 202	Engineering Materials	4	2
		20	14

Total Credit Hours = 27

Forth Term		Credit Hours per week Theory	Practical
MS 212	Mathematics - IV	4	0
CE 203	Engineering Drawing - II	4	4
CE 204	Fluid Mechanics - I	4	4
CE 205	Concrete Technology	2	4
CE 206	Theory of Structures - I	4	0
HS 201	Islamic Studies - II	2	0
		20	12

Total Credit Hours = 26

Fifth Term

MS 311	Mathematics - V	4	0
CE 301	Strength of Materials - II	4	0
CE 302	Transportation Engineering - I	4	2
CE 303	Engineering Construction	4	0
CE 304	Reinforced Concrete - I	4	4
MS 301	Engineering Economics	4	0
		24	6

Total Credit Hours = 27

Sixth Term

CE 305	Soil Mechanics - I	4	2
CE 306	Engineering Geology	4	4
CE 307	Quantity Surveying & Costing	4	4
CE 308	Theory of Structure - II	4	0
CE 309	Reinforced Concrete - II	4	2
HS 302	Islamic Studies - III	2	0
		22	12

Total Credit Hours = 28

Seventh Term		Credit Hours per week Theory	Practical
CE 401	Steel Structures	4	0
CE 402	Structural Design	4	2
CE 403	Soil Mechanics - II	4	2
CE 404	Sanitary Engineering - I	4	4
CE 405	Fluid Mechanics - II	4	4
CE 411	Civil Engineering Project	0	0
		20	12

Total Credit Hours = 26

Eighth Term

CE 406	Construction Management	2	0
CE 407	Transportation Engineering - II	4	2
CE 408	Water Resources Engineering	4	2
CE 409	Archetecture & Town Planning	4	0
CE 410	Sanitary Engineering - II	4	4
CE 411	Civil Engineering Project	0	12
		18	20

Total Credit Hours = 28

(2) BI-ANNUAL PROGRAMME FOR BACHELORS DEGREE IN MECHANICAL ENGINEERING

First Term		Credit Hours per Week Theory	Practical
ME 101	Engineering Mechanics - I	4	4
CE 103	Surveying - I	3	3
MS 115	Calculus - I	4	0
MS 107	Chemistry	4	4
HS 101	English	4	0
		19	11
	Total Credit Hours =	24.5	

Second Term			
ME 102	Engineering Mechanics - II	4	4
ME 103	Engineering Drawing	4	6
ME 104	Workshop Practice	0	4
MS 116	Calculus - II	4	0
MS 104	Physics	4	4
MS 105	Pakistan Studies - I	2	0
		18	18
	Total Credit Hours =	27	

Third Term			
ME 201	Thermodynamics	4	4
ME 202	Solid Mechanics - I	4	4
ME 205	Production Engineering - I	4	4
EE 212	Electrical Technology - I	4	4
MS 215	Differential Equations	4	0
		20	16
	Total Credit Hours =	28	

Forth Term		Credit Hours per week Theory	Practical
ME 203	Fluid Mechanis - I	4	4
ME 204	Elements of Machine Dynamics and Design	4	4
EE 214	Electronics	4	4
MS 216	Mathematical Methods	4	0
MS 204	Islaic Studies - I (for Muslims) or	2	0
MS 205	Pakistn Studies - II (for Non-Muslims)		
		18	12
	Total Credit Hours =	24	

Fifth Term			
ME 301	Internal Combustion Engines	4	4
ME 302	Steam Genertion and Steam Turbines	4	4
ME 303	Solid Mechanics - II	4	4
ME 309	Metallurgy	4	4
MS 315	Numerical Analysis	3	0
MS 303	Engineering Economics	4	0
		23	16
	Total Credit Hours =	31	

Sixth Term			
ME 304	Fluid Mechanics - II	4	4
ME 305	Machine Design	4	4
ME 306	Mechanican Vibrations	4	4
ME 307	Heat Transfer - I	4	4
ME 311	Production Engineering - II	4	4
MS 318	Probability and Statistics	2	0
MS 304	Islamic Studies - II (for Muslims) or	2	0
MS 306	Ethical Behaviour (for Non Muslims)		
		24	20
	Total Credit Hours =	34	

Seventh Term		Credit Hours per week Theory	Practical
ME 401	Stress Analysis	4	4
ME 402	Gas Dynamics	4	4
ME 404	Heat Transfer - II	4	4
ME 405	Refrigration and Air Conditioning	4	4
MS 415	Advanced Mathematical Techniques	2	0
		18	16
	Total Credit Hours =	26	

Eighth Term			
ME 403	Gas Turbines	4	4
ME 406	Nuclear Power	4	4
ME 407	Lubrication	4	4
ME 411	Industrial Engineering	4	4
ME 409	Mechanical Engineering Design Project	0	6
		16	22
	Total Credit Hours =	27	

(3) BI-ANNUAL PROGRAMME FOR BACHELORS DEGREE IN ELECTRICAL ENGINEERING

		Credit Hours per Week	
First Term		**Theory**	**Practical**
EE 113	Basic Electrical Engineering	4	2
ME 101	Engineering Mechanics - I	4	2
MS 113	Mathematics - I	4	0
MS 102	Physics	2	1
MS 101	English	4	0
HS 102	IslamicStudies - I or		
HS 103	Pakistan Studies - I	2	0
		20	5
	Total Credit Hours =	25	
Second Term			
EE 114	Basic Circuit Theory	4	2
EE 132	Basic Electronics	4	2
ME 103	Engineering Drawing	4	0
ME 104	Workshop Practice	0	4
MS 213	Mathematics - II	4	0
MS 105	Chemistry	4	2
		20	10
	Total Credit Hours =	30	

Third Term		Credit Hours per Week Theory	Practical
EE 221	Electrical Measuring Instruments	4	2
EE 233	Electronics - I	4	2
EE 241	Basic Electrical Machines	4	2
ME 102	Engineering Mechanics - II	4	2
MS 214	Mathematics - III	4	0
HS 201	*Islamic Studies - II or*		
HS 202	Pakistan Studies - II	2	0
		22	8
	Total Credit Hours =	30	

Fourth Term			
EE 222	Electrical Measurements	4	2
EE 234	Electronics - II	4	2
EE 242	Electrical Machines - I	4	2
ME 201	Thermodynamics	4	2
CS 202	Fortran-IV Programming	4	2
MS 313	Mathematics - IV	4	0
		24	10
	Total Credit Hours =	34	

Fifth Term			
EE 315	Network Theory	4	2
EE 335	Power Electronics	4	2
EE 343	Electrical Machines - II	4	2
EE 352	Electrical Power Systems -I	4	2
MS 315	Mathematics - V	4	0
HS 303	Engineering Economics	4	0
		24	8
	Total Credit Hours =	32	

Sixth Term		Credit Hours per Week Theory	Practical
EE 336	Industrial Electronics	4	2
EE 344	Electrical Machine Design & Drawing	4	0
EE 372	Linear Control Systems - I	4	2
EE 361	Logic Design & Switching Theory	4	2
EE 382	Electromagnetic Field - I	4	2
HS 105	Pakistan Studies - I or		
HS 306	Ethical Behaviour	2	0
		22	8
	Total Credit Hours =	30	

Seventh Term			
EE 445	Generalised Electrical Machines Theory	4	2
EE 453	Electrical Power Systems - II	4	0
EE 462	Analog & Digital Techniques	4	2
EE 451	Energy Conversion	4	2
EE 492	Telecommunications - I	4	2
		20	8
	Total Credit Hours =	28	

Eight Term			
EE 401	Electrical Engineering Project	0	8
EE 454	Electrical Power Systems - III (Analysis Protection)	4	2
EE 464	Computer Architecture & Organisation	4	2
EE 473	Linear Control Systems - II	4	2
EE 483	Electromagnetic Fields - II	4	2
EE 493	Telecommunications - II	4	2
		20	18
	Total Credit Hours =	38	

Appendix-6 Proposed Subjects of Experiments to be Undertaken in Each Laboratory

A. CIVIL ENGINEERING DEPARTMENT

A-1 Structural and Concrete Section

Subject Strength of Materials (2nd Year)

1. To determine the impact strength of metals
2. To determine the fineness of cement by means of the No. 200 sieve
3. To determine the normal consistency of a given sample of cement
4. To determine the initial and final setting time of cement
5. Preparation of briquettes
6. Determination of tensile strength of cement
7. To determine the modules of rigidity of a given metal specimen

Subject Concrete Technology (2nd Year)

1. To determine the fineness modulus of fine aggregate
2. To determine the moisture content of coarse aggregate
3. To determine the resistance to abrassion of stones by Los Angeles abrassion test
4. To determine the compressive strength of concrete cubes and cylinders for various mix designs
5. To determine the tensile strength of concrete by splitting test of cylinders
6. To determine the flexural strength of concrete beams

7. To determine the creep of concrete by using the creep test apparatus

Subject Reinforced Concrete - I (3rd Year)

1. To determine the particle size distribution of the coarse aggregate by sieve analysis
2. To determine the particle size distribution of fine aggregate by sieve analysis
3. To determine the bulk density of coarse aggregate
4. To determine the specific gravity of coarse aggregate
5. To determine the workability of concrete by slump test
6. To determine the compressive strength of micro concrete using 2"x2"x2" cube in universal testing machine
7. To determine the compressive strength of micro concrete using 4"x8" cylinder, in universal testing machine

Subject Reinforced Concrete - II (3rd Year)

1. To determine the workability of concrete by the compaction factor test
2. To determine the consistancy of concrete by the flow test
3. To determine the consistancy of concrete by the ball penetration test
4. To determine the compressive strength of concrete by crushing the cube (6"x6"x6") in universal testing machine
5. To determine the compressive strength of concrete by crushing the cylinder (6"x12") by universal testing machine
6. To determine the compressive strength of concrete using (6"x12") cylinder by spiliting test
7. To determine the flexural strength of prism

8. To determine the compressive strength of concrete on various types of curing

9. To determine the compressive strength of steel bars

10. To determine the tensile strength of steel bars

A-2 Soil Mechanics Section

Subject Engineering Geology (3rd Year)

1. Identification of common minerals

2. Physical properties of the minerals

   a) Color

   b) Streak

   c) Duster

   d) Cracks

   e) Fracture

   3) Hardness

3. Identification of igneous rock

4. Identification of sedimentary rock

5. Identification of metamorphic rock

6. Study of maps:

   a) Contour map

   b) Geo-Physical maps

   c) Earthquake zones

   d) Relief maps

e) Aerial photographs

f) Satellite images for the indentification of different minerals

7. Study of geological structure models

Subject Soil Mechanics - I (3rd Year)

1. Water content determination
2. Field collection of a soil sample
3. Liquid and plastic limits of a soil
4. Shrinkage limit of soils
5. Grain-size analysis mechanical method
6. Grain-size analysis hydrometer method
7. Specific gravity of a soil
8. Classification of soils
9. Moisture density relationship
10. Determination of in-place soil density by sand cone apparatus
11. Determination of in-place soil density by ballonet density apparatus

Subject Soil Mechanics - II (4th Year)

1. Coefficient of permenbility constant head method
2. Coefficient of permeability falling head method
3. Consolidation test
4. Unconfined compression test
5. Triaxial test without pore-pressure measuremetns

6. Triaxial test with pore-pressure measurements

7. Direct shear test

8. Relative density determination

9. California bearing ratio (CBR) test

A-3 Road and Highway Section

Subject Transportation Engineering (3rd Year)

1. Penetration test for asphaltic bitumen

2. Ductility test for asphalt

3. Softening point test

4. Flash and fire point test

5. Specific gravity test for asphalt

6. Marsha test

7. C.B.R. test

8. Asphalt stability test

A-4 Sanitary Engineering & Irrigation Section

Subject Fluid Mechanics - I (2nd Year)

1. To determine densities and specific gravity

2. To determine the viscosity of various liquids at atmospheric pressure and temperature

3. To observe the effect of the size of the gap between two flat plates on capillary elevation

4. To measure the capillary elevation produced by various sizes of capillary tube

5. To show how the free surface of a stitic liquid is horizontal

6. To study the effect of flow on the free surface

7. To measure a change in liquid levels using the hook gauge

8. To show that the intensity of liquid pressure depends only on depth

9. To determine the position of the centre of pressure on the rectangular face of the colloid

10. To read the baromatic or atmospheric pressure

11. To calibrate a bourdon-type pressure gauge using the dead-weight pressure gauge calibrator

12. To use a water over mercury "U" tube manometer to determine the pressure at a point. To compare the reading of a manometer with a bourdon gauge

13. To use an air over mercury "U" tube manometer to determine the pressure at a point

14. To use a water once mercury manometer to determine and compare differences in pressure in a water and air system

15. To verify archimedes principle

16. To determine the meta centric height of a model pontoon

Subject Sanitary Engineering (4th Year)

1. To find the amount of Chlorine contents in a given sample of water in ppm

2. To find out the total acidity in a given sample of water in p.p.m. calcualted as $CaCO_3$

3. To find the PH of a given sample of water in ppm

4. Determination of total residual chlorine

5. To find the sulphate content in a given sample of water in ppm

6. To find out the total alkalinity in a given sample of water calculated as $CaCO_3$

7. To find out the amount of iron present in a given sample of water in ppm

8. Determination of settleable solids in sewage

9. Tayler total hardness test

Subject Water Resources Engineering (4th Year)

1. To determine the characteristics of a sharp edge orifice meter

2. To determine the characteristics of a venturi flow meter

3. To determine the characteristics of a different pipes in parallel

4. To determine the characteristics of a different pipes in series

5. To determine the loss of head in a different pipe fittings

6. To determine the friction factor "P" for each of the four pipes

7. To determine the discharge beneath a sluice gate

8. To determine the force on sluice gate

9. To examine quantitative characteristics of a hydraulics jump formation on a horizontal floor of a rectangular channel

10. To establish uniform flow in rectangular channel

A-5 Surveying Section

Subject Surveying - I (1st Year)

1. Chain surveying
2. Compass transversing
3. Measurement of angles with theodolite
4. Measurement of angles with plainmeter
5. Plane table surveying
6. Offsets in chain surveying
7. Longitudinal and profile levelling

A-6 Drawing Room Section

B. MECHANICAL ENGINEERING DEPARTMENT

B-1 Hydraulic Laboratory Section

Subject Fluid Mechanics (2nd Year)

1. To caliberate a venturi tube with the help of V-Notch
2. To study a flow through a V-Notch
3. Study of high pressure test rig
4. Study of flow through the flow nozzle
5. Calibration of orifice plate with the help of flow nozzle
6. Calibration of "Sharp edge weir" with the help of flow nozzle
7. Study of open channel test rig
8. Study of flow under sluice gate with hydraulic
9. Study of flow over broad created weir

Subject Gas Dynamics (4th Year)

1. Wind tunnel testing of model aircraft, motor cars etc. for drag measurements, lift measurements, pitching moment measurements etc., similar measurements for buildings etc.
2. Blower Testing Machine:

   Test rig for performance curve plotting of air turbomachines, can measure specific power, specific head, flowrate etc. at various specific speeds of blowers, fans etc.
3. Flow Visualisation Equipment:

   Smoke tunnel for study of flows around various objects like aerofoils, cylinders, flat plates etc, with visualistion of laminar versions tubulant flow, flow separation, boundary layer phenomenon etc.

4. Pipe Flow Equipment:

Measurement of velocity profiles across the pipe cross-section at various axial portions and thus study of development of laminar/turbulent velocity profiles in a pipe. Equipment includes a available speed blower at one end.

5. Free Jet:

A small wind tunnel fed by a blower and finally discharging a free jet in the atmosphere. Measurement of velocity profiles, pressure distribution etc. across the jet at various axial positions

Models:

a) Wind turbine (horizontal axis)

b) Gas turbine with an axial flow compressor

c) Centrifugal compressor

d) Vertical axis wind turbines (Darriens rotor, Savonins rotor, etc.)

e) Some common air craft, specially of subsonic range for use in wind tunnel

B-2 Material Testing Section

Subject Solid Mechanics - I (2nd Year)

1. To study the Tinus Olsen universal testing machine

2. To determine the modulus of elasticity and to draw the following:

a) Shear force and B.M. diagram

b) Graph load vs deflection

c) Young's modulus of elasticity load vs extension diagram

3. To determine the maximum shear stress of a given wooden block

4. To determine the maximum shear stress ofa given 1/2" dia. round bar

5. To determine the hardness of a given specimen by Rockwell method

6. To determine the hardness number of a specimen by Brinell method

Subject Solid Mechanics - II (3rd Year)

1. To find the stiffness of a helical spring by spring testing machine

2. To determine the modulus of elasticity of a given rectangular bar and circullar bar, also draw a graph between:

   a) Load v/s deflection

   b) WL^3 v/s 48I same and bending moment shear force diagram

3. To determine the stiffness of a given leaf spring. Also find out the proof load calculate the strain energy started at 100 kg.

4. Through tensile test, determine the following specimen (mild steel).

   a) Modulus of elasticity

   b) Stress strain rurve

   c) U.T.S.

   d) Failure load

5. To determine the maximum shear stress of the given mild steel and brass specimen.

6. To find out the hardness of the following material by Vicker's Method:

   a) Mild steel

   b) Brass

   c) Aluminium

Subject Stress Analysis (4th Year)

1. Study of spring testing machine.

2. To find the following through tensile test.

   a) Strain - stress curve

   b) Modulus of elasticity (Graphically)

   c) U.T.S. (Ultimate tensile strength)

   d) Failure load

3. Maximum shear strength of wooden block; also draw a graph between strain-stress

4. Maximum shear strength of circular bar dia. = 1/2"; also draw a graph between stress vs strain

5. Stiffness of a helical spring, graph between load vs deflection.

6. Stiffness of a load spring, graph between load vs deflection.

7. Strain gauge bridge

8. Torsion testing machine

9. Electronics

B-3 Precision Measuring Section

Subject Engineering Mechanics - I (1st Year)

1. To determine the co-efficient of restitude of different metallic balls with respect to steel blocks
2. To determine the value of unknown mass by using dynamical compression of masses using an inertia balance
3. To make a study of the motion of the body moving with constant speed in circular paths and, its centripetal expansions
4. To verify the initial velocity of the arrow with the help of pendulum
5. To verify Newton's first and second law of motion

Subject Engineering Mechanics - II (1st Year)

1. To determine the modules of rigidity of wire by torsion method
2. To determine the young modules and elasticity of a metalio bar by plunine method
3. To study the different types of gears
4. To study the structural of frames

Subject Vibration (3rd Year)

1. To find the values of 'G' by using a simple pendulum
2. To find the radius of gyration by using compound pendulum
3. To determine the centre of percussion of a given wooden compound pendulum
4. To determine the acceleration of gravity by means of a Kater (Reversible) Pendulums

5. To find the stifiness of a given spring system; also draw a graph between lead and extension

6. To find the moment of inertia of a body about an axis passes through its centre of gravity by using bifilar suspension

Subject Metrology

1. Introduction to metrology and measuring instruments and basic discrimination

2. To use and study the vernier calipper

3. To use metric and inch micrometer

4. Build up a dimension by means of block gauges or slip gauges or limit gauges

5. Measuring angles with universal bevel protector

6. To use dial indicator for checking tolerance, roundness, cum and parallelism

7. Gauging a screw thread by using three wires and an outside micrometer

8. To study the surface texture by using the surface texture testing machine

B-4 Heat Engine Section

Subject Thermodynamics (2nd Year)

1. The thermodynamics concept and definitions

2. Working principle of four stroke spark ignition engine

3. Working principle of two stroke cycle

4. Working principle of compression ignition (diesel) engine

5. Identify the main electrical components and working principle of starting and ignition system of S.I.E.

Subject Internal Combustion Engine (3rd Year)

1. To identify the main components and working principle of a 2-stroke spark ignition engine
2. To identify the main components and working principle of a 4-stroke spark ignition engine
3. To identify the main components and working principle of 4-stroke 2 cylinder spark ignition engine
4. To study the starting and ignition system of a 4-stroke 4-cylinder spark ignition engine
5. Introduction to I.C. engine in relation to performance and characteristics
6. Study the components and working principles of diesel petrol test bed
7. Study of Duetz T-216 Gas Turbine unit with performance characteristics curves.
8. Study of eddy current type electric by dynamometer
9. Study of cetane test unit determination of knocking properties with different cetane No. and compression ratios
10. Study of octane test unit and determination of knocking properties with defferent octane number and compression ratio

Subject Steam Generation & Steam Turbine (3rd Year)

1. Study of water treatment system
2. Introduction of the steam plant

3. Study of gas system, water system, hydraulic system, air system

4. To determine the dryness fraction of the steam flowing in the steam main

5. Study of the steam engine, including formation and of the engine

   a) governor

   b) D-slide valve

   c) Flywheel

6. Study of the steam time

7. How to operate the Boiler

   a) Field test operaiton

   b) Purging operation

   c) Electrical system

   d) Safety and precautions on boilers

B-5 Airconditioning and Refrigeration Section

Subject Heat Transfer - I (3rd Year)

1. To study the working of adjustable thermostat bi-metallic type

2. To study the working of a diaphragm type thermostat

3. To study free convection in liquids

4. To study the natural convection in gases (oil)

5. To compare the thermal conductivities of different materials and cross-sectional areas

6. To study the thermal radiations by parabolic reflectors

7. To determine the thermal conductivity of a thin piece of poorly conductivity material using immersion heater method

Subject Heat Transfer - II (4th Year)

1. To find overall heat transfer coefficients Uo and Ui for passes 3, 4, 5 and 6 for both counter and parallel flow heat exchanger
2. Calculate total thermal resistance of passes 3, 4, 5 and 6 four counter and parallel flow
3. Find out the resistance of metal wall for both counter and parallel flow for pass 3, 4, 5, 6
4. To compare the properties of copper and stainless

Subject Refrigeration and Aircondition (4th Year)

1. To study the domestic refrigerator
2. To study the water cooler
3. To study the room airconditioner
4. To study the vortex tube
5. To study of ice making plant
6. To study of airconditioning system
7. Study of airconditioning system of material testing laboratory
8. Study of re-circulaty airconditioning unit

B-6 Lubrication and Fuel Combastion Section

Subject Lubrication (4th Year)

1. Determination of visc. index (V.1) of a lubricating oil SAE 30/40 by saybolt viscometer
2. Determination of consistency of unworked grease
3. To study the relative accuracy of visc. temperature relations by redwood viscometer No. 1
4. To study the relative accuracy of visc. temperature relations by Redwood Viscometer No. 2

B-7 Workshop Section

Subject Workshop Practice (1st Year)

1. Job Practice

Subject Production Engineering - I (2nd Year)

1. To draw or bead of metal or filter (metal) on a green metallic piece
2. To make a butt joint on two given metallic pieces

Subject Production Engineering - II (3rd Year)

1. Job Practice

B-8 Drawing Room Section

C. ELECTRICAL ENGINEERING DEPARTMENT

C-1 Basic Electrical Engineering Section

Subject Basic Electrical Technology (1st Year)

1. To verify ohms low experimently to draw the characteristics curves between voltage and current, current and resistance
2. To study the steady state response of series RL circuit and to find out the impedance, power and power factor
3. To verify experimentaly the condition for three resistors connected in parallel
4. To study the steady state response of series RC circuit and to find out the impedance, power and power factor

Subject Basic Circuit Theory (1st Year)

1. To study the steady state responses of a series RLC circuit and to determine impedance and power factor
2. To varify the voltage division law in series, resistance circuit
3. To find out the internal resistance R_1 of the source according to the Tevenin's therrom
4. To study the non-linear resistive circuit containing voltmeter energy meter and to plot the characteristic curve betwen current and voltage

Subject Electrical Technology (1st Year)

1. To design series, parallel and combined circuits
2. To measure the current, voltage and power in the circuit
3. To study the RLC circuit and determine the power factor
4. To study and operate the DC machines

5. To study and operate the AC machines

6. To study the transformers

Subject Net Work Theory (3rd Year)

1. To become familiar with Δ & Y transformation of given resistance network and to find out the value of R_X to make equivalent Y of a given network.

2. To analyse a 3 mesh net work using mesh analysis and to check the analytical results by experiment measurement

3. To apply the node voltage method for finding voltages at different modes of a circuit to a given circuit and to verify the equation

4. To analyse a resistive bridge T network and to check the analytical results by experimental measurement

C-2 Electrical Machine Section

Subject Basic Electrical Machine (2nd Year)

1. To study different parts of a DC machines

2. To determine and plot the magnetic characteristic of a separately excited DC generator

3. To determine and plot the magnetic characteristic of a self excited DC generator

4. To perform the open circuit test on a single phase transformer

5. To perform the smart-circuit test on a single phase transformer

6. To determine the load characteristics of a DC shunt generator

7. To determine the efficiency and percentage regulation of a single phase transformer

Subject Electrical Machine - I (2nd Year)

1. Study of a DC shunt motor starter
2. Spend control of a DC shunt motor by field control and rehoestic control method
3. To determine the efficiency losses, of a DC motor by HopKin's test method
4. To determine the losses and efficiency of a series motor generator of a series motor generator set by performing "series field test"
5. To determine the efficiency of a DC motor by retardation test
6. Parallel operation of two DC generators

Subject Electrical Machine - II (3rd Year)

1. To determine the measurement of power of a 3 phase induction motor by two wattmeter method
2. To perform block rotor test with three phase slipring motor
3. To study the working of a Scott-connected transformer
4. To determine the efficiency of two single phase transformer by back to back test
5. To study star delta starter

Subject Generalized Electrical Machine Theory (4th Year)

1. Connect and operate two induction motor in cas cading
2. Efficiency and characteristic of 3 Phase AC Rotatory converter and to verify voltage and current relations
3. Break test of repulsion - start induction motor

4. Break test of resistance split-phase motor

C-3 Electronics Section

Subject Basic Electronics (1st Year)

1. Introduction to electronic component
2. Test circuit to become familiar with the use of a millimeter
3. To measure the current and voltage characteristic of a semi-conductor diode and to determine the value of a level resistor included in the measurement circuit
4. To study the effect, a capacitor filter on the output of a bridge rectified with the help of a oscilloscope
5. To study the volt-ampre characteristic of a Zenor Diode
6. To measure the base and collector current in transister
7. To study the effect of a diode circuit

Subject Electronics - I (2nd Year)

1. To measure the emitter and collector currents following in a common-base p-n-p transistor and to plot the characteristics
2. To find out the type of DTL gate
3. To draw the growth and decay curve of a capacitor for finding value of resistance
4. To measure V_{EE}, V_{CE}, I_C, I_E for the given circuit
5. To test the PET for gm and I_{DSS}
6. To plot the mutual characteristics of a PET and to calculate the transconductance.

Subject Electronics - II (2nd Year)

1. To determine B_F, B_O, and gm of a transistor
2. To determine the differential input resistance differential mode voltage gain and CMMR of differential amplifier pair
3. To determine output resistance of simple current source
4. Determination of operational amplifier as invertor
5. To draw the input or output characteristic of a DTL gate and determine noise margin and type of gate

Subject Linear Control Systems - I (3rd Year)

1. To observe how synchro torque transmitter and indicator work
2. To observe how a differential transformer works with synchro transmitter and synchro-receiver
3. To build up and operate a servo-mechanism

C-4 Telecommunication Section

Subject Electrical Measuring Instruments (2nd Year)

1. To use the AC potentiometer to investigate the amplitude and phase relation ships in a transformer
2. Measurement to non-electrical quantities with the help of transducers i.e, thermoister, straingauge bridge thermocouple
3. The use of Kelvin double bridge for finding an unknown resistance of low value
4. The use of universal bridge to measure the unknown resistance, capacitance and inductance and to verify the results with the help of an RCL bridge

5. To observe the effect of resistance, inductance and capacitance of the circuit on the shape of current wave when the voltage wave is complex (on a C.R.O.). Also to split the given complex wave into its hermonics by the use of a frequency analyser

Subject Electrical Measurement (2nd Year)

1. The calibration of moving coil milliammeter and the measurement of meter

2. A series type ohm-meter circuits for measuring high resistance values

3. A shunt type ohm-meter for the measurement of relatively low values of resistance in the range (1-10) ohms

4. Measurement of power in single phase circuit by 3-ammeter and 3 voltmeter method

5. The measurement of power, power factor and KVAR of a given load by the use of watt-meter, power factor meter, ammeter and volt-meter

6. Measurement of the breaking current of miniature circuit breaker and fuse by the use of variable current source

7. To study the display of a binary counter

8. To measure energy consumed by single phase load in given time

9. To extend the range of AC ammeter and wattmeter by rising current transformer

C-5 Computer Section

C-6 Workshop Section

C-7 Drawingroom Section

D. GENERAL EDUCATION DEPARTMENT

D-1 Applied Physics Section

Subject Applied Physics (1st Year)

1. To find the thermal conductivity of a good conductor by Searle's apparatus
2. To determine the co-efficient of viscosity of transperent oil by Block's apparatus
3. To determine the value of J by constant flow method
4. To determine the co-efficient of thermal conductivity of bad heat conductor by Lee's Charitan method
5. To determine the frequency of tuning fork by sonometer
6. To determine the coefficient of surface tention by capillary rise method
7. To find the horizontal component of earth magnetic field by tangent galvanometer
8. To determine the unknown resistence X by potentiometer
9. To determine the value of J by electrical method
10. To find the ratio of specific heat at constant pressure and value for air i.e. Cp/Cr

D-2 Applied Chemistry Section

Subject Applied Chemistry (1st Year)

1. To plot the titration curve and to determine the total alkalinity of given sample of water in terms of $CaCO_3$ in (a) gm/lit, (b) gm/11 ml and (c) ppm, given: H_2SO_4 - 0.02N

2. To determine the total hardness of $CaCO_3$ in a given sample of water by E.D.T.A. titration, material in (a) gm/lit, (b) gm/33 ml and (c) ppm

3. *Draw the calibration curve and determine the concentration* of the unknown solution in (a) gm/lit, (b) gm/222 ml and (c) ppm

4. To determine the total alkalinity of given sample of water with differentiation of CO_3, HCO and OH in (a) gm/lit, (b) ppm

5. Find out the total acidity a $CaCO_3$ in a given sample of water in (a) gm/lit (b) gm/555 ml (c) ppm

6. Find out the choloride in the given sample of water in (a) gm/lit, (b) gm/666 ml, (c) ppm

7. Find out the amount of ferrous in given sample of water in (a) gm/lit, (b) gm/777 ml, (c) ppm

8. Find out the viscosity of given liquid by Ostwald Viscometer, given viscosity of water W20-9779 poise at 21°C

9. Find out the surface tention of given liquid, surface tension of waste, rw = 72.75 dynatam at 21°C

10. To draw a pH curve and calculate the alkalanity of the given sample in ppm by pH meter

D-3 Language Laboratory Equipment

Appendix-7 Outline of the Equipment Requested by the Pakistani Side

	Requested No. of Items at Basic Design Study	Requested No. of Items at Preliminary Study
Civil Engineering Department		
1. Structural and concrete section	79	64
2. Soil mechanics Section	174	26
3. Road and highway Section	85	25
4. Sanitary and irrigation section	126	30
5. Survey Section	50	36
6. Drawing Section	6	16
Total	520	197
Mechanical Engineering Department		
1. Hydraulic laboratory Section	67	19
2. Material testing section	47	13
3. Precision measuring Section	99	41
4. Workshop Section	87	57
5. Heat engine Section	24	9
6. Air Conditioning & Refrigeration Section	26	11
7. Heat Treatment Section	76	13
8. Automotive Workshop Section	18	26
9. Drawing room section	6	16
Total	450	205

Electrical Engineering Department		
1. Electricity Section	168	97
2. Electronics Section	76	17
3. Telecommunication Section	44	1
4. Workshop Section	20	27
5. Drawing room section	6	16
6. Computer Section	6	13
Total	320	171
Common Educational Equipment		
1. Applied Physics Section	138	54
2. Applied chemistry Section	140	68
3. Language Laboratory Equipment	1	9
Total	279	131
Grand Total	1,569	704

Appendix-8 Rough Estimation of Electricity Consumption

	Acuumulated load	Demand factor	Average load
Civil Engineering Dept.	60 KW	0.2	12 KW
Mechanical Engineering Dept.	80	0.2	16
Electrical Engineering Dept.	60	0.2	12
Basic Science Dept.	40	0.2	8
Work Shop	200	0.3	60
Total			108 KW