APPENDIX 9. LIST OF AVAILABLE EQUIPMENT IN TARGET 11 UNIVERSITIES

APPENDIX 9 AVAILABLE EQUIPMENT LIST IN EACH UNIVERSITIES

I. University of Syiah Kuala

(1) Civil Engineering Dept.

1) Sheat and Strip Metal Tester
2) Building Material Testing Machine
3) Universal Testing Machine UPD
4) Compressive Strength Tester
5) Universal Testing Machine
6) Compressive Strength Tester
7) Pendulum Impact Tester PSW
8) Mortor Mixer
9) Morter Vicat Apparatus Mic
10) Brinell Hordness Test Machine
11) Heating Oven
12) Mortor Viest Apparataus
13) Flow Table Testing Machine
14) Mortar Mixer
15) Balance
16) Soundness Test Set
17) Concrete Mixer
18) Mold of Strength Test
19) Air Content Test Machine
20) Concrete Vibrator
21) Air Content Test Apparatus
22) Aggregate Analysis Test Set
23) Unit Weight Test of Aggregate
24) Concrete Test Curing
25) Heavy Boring Machine
26) Slightly Boring Machine
27) Hand Boring
28) Cone Penetrometer
29) Unconfined Compression Test
30) Direct Shear Test
31) Triaxial Test
32) Consolidation Test
33) Permeability
34) Field CBR
35) Laboratory CBR
36) Compaction Test
37) Sand Cone
38) Potential Volume Change
39) Swelling Test
40) Specific Gravity App.
41) Atterberg Limit App.
42) Grain Size Analysis
43) Hydrometer
44) Oven
45) Balance
46) Hanging Theodolite
47) Level
48) Planimeter
49) Wooden Levelling Staff

(2) Mechanical Engineering Dept.

1) Vertical Milling Machine
2) Horizontal Milling Machine
3) Universal Milling Machine
4) Shaper Machine
5) Column Drilling Machine
6) Bench Drilling Machine
7) Lathe
8) Band Drilling Machine
9) Band Saw Machine
10) Three Roller Plate Machine
11) Hack Saw Machine
12) Cutter Grinding Machine
13) Air Commpressor
14) Bench Grinding Machine
15) Universal Testing Machine
16) Arc Welding Machine
17) Arc Welding Machine
18) Oxy-acetylene Welding Machine
19) Mini Air Compressor
20) Water Turbine Test Stand
21) Gasolin & Diesel Engine Tet Set
22) Engine Test Equipment

(3) Chemical Engineering Dept.

1) Capilary Viscometer
2) Hand Deyer
3) Microscope
4) PH-mV meter
5) Melting Point App
6) Power Supply Regulator
7) Centrifuge
8) Magnetic Stirrer
9) Flame Analyzer
10) Digital Stop Watch
11) Fluoro Spectrometer
12) DC Constant Current Source
13) Jacket Heater
14) Polarimeter
15) Refractometer
16) Imersion Pump
17) Coil Heater
18) Temperature Controller
19) Colorimeter
20) mV-DC Meter
21) Galvanometer
22) V meter DC
23) A meter AC
24) Voltage regulator (DC)
25) Digital Balance
26) Hot Plate
27) Stirrer
28) Dry Oven
29) Incubator

30) Vacuum Pump
31) Surface Tensiometer
32) Water Bath
33) Electric Balance
34) Spectronic 20
35) Analytical Balance
36) Conductivity Meter
37) Autoclave
38) Melting Point App.
39) Rotary Evaporator
40) Water Bath
41) Balance
42) Hot Plate Stirrer
43) Microscope
44) Grinding Mill
45) Furnace
46) Cimpressor
47) Analytical Balance
48) Fractional Distillation
49) Friction Loss
50) Liquid Flow Testing System
51) Filtration System
52) Electrilysis
53) Water Treatment System
54) Heat Transfer

II. University of North Sumatera

(1) Civil Engineering Dept.

1) Direct Shear Apparatus
2) Static Penetration
3) Boring Machine, Handy
4) Pocket Penetrometer
5) Torvan Shear Device
6) Sensitive Vane Adaptor
7) High Capacity Adaptor
8) Balance
9) Miscellaneous Tools
10) Soil Sampling Auger Set
11) Basic Field Density
12) Proving Ring Penetrometer
13) Triaxial Apparatus
14) Lo Air Compressor
15) Unconfined Compression Test
16) Consolidation Test Set
17) Hydrometer
18) Balance
19) Labo.Oven
20) Liquid Limit Set
21) Liquid Limit Set
22) Shrink Age Limit Set
23) Labo. Compaction Set
24) Labo. California Bearing Ratio
25) Soil Vertijack
26) Soil Investigation Film Strip
27) Tube Density Sample Set
28) Volume Change Apparatus
29) Double Sample Splitter Attach.
30) Mechanical Compactor
31) Combination Permeameter
32) Moisture Equivalent
33) Plastic Limit Ratio
34) Soil Color Chart
35) Hot Plate
36) Film Strip for Soil Work
37) Autographic Test Apparatus
38) Balance 6000 Gram
39) CBR Field Test Set
40) CBR Hould Set
41) Density Apparatus Baloon
42) Desicator Vacuum
43) Direct/Residual Shear App.
44) Soxlet Extraction Apparatus
45) PH Meter
46) Magnetic Stirrer
47) Hot Plate
48) Turbidimeter
49) Water Filtering Funnel
50) Hydrometer Soil
51) Needle Point Test
52) Sieve Set

53) Sieve Shaker
54) Speedy Moisture Tester
55) Surcharge Weight, Split
56) Surcharge Weight, Round
57) Swell Plate & Tripod
58) Vacuum Pump
59) Internal Vibrator
60) Test Hammer
61) Test Sieve
62) Tension Meter
63) Vicat Apparatus
64) Concrete Testing Machine
65) Slump Test Apparatus
66) Concrete Mixer
67) Cylinder Mold
68) Cube Mold
69) Mean Mold
70) Sieve Shaker
71) Schlieper
72) Glass Ware
73) Compression Test Machine
74) Large Capacity Sample Spettar
75) Vicat Apparatus
76) Elaine Fineness
77) Cement Autoclave
78) Length Comparator
79) Cement Briquettle Tester
80) Labo. Conoureta Mixer
81) Laboratory Vibrator
82) Slump Test Set
83) Cylindrical Mold
84) Concrete Beam Form
85) Caping Set
86) Semi Automatic Scale
87) Field Labo Scale
88) Twin Beam Scale
89) Coml Scale Balance
90) Testing Screen
91) Specific Gravity Set
92) Dry Oven
93) Ashing Furnace
94) Large Hot Plate
95) Vacuum Pump
96) Auto Water Still
97) Concrete Test Hammer
98) Sieve Shaker
99) Starain Guage
100) Motor Mixer
101) Moisture Tester
102) Organic Test Set
103) Abrasion Resistance
104) Concrete Micrometer
105) Calculator
106) Capping Warmer
107) Carrier
108) Capping Ruler

109) Tester for Scunders
110) Concrete Permeability App.
111) Young Modulus Rigid Meter
112) Extra Mold
113) Specific Gravity Testing Set
114) Mortet Length Comprator
115) Three Gabg Mol
116) Sand Avaorption
117) Concrete Test Hammer
118) Portable Concrete Test Machine
119) Balance
120) Oven
121) Flexure Test
122) PH Meter
123) Test Hammer
124) Vicat Apparatus
125) Glass Ware
126) Extra Mold
127) Specific Gravity Testing Set
128) Mortet Length Comorator
129) Sand Avaorption
130) Three Gang Mold Formeter Camp.
131) Concrete Test Hammer
132) Potable Concrete Test Machine
133) Abrasive Charge Set
134) Compression Tester
135) Compresson Meter
136) Concrete Penetrometer
137) Concrete Sonometer
138) Concrete Test Hammer Set
139) Kelly Ball Penetration App.
140) Le Chatelier Flask
141) Mortor Mixer, Bench Scale
142) Pycnometer
143) Sieve Set, 8 inch, 12 inch
144) Universal Testing Machine
145) Enalars
146) Asphalt Penetrometer
147) Asphalt Oven
148) Ring Bal Type
149) Asphalt Ductility Machine
150) Cleaveland Flash Point Tester
151) App. Porestimatan/Moisture
152) Tag Class Sup Tester
153) Distillation Apparatus
154) Pressure Type Filter
155) Asphalt Mixer
156) Electric Tharmostat Water Bath
157) Marahall Tes Apparatus
158) Hot Plate
159) Marahall Automatic Compaction
160) Binder Recovery Apparatus
161) Centrifuge
162) Container Sample
163) Rubber Gloves
164) Heater Stirrer

165) Immersion Heater
166) Mixer
167) Moisture Tester
168) Oven
169) Scoop
170) Sieve Set
171) Skid Resistance Tester
172) Thermometer
173) Tray
174) Tripod Stand
175) Viscometer
176) Viscosimeter
177) Compass Wild
178) Level
179) Theodolite Wild
180) Theodolite Rank
181) Planimeter
182) Level
183) Staf Halbre
184) Theodolite TM
185) Panthograph
186) Drawing Table Set
187) Slide Projector
188) 8 mm Camera
189) 8 mm Projector
190) Overhead projector
191) Slide Projector
192) Wireless Microphone
193) Telephoto
194) Far Overhead Projector
195) Pitot Static
196) Pitot Tube
197) Otto Small Current Meter
198) Otto Revolutional Counter
199) Otto Universal
200) Otto Point and Hook Gauge
201) Otto Point Gauge
202) Glass Walled Flame
203) Relative Viscosimeter
204) Compact Flow Vis. Channel
205) 31 Fluid Circuit Experiment
206) Barometer
207) Chart Recorder
208) Drag Coefficients Apparatus
209) Drainage/seepage Tank
210) Hydraulic Bench
211) Inclinometer
212) Laminar Flow Analysis App.
213) Multi Purpose Teaching Fluid
214) Sediment Transport Channel
215) Tachometer
216) Velocity Probe Digital
217) Wave Monitor

(2) Mechanical Engineering Dept.

1) Complete System Model Apic
2) EPIC I Engine Analy. System
3) New Transparent Consus. Engine
4) Refrege. Air Con. Training Unit
5) Dwel Tachometer
6) Tube up Tester
7) Temperature Tester
8) Termis Vacuum Gauge
9) Relating Weight Balance
10) Cylinder Gauge
11) Thermal Moisture Temp. Detector
12) Wheastone Bridge
13) Wheastone Bridge
14) Power Supply
15) Insulation Tester
16) Automatic Bomb Calori Meter
17) Manometer
18) Engine Deagnesis Depart
19) Electro Dynamic Meter
20) Nozzle Tester Generator Set
21) Tool Kit
22) KWH Meter
23) P.H. Meter
24) Dual Trail Cacill Scope
25) Cresilater
26) Oilseparator
27) Hand Distance Meter
28) Stopwatch
29) Pump.
30) Water Pump
31) Analytical Balance
32) Miscellaneous Tool Set
33) Calculator Casio
34) Multi Tester
35) Thermometer
36) Tutor Air Compressor
37) Centrifugal Pump
38) Tutor Francis Set
39) Tutor Pelton Test
40) Stroboscope
41) Turbine Runner Display Panel
42) Pump Impalur Display Stand
43) Pipe Flow Nozzle Apparatus
44) Laminar/Turbulact
45) Water Hammer Apparatus
46) Subonic Wind Tunnel
47) Gear Pump Test Set
48) Piston Pump Test Set
49) Multi Purpose Air Duct
50) Environmental Control App.
51) Vacuum Pump
52) Journal Bearing Demo. Apparatus
53) Cam Analysis Machine
54) Universal Vibration App.

55) Sttis & Dynamic
56) Gear Tooth Form App.
57) Torsion Testing Machine
58) Struck Apparatus
59) Universal Beam Apparatus
60) Universal Governor App.
61) Gyroscope
62) Petrol Engine Test Bed
63) Diesel Engine Test Bed
64) Wancle Engine Test Bed
65) Gas Calorimeter
66) Model Wankel Engine
67) Model Diesel Engine
68) Model Petrol Engine
69) Model Two Stroke Engine
70) Model Axile & Diff.
71) Model Gear Box Clutch
72) Model Diesel Pump
73) Model Stearing
74) Model Steam Engine
75) Mahler Coal Bomb Calorimeter
76) Boiling Heat Transfer Unit
77) Exp. Solar Energy Collector
78) Film/Dropwise Cond. Unit
79) Focusing Solar Energy App.
80) Free and Forced Conjection App.
81) Gas Turbine Unit
82) Heat Conduction App.
83) Recirculation AC Unit
84) Steam/Water Heat Exchanger
85) Sawing Machine
86) Diesel Generator
87) Gas Welding Apparatus
88) Vice
89) Machine Tools
90) Micrometer
91) Stopwatch
92) Dial Meter
93) Multitester
94) Engine Lathe with Accessories
95) Universal Milling Machine
96) Mack Saw Machine
97) Grading & Bracking Flute Lep. M
98) Twist Drill Grinding Machine
99) Bench Drilling Machine
100) Gas Welding Apparatus
101) Welding Rectifier
102) Spot Welding
103) Sheet Folding Machine
104) Outside Micrometer
105) Inside Micrometer
106) Dial Comparator
107) Verniar height Guage
108) Vernier Caliper
109) Thickness Guage
110) Screw Pitch Guage

111) Screw Thread Guage
112) Handlover App. with Tad
113) Foolroom Lathe
114) Dritling Machine
115) Folding Machine
116) Welding Rectifier
117) Slim Bending Roller
118) Oxy-Acetylene Gas Welding Set
119) Grinding Machine
120) Air Compressor
121) Spot Welding Machine AEG.
122) Glass-Blowing Kit
123) Pipe Vises
124) Pipe Thread Cutter
125) Hand Drill
126) Universal Wood Working Machine
127) Tool Kit
128) CNC Training Lathe System
129) Vega Complete Weld
130) Brinnel Hardness Tester
131) Rockwell Hardness Tester
132) Photography System
133) Cutting Machine
134) Microscope
135) Boring Machine
136) Polishing Grinder
137) Metallugical Microscope
138) Polishing Machine
139) Vice
140) Furnace
141) Grinder
142) Digit Outside Micrometer
143) Cariper
144) Dial Caliper
145) Miscellaneous Tool Set
146) Universal Tensil Tester
147) Rockwell Hardness Tester
148) Rebound Hardness Tester
149) Impact Testing Machine
150) Heat Treatment Furnace
151) Metallographical Microscope
152) Cut-off Machine Universal
153) Roll Grinder
154) Polishing Table Unit
155) Thermal Radiation App.
156) Lathe
157) Boring Machine
158) Hand Drill
159) Camera Attachment
160) Induction Bending
161) Induction Melting
162) Universal Sand Strength Tester
163) Sand Mixer
164) Induction Furnace
165) Impact Tester
166) Torsion Testing Machine

167) Jominy Tester
168) Drafting Board (small)
169) Drawing Machine
170) Tools
171) Caliper
172) Micrometer
173) Cut Side Caliper
174) In-side Caliper
175) Planimeter
176) Pantograph
177) Drafting Board
178) Miscellaneous Tools

(3) Electrical Engineering Dept.

1) Analog Computer
2) Linier Unit
3) Non Linier Unit
4) Servo Control System
5) CNC Trainer
6) Variable Phase Generator
7) Volt Meter
8) Servo System Trainer
9) IC Logic Trainer
10) Key Board and Display Unit
11) Microprocessor Appl. Trainer
12) Oscilloscope
13) Digital System Trainer
14) Electro Hydro.Servo Trainer
15) Function Generator
16) Drawing Table
17) MCB
18) Trans
19) Automatic Trans
20) ELAVI 5N
21) Magnetic Contactor
22) Push Button Switch
23) Terminal Block 4 Pole
24) Power Station Simulator
25) Power Supply
26) DC Ammeter
27) AC Ammeter
28) Multi Tester
29) Frequency Meter
30) Current Trans
31) Start Delta Switch
32) KWH Meter
33) Capacitor Start
34) Induction Motor
35) AC Voltmeter
36) KWH Meter
37) Wattmeter
38) Transformer
39) Slide Resister
40) AC Volt Meter
41) Running Capacitor

42) Tang Ampare
43) Panel Meter
44) DC Generator Set
45) Circuit Breaker
46) Circuit Breaker
47) Motor Sinkron
48) Magnetic Switch
49) Selector Panel
50) Multitester
51) Syncronous
52) Automatic Trans
53) Battery Charger
54) Circuit Breaker
55) Stabilizer
56) Balance (spring)
57) Tool Set
58) Electro Mecha. Training System
59) Recorder X-Y
60) Multimeter
61) Fundamental Tele Comm. Kit
62) Transmission Line Demonstrator
63) Advance Tele Communication Kit
64) Antena System Demonstrainer
65) Weather Satelite Receiver
66) Function Generator
67) Signal Generator
68) Electronic Multimeter
69) Frequency Counter
70) Digital Multimeter
71) Soar Decilloscope
72) Audio Generator
73) Multitester
74) Tolset
75) VI-YMMV-DC
76) Voltage Regulator
77) Impedance
78) Double Beam
79) AM/FM Generator
80) AM/FM Receiver AM abt
81) Wattmeter
82) Function Generator
83) Function Generator
84) DC Micro Amper Meter
85) DC Amper Meter
86) DC Volt Meter
87) AC Ammeter
88) AC Volt Meter
89) Multitester
90) Oscilloscope
91) Multitester
92) Power House
93) Vacuum Tuby Demon
94) Small Series
95) Resistance Box
96) Calori Meter
97) Soldering Kit

98) AC Ampermeter
99) DC Ampermeter
100) DC/AC Volt Meter
101) Oscillater CR
102) Frequency Amplifier
103) Oscilloscope
104) Transformer
105) Starter
106) DC Motor
107) Auto Transformer
108) Auto Transformer
109) DC Convertor Meter
110) Motor Controler
111) PSK Transmitter & Rec. Adapt
112) Digital Probe
113) Casset Recorder
114) Multitester
115) Solar Panel
116) Digital AC Meter
117) Audio Generator
118) Multitester
119) Ampere Meter
120) Ampere Medter
121) Volt Meter
122) Multimeter
123) Signal Generator
124) AM/FM Generator
125) Power Supply
126) IC Tester
127) Operational Amplifier Module
128) Oscilloscope
129) Function Generator
130) Test Transformer
131) Selenium Rectifier
132) Capacitor
133) Load Capacitor
134) Measuring Capaacitor
135) Protective
136) Load Resistor
137) Damping Resistor
138) Discharge Resistor
139) Spark Gap
140) Drive for Gap
141) Post Insulator
142) Connector
143) Space Tube
144) Mode
145) Base
146) Insulating Base
147) Peak Voltmeter
148) Impulse Voltmeter
149) Low Voltage
150) Cable Adaptor
151) DC Voltage
152) Triggering Unit
153) Triggering Boester

154) Connecting Cable
155) Trigger Elevtrode
156) Measuring Gap
157) Spacer Tube
158) Pressure Vessel
159) Corona Traps
160) Oil Testing Gear
161) Gas Capacitor
162) Control Desk
163) Double Beam Osc
164) Electrostatic
165) Generatoring Gear
166) Earthing Switch
167) Measuring Resistor
168) Thermometer
169) Hygrometer
170) Insulation Tester
171) Manometer
172) Galvanometer
173) Oscillator
174) Trans
175) Amperemeter AC
176) AC Volt Meter
177) Slide Resistor
178) Multitester
179) Tool Set
180) Mili Ammeter
181) Multitester
182) CR. Oscillator
183) Digital Hitester
184) Multitester
185) Ampere Meter
186) Volt Meter
187) Electronic Volt Meter
188) Signal Generator
189) Power Supply Unit
190) Power Supply Unit
191) 2 Channel Oscilloscope
192) Memos Cope Electronic
193) Four Channel Oscilloscope
194) Oscilloscope
195) Impedance Bridge
196) Capacitance
197) Volt and Phase Detector
198) Volt Meter
199) Power Factor Meter
200) Current Recorder
201) Recorder
202) Signal Generator
203) Multimeter with Cap Tester
204) Epstein Iron Loss Test Set
205) Frequency Meter
206) Oscilloscope
207) Stopwatch
208) Automatic Trans
209) Current Transformer

210) Freseateon Double Bridge
211) Portable Wheaston Bridge
212) Philip RIC Bridge
213) Standard Resistor
214) Slide Resistor
215) Six Dial Resistor Box
216) DC Voltage Current Calibration
217) Insulation Tester
218) Photo Tachometer
219) Portable Lux Meter
220) Leakage Current Tester
221) Flux Meter
222) Search Coil
223) Earth Tester
224) Single Phase Wattmetter
225) Three Phase Wattmeter
226) Portable Freg Meter
227) Power Factor Meter
228) AC Ammeter
229) Volt Ampere Meter
230) DC Volt Meter
231) DC Potential Meter
232) GalVanometer
233) Digital Multimeter
234) Ohm Law. Demonstrator
235) Circuit Apparatus
236) Self Inductance
237) Small Series Motor
238) Small Dynamo
239) Digital AC Power Meter
240) AC Mili Volt Meter
241) Adaptor AC/DC
242) Power Factor Meter
243) Portable Factor Met
244) Tool Set
245) Volt Regulator
246) Meteran Automatic P.J 10 Meter
247) Multi Tester
248) Wheastone Bridge
249) Thomson Bridge
250) Impedance Bridge
251) Moving/Ammeter
252) Moving Iron Volt Meter
253) Moving Coil Ammeter
254) Moving Coil Volt Meter
255) Electro Dynamic Wattmeter
256) Current Transformer
257) Standard Cell
258) Standard Resistance
259) Reflecting Galvanometer
260) Electrodynamic Ammeter
261) Moving Coil Ammeter
262) Electro Statis Voltmeter
263) Moving Iron Ammeter
264) Stopwatch
265) Frequency Meter

266) Current Transformer
267) Electro Dynamic Wattmeter
268) Electro Dynamic Wattmeter
269) KWH meter
270) KWH meter
271) Sliding Resistor
272) Impedance Load
273) Double Beam Oscillo
274) Impedance Load
275) Oscilloscope
276) Functional Generator
277) Variable Phase Generator
278) Volt Meter
279) Multimeter
280) X-Y Recorder
281) Functional Generator
282) Oscilloscope
283) Galvanometer
284) Galvanometer
285) Signal Generator
286) X-Y Recorder
287) Multimeter
288) Power Factor Meter
289) Frequency Meter
290) Epstein Iron Loss Test Set
291) Recorder
292) Capacitance Tester
293) Multi Meter
294) Volt Meter
295) Volt & Phase Detector
296) Ammeter
297) Insulation Tester
298) Power Pack
299) Resistive Load Module
300) Inductive Load Module
301) Volt Meter
302) Frequency Meter
303) Sound Level Meter
304) Vibration Analyzer
305) Function Generator
306) Wheastone Bridge
307) Current Supply
308) Detector
309) Dynamometer
310) DC Machine
311) Wound Rotor Machine
312) Squirred-Cage Motor
313) DC Rotor
314) Single Phase Motor
315) Split Phase Motor
316) Universal Motor
317) Shunt Woud Motor
318) Static Converter Model
319) Moving Coil Ampere Meter
320) Moving Iron Ammeter
321) Single Phase Wattmeter

322) Moving Iron Voltmeter
323) Tachometer
324) Power Factor
325) Double Beam Oscilloscope
326) Stopwatch
327) Resistor Load Unit
328) Three Phase Transformer
329) Resistor Load Unit
330) Inductor
331) Capacitor Load Unit
332) Power Pack
333) Variable Transformer
334) Phase Sequence Meter
335) Sliding Meter
336) Frequency Meter
337) Current Transformer
338) Electromagnetic Contactor
339) Thermal Overload Relay
340) Time Relay
341) Pneumatic Time Relay
342) Star Delta Switch K+N
343) Push Button
344) Star Delta Starter
345) Single Throw Switch
346) Double Throw Swtich
347) Thermo Couple Voltmeter
348) Tachogenerator
349) Portable Recorder
350) Capacitive Load Module
351) Voltmeter
352) Power Pack
353) Resistive Load Module
354) Inductive Load Module
355) Frequency Meter
356) Computer
357) Key Board
358) Monitor
359) Office Chair
360) Printer

(4) Chemical Engineering Dept.

1) Batch Plate Distillation Unit
2) Hammer Mill
3) Climbing Film Evaporator
4) Concentric Tube Heat Exchanger
5) Liquid-Liquid Extraction App.
6) Pressure Gauge Calibrator
7) Centrifuge Tube
8) Solid-Liquid Extraction App.
9) Temperature Measure Bench
10) Tray Drier
11) Unit Process
12) Water Cooling Tower
13) Wetted Wall Gas Absorp. Column
14) Auto Clave High Press

15) Balance
16) Ball Mill
17) Barometer
18) Batch Plate Distil. App.
19) Beaker Glass
20) Bottle Ceder Wood Oil
21) Dropping Bottle
22) Reagent Bottle
23) Reagent Bottle
24) Buret
25) Calculator
26) Cavitation Apparatus
27) Centrifuge
28) Clip Mohr
29) Centrifuge
30) Condenser
31) Corrosion Study Kit
32) Corrosion Test Pieces
33) Crucible
34) Dynamic Behavior Stirred Tank
35) Gas Absorption Column
36) Hydrocyclone Separator
37) Liquid Phase Chemical Reactor
38) Oven
39) Process Control Apparatus
40) Pump Peristaltic, 4500 ml
41) Pump
42) Water Bath
43) Microscope
44) Hygrometer
45) Mercury Barometer
46) Tachometer HB
47) Colorimeter
48) Hydrometer Set
49) Abbe Refractometer
50) Gas Analyzer
51) Multiple Stirring Set
52) Stirring Motor
53) Stirring Rod
54) Water Bath
55) Soxlet Extraction Apparatus
56) pH Meter
57) Magnetic Stirrer
58) Hot Plate
59) Turbidimeter
60) Chart Recorder
61) Durat Water Bottle
62) Water Filtering Funel
63) Water Test Disc
64) Water Filtering Funnel
65) Water Test Counting Cell
66) Ampulmative
67) DPD Comparator Kit
68) Oil Sample Tube
69) Aniline Point Prec.App.
70) Hester

71) Carbon Residue
72) Cloud and Pour Test
73) Corrosion Test
74) Grease Cone
75) Distilling Receiver
76) Polarimeter
77) Reagent Bottle
78) Gas Washing Bottle
79) Washing Bottle
80) Condenser
81) Cruicible, Porcelain
82) Evaporating Dish
83) Distillation Flask
84) Erlenmeyer Flask
85) Flask
86) Funnel
87) Pippet
88) Miscellaneous goods
89) Centrifuge
90) Beaker Glass
91) Buret
92) Micro Buret
93) Cylinder Measuring
94) Volumetric Flask
95) Pipet
96) Thermometer
97) Test Tube
98) Watch Glass
99) Semi Micro Mantle
100) Spectrophotometer
101) Spacpart Spectrophotometer
102) Oven
103) Vacuum Pump
104) Water Bath
105) Kjerdahl Flask
106) Miscellaneous

(5) Industrial Engineering Dept.

1) Clock/Counter Timer
2) Magnifier
3) Multi-range Interval Timer
4) Multiple Timing Apparatus
5) PH meter
6) Precision Hygrometer
7) Robotic Teaching System
8) Scale, hanging
9) Sound Level Meter
10) Stopwatch
11) Thermometer
12) Vibration Analyzer

III. Nommensen University

(i) Electrical Engineering Dept.

1) Over Head Wiring Pract, Panel.
2) Indoor Wiring Practice Panel
3) L:V.Distribution Panel
4) H:V.Distribution Panel
5) H.V. Insulator
6) Working Tool
7) Coble
8) Experimental Panel 1
9) Regulator 1 phase
10) Panel Lamp Load
11) V A R meter 1 phase
12) K V A R meter 3 phase
13) Galvanomater
14) Electeric Galvanometer
15) Voltmeter AC
16) Amperemeter AC phase DC
17) Teclok Speedmeter
18) Digital Tachometer
19) Motor DC
20) Motor AC
21) Motor AC 3 phase
22) Control Box
23) Eddy Curren Brake
24) Starting Control Motor DC
25) Resistor
26) Speed Meter
27) Transformer 1 phase
28) Transformer 3 phase
29) Experimental Panel of Power
30) DC Power Supply
31) AM. Part with Ferrit Antenna
32) Time Multiflek Stereo Decorder
33) Tuning Panel
34) FM IF Amplifier Integrated
35) FM Tuner
36) Noise Filter
37) PLL Stereo Decoder
38) Balance Control
39) HIfi Output Amplifier.20 W.
40) FM Tuner
41) Tunable Filter
42) Universal Assemble Board
43) Modulato Demodolater
44) Band Pass Two Fold
45) Sinusoidal Signe Generator
46) Microphone
47) Grover Network
48) Volume Control
49) Ratio Detector
50) Signal Dplexer
51) Preliminary Circuit
52) Universal Assembly Board

53) AF Amplifiem.
54) Power Supply for DC Poltage
55) Presence Cdontrol
56) Oscilator Circuit
57) Universal Assembly Board
58) Sinusoidal Signal Generator
59) Experimental Panel
60) RF Signal Generator
61) RLC Brigde
62) Frequency Counter
63) FM Stereo Generator
64) RF Signal Generator
65) AC Volt Meter
66) Audito SVM
67) Loudspeaker
68) Sweepw Fungtion Generator
69) Fungtion Generator
70) OR Oscilator
71) Osciloscope
72) Coil Repeating
73) Transistor
74) Dioda Qartet
75) Transformer
76) Parameter Tranmissi
77) Induktor
78) Multi Plizierer
79) Pariable Condensator
80) Plat Type Relay
81) Reed Relay
82) Capacitance
83) Diode
84) Resistansi
85) Osciloscope
86) Idem
87) Transformer
88) Universal Assembli Board
89) Universal Phanton Net Work
90) Telephone Set
91) Multi Meter
92) Teknikit Consolatte
93) Fulse Code Modulation
94) Superhet Receiver
95) Audio Unit
96) Delta Modulation
97) Single Side Band
98) Double Side Band
99) Sample Hold and Multiflex
100) Wave from Analisyc
101) Micro Wave Trainer
102) Rf Generator
103) Antenna Demonds
104) Experimental Panel
105) Portable DC Potensio Meter
106) Voltmeter AC
107) V-A meter AC
108) Power Factor Meter

109) Wattmeter AC/DC
110) AC Voltmeter
111) Signal Deplexer
112) Band Pass Twofold
113) Cable (100cm) with Top of Point
114) Sinusoidal Signal Generator
115) Hinght Pass Filter
116) Terepon Set
117) Bidirectional Amplifier
118) IF Band Filter
119) Stylus Equalizer
120) Remble and Noise Filter
121) Tone Control

IV. University of Medan Area

(1) Civil Engineering Dept.

1) Balance
2) Platform Beam Scale
3) Balance
4) Platform Scale
5) compresstion Tester
6) Concrete Cylinder Molds
7) Concrete Cube Molds
8) Oven
9) Air Content Of Concrete
10) Slump Test Set
11) Speedy Moisture Tester
12) Los Angeles Abrasion Machine
13) Sieve Shaker
14) Hammer Concrete Test
15) Flow Table
16) Concrete Mixer
17) Sample Splitter
18) Stop Watch
19) Calipers
20) Glasswares; miscellaneous
21) Standard Colour Chart
22) Le Chatelier Flask
23) Sieve
24) Absorption Cone & Tamper
25) Container
26) Aluminium Scoop
27) Trowel
28) Miscellaneous Small Equipment
29) Level
30) Theodolite
31) Kompas Engineer
32) Baak Ukur Mini Terbungkus
33) Baak Ukur Besar
34) Baak Ukur Bacaan Terbalik
35) Staff
36) Meteran Baja
37) Jalon

(2) Mechanical Engineering Dept.

1) Lathe
2) Shaper machine
3) Univercal Testing Machine
4) Drilling Machine
5) Boring Machine
6) Arc Welding Machine
7) Cutting Machine
8) Electrical Drill
9) Bench Vise
10) Acetylene Welding Machine
11) Tools

(3) Electrical Engineering Dept.

1) Digital & Basic Control System
2) Basic Tele Communication
3) Basic Electronics
4) Electric Distribution
5) Electric Circuit
6) Measurement Inetsument
7) AC DC Converter
8) Transformer (1 Tr x 6)
9) Motor Control
10) Auto Transformer
11) AC Ind. Motor & Syn. Generator
12) DC Motor & DC Generator
13) Protection Relay
14) Generator Parallel Operation
15) Illumination
16) Digital Multi Meter
17) Multi Tester
18) Megger
19) Osciloscope
20) Trio Osciloscope
21) Audio Generator
22) Tachmeter
23) Lux Meter
24) Multi Tester
35) Clamp Meter
36) Mogger
37) Stop Watch
38) Power Hitester/Cosfi Meter
39) Watt Meter (Single Phase)
30) Volt Meter
31) AC Volt Meter
32) Multi Tester
33) Rele (Aux Pelay)
34) Thermeal Overload Relay
35) Thermal Overload Relay
36) Regulator 220 / 240
37) Thermometer
38) Electric Drcll
39) Hand Drill
40) AC Induction Motor
41) AC Synchronous Generator
42) AC Induction Motor
43) DC Motor
44) DC Generator
45) AC Motor
46) AC Synchronous Generator
47) Insulation Oil Testing
48) AC High Voltage Transformer
49) Impulse High Voltage Test

(4) Industrial Engineering Dept.

1) Stopwatch
2) Caliper

3) Microguage
4) Scale

V. Dharma Agun University

(1) Civil Engineering Dept.

1) Theodolite
2) Levelling
3) Tripod
4) Rambu
5) Mbteran
6) Payung
7) Pressure Compression Machine
8) Kerucut Abrams
9) Slump Test
10) Concrete Vibrator
11) Mixer
12) Bejana Aggregate
13) Vicat Apparatus
14) Balance (Neraca) Ketelitian
15) Sileve Shaker Aggregate
16) Sieve Aggregate
17) Piknometer
18) Glass Ware
19) Miscellaneous Tools
20) Dutch Cone Pnetro
21) Hand Auger
22) Direct Shear Apparatus
23) Consolidation Apparatus
24) Unconfined Hand Operatet
25) Extruder
26) Universal Extruder
27) Standard Compaction
28) M Dified Compaction
29) Sand Cone Test
30) CBR Lapangan
31) Liquit Limit Test
32) Plastic Limit Test
33) Krus Undisturbed
34) Krus Disturbed
35) Pisau Tanah
36) Hydro Meter
37) Brus Kawat
38) Sieve Shaker Aggregate
39) Sieve Aggregate
40) Paul Karet
41) Glass Ware
42) Miscellaneous Tools

(2) Mechanical Engineering Dept.

1) Face Lathe
2) Horizontal Milling Machine
3) Shaper Machine
4) Drilling Machine
5) Hach Sawing Machine
6) Grindor
7) Bench Vise

8) Hammer
9) Files
10) Cold Chisel
11) Metallurgical Microscope
12) Digital Multimeter
13) Jominy Test
14) Dial Caliper
15) Stop Watch
16) Deflexion Tester
17) Drawing Table
18) Engine Parts for D.W.G
19) Volues for D.W.G

(3) Electrical Engineering Dept.

1) Multi Tester
2) Watt Meter
3) Volt Meter
4) Digital Tachometer
5) Volt Meter
6) Ampere Meter
7) Clip Ammeter
8) Variable Resistance
9) IVR 3 phase
10) Rheostat
11) Transformer
12) Power Hi-Tester
13) Multi Tester
14) Ammeter
15) Epstein Iron Loss
16) Volt Meter
17) Earth Tester
18) Potetio Meter
19) AC Volt Ampere Meter
20) AC Watt Meter
21) Push Button Switch
22) Wheastone Bridge
23) Osciloscope
24) Oscillator
25) Function Generator
26) DC Power Supply
27) Digital Multi Meter
28) Tester
29) Watt Meter
30) Converter
31) AC Volt Meter
32) Resistance Attenuator
33) Slide Resistance
34) Solder
35) Induction Motor
36) Generator
37) Motor Sinkron
38) Generator
39) Motor
40) Generator Sinkron
41) No Fuse Breaker

42) Magnetic Contactor
43) Miscellaneous Parts
44) Amper Meter
45) Volt Meter
46) Frequency Meter
47) Cos & Meter
48) Reactance
49) Timer (Time Delay)
50) Multi Meter
51) Oscilloscope
52) Power Supply
53) Signal Generator
54) Audio Signal Generator
55) Digital Freg. Counter
56) 4 MHz Oscilloscope
57) 15 MHz Dual Trace Oscilloscope
58) 15 MHz Single Trace Oscillo.
59) Voltage Regulator
60) Power Supply
61) AC Auto Regulator & Stabilizer
62) Microphone
63) 10UD Speaker
64) Radio Receiver
65) Amplifier (SAFTRON)
66) TV B/W 17 inch
67) TV C 14 inch
68) Consumable goods
69) Transformator
70) Mini Drill Set
71) Parts Storage Box
72) Circuit Board
73) Tool Set Kit
74) Multi Tester Digital
75) Multi Meter
76) Miscellaneious goods
77) Potentio Meter Trimpot
78) Ammeter AC/DC
79) Volt Meter AC/DC
80) Resistor
81) Capacitor
82) Diodo
83) Transistor
84) Crystals
85) I.C.
86) Video Caset
87) Miscellaneous goods

VII. Andalas University

(1) Civil Engineering Dept.

1) Teodolite
2) Level
3) Staff
4) Weighing
5) Footing
6) Standard Penetration Test
7) Hand Boring Test
8) Cone Penetration Test
9) Consolidation Test
10) Unconfined Compression Test
11) Direct Shear Test
12) Sample Extruder
13) Tube Density Sampler
14) Laboratorium CBR Test
15) Compaction Test
16) Sieve Shaker
17) Balance
18) Hydrometer Test
19) Permeability Test
20) Vane Shear Test
21) Plastic Limit Set
22) Compaction Preameter
23) Shrinkage Limit Test
24) Oven
25) Thermometer
26) Sand Corn, Volum Set
27) Atterberg Limits
28) Container
29) Balance 20Kg
30) Glass Measurement 2000cc
31) Vicat Device
32) Humidity Device
33) Stop Watch
34) Melting Table
35) Curing Cabinet
36) Le Chateliier Flask
37) Small Container
38) Balance 300g
39) Speedy Moisture Tester
40) Compression Strength Test
41) Oven
42) Picnometer
43) Water Bath
44) Motor Mixer
45) Unit Weight Of Aggregate
46) Los Angeles Test
47) Balance 30Kg
48) Concrete Mould
49) Slump Test Set
50) Hammer Test Set
51) Penetration Test Set
52) Ductility Machine Set

53) Marshall Test Apparatus
54) Water Bath
55) Computer
56) Printer
57) Software
58) Drawing Table

(2) Mechanical Engineering Dept.

1) Rockwell Hardness Test machine
2) Micro Hardness Tester
3) Metallurgical Microscope

VIII. University of Sriwijaya

(1) Civil Engineering Dept.

1) Theodolit
2) Watter Pass
3) Theodolit
4) Watter Pass
5) Theodolit
6) BT 14. No.
7) Salon
8) Kipas Angin
9) Mesin Tik
10) Consolidation Test
11) Labo CBR Test Set
12) Triaxial Test
13) Uncontinued Compression Test
14) Direct Shear Test
15) Swedish Sounding Apparatus
16) Dutch Cone Penetrometer
17) Cone Penetrometer Test
18) Balance
19) Soil Compaction Test Set
20) Liquid Limit Test
21) Plastic Limit Test
22) Soil Test Siever Set
23) Hydro Meter
24) Mechanical Stirring Apparatus
25) Piknometer
26) Desicator
27) Water Bath
28) Glass Ware
29) Stop Watch
30) Oven
31) Extruder
32) Compaction Apparatus
33) Open Channel Set

(2) Mechanical Engineering Dept.

1) Centrifugal Pump Testing Unit
2) Refrigeration Unit for Cooling
3) Internal Combusion
4) Water Turbine Testing Unit
5) Horizontal Milling Machine
6) Lathe Machine
7) Rolling Machine
8) Drilling Machine
9) Banch Type Hand Drill
10) Grinding Machine
11) Cutting Machine (small type)
12) Acetylene Gas Welding Appr.
13) Arc Welding Machine
14) Electrical Welding Machine
15) Bench Vise
16) Hack Sawing Machine

17) Cutting Machine
18) Bending Machine

(3) Electrical Engineering Dept.

1) 3 Phase Induction Motor
2) DC Motor
3) AC Generator
4) Transformer Experiment Panel
5) AG M - G Experiment Panel
6) Electrical Arcuit Experiment
7) Power Supply
8) Tester
9) Ammeter
10) Galvanometer
11) Clunk Meter
12) Oscilloscope
13) Resistance Standard
14) Slidac

IX. University of Lampung

(1) Civil Engineering Dept.

1) Direct Shear Test
2) Consolidation Test
3) Compaction Permiameter
4) Sand Density Cone Test
5) Speedy Moisture Tester
6) Proving Ring Penetrometer
7) Cone Penetrometer
8) Proving Ring Single Dial
9) Sieve Shaker
10) Balance
11) Triple Beam Scale
12) Heavy Duty Balance
13) Dial Balance
14) Glass Apparatus
15) Leu Chatrier Flask
16) Oven
17) Drilling for Soil Sampling
18) Laboratory CBR Test Set
19) Mixer Small
20) Los Angeles Abrasion Test
21) Vibrator
22) Universal Testing Machine
23) Miscellaneous Tools
24) Mold Cubic
25) Mold Cylindrical
26) Sample Splitter
27) Balance
28) Slamp Test Set
29) Theodolite
30) Level
31) Staff
32) Stereoscope
33) Kompass
34) Camera
35) Pole
36) Miscellaneous Tools
37) Dead Weight Pressure Gauge Cal
38) Hydraulic Bench
39) Bernoili Apparatus
40) Impact of Jet Stream Apparatus
41) Orifice and Jet Stream Test
42) Pipe Friction Test
43) Flow Visual Channel Test
44) Osborn Reynolds Apparatus
45) Flow Meter Demonstration Test
46) Head Losses in Bed

X. Univerfity of Tanjungpura

(1) Civil Engineering Dept.

1) Theodolite
2) Transit Level
3) Level
4) Rectangular-Prism
5) Compass (Chrinometer)
6) Compass
7) Pranimeter
8) Phantograph
9) Electro-Optical Distance Meter
10) Scale
11) Pole
12) Staff
13) Tripod
14) Consolidation Test
15) CBR. Tester
16) Unconfined Compression Test
17) Direct Shear Test
18) Falling Head Permeater
19) Dutch Corn
20) Balance
21) Standard Penetration Test
22) Sieves
23) Extruder
24) Soil Compaction Test
25) Picnometer
26) Aluminum Sampler
27) Liquid Limit
28) Plastic Limit
29) Shrincage Limit
30) Oven
31) Stopwatch
32) Hydrometer
33) Const. Temp. Water Bath
34) Sieve Shaker
35) Desicator
36) Graduate Cylinder
37) Stirrer
38) Sand Volume Equivalent Test
39) Compression Testing Machine
40) Concrete Mixer
41) Slamp Test
42) Sample Mold
43) Concrete Cure Trough

(2) Electrical Engineering Dept.

1) Electromechanical Trans Sys
2) Electromechanical Sys
3) DC Motor/Generator
4) Squirrel Cage Induction Motor
5) Wound Rotor, 3-Phase Induct.
6) Synchronous Motor / Generator

7) Split Phase / Capaci.Motor
8) Capacitor Run Motor
9) Universal Motor
10) Repuls.Start-Induct.Motor
11) Electodynamometer
12) Single-Phase Transformers
13) Single-Phase Wattmeter
14) 3-Phase Wattmeter
15) 3-Phase Power Supply
16) Synchronizing Switch
17) Speed Contgrol Rheostat
18) Hand Tachometer
19) Ser Speed Control
20) DC Volt-Ammeter
21) AC Ammeter
22) Variable Resistance
23) Variable Inductance
24) Variable Capacitance
25) Indiv. Paced Inst Prog.Tran
26) Indiv.Inst.Prog.100Rot Mach
27) Indiv.Inst.Prog.Refri.Cycle
28) Computer
29) Printer
30) Powerscope Analyser
31) Refrigeration Training System
32) Autotransformer
33) Variable Transformer
34) Perguson Transformer
35) Analogue Multimeter
36) Electrican Tool Kit
37) Spectrum Analyzer
38) Hitachi Oscilloscope
39) Digital Multimeter
40) Transistor & Diode Tester
41) High Impedance Tester
42) Digital LCR or Meter, Full Auto
43) Clip-on Current Transformer fo
44) Point Welder
45) Small Drill for Electronic
46) Mobile Maintenance Work Station
47) Experimental Unit for D.C.
48) Experimental Unit for A.C.
49) Experimental Units for 3 Phase
50) Experimental Units for Electro
51) Experimental Unit OP-AMP
52) Experimental Units for Applicat
53) Analog Power Electronics
54) Oscillatory Circuits and Filte
55) Modulation and Demodulation
56) Transmitter and Receiver
57) Basic Digital Circuit
58) Multimeter
59) Two Channel 20MHZ Oscilloscope
60) Probe
61) Screened Cable
62) Adapter

63) Stop-clock
64) Thermometer
65) Magnet with Bore
66) Pocket-compass
67) Constantan Wire
68) Chromnickel Wire
69) Steel Wire
70) Electrochemistry Kit
71) Shaft End Guard
72) Power Supply Syst. & Workbenc
73) Connecting Leads
74) Monitor 12 Inches Monocrome
75) Matrix Printer
76) Personal Computer with Hard Di
77) Micro Vision System
78) AC-Universal Motors
79) AC Repulsion Motor
80) Bifilar Wound Motor
81) Capacitor Motor
82) Squirel Cage 3 Phase Motor Pul
83) Squirel Cage Motor with 2 Sepa
84) Slip Ring Motor
85) Synchronous Machine
86) Reluctance Motor
87) Resistive Load
88) Capacitive Load
89) Inductive Load
90) DC Machine Starter
91) Field Regulator
92) On/Off Switch Three Pole
93) Motor Protection 1
94) Motor Protection 2
95) Star Delta Switch
96) Star Delta Reversing Switch
97) Reversing Switch
98) Pole Reverser Separate Winding
99) Rotor Starter
100) Syshronizing Indicator
101) Reversing Field Regulator
102) Zero Voltmeter
103) Double Voltmeter
104) Double Frequency Meter
105) Synchronoscope
106) Safety Bridging Plug SW
107) Safety Bridging Plug GG
108) Safety Connecting Leads
109) Magnetic Powder Brake
110) Coupling Rubber Sleeve
111) Accessories
112) Digital Torquemeter
113) Flash Stroboscope
114) Process Simulator/Basic Contro
115) DC Modular Servo System
116) Temperature Control
117) Level Control Equipment Set
118) Speed and Voltage Control

119) Analog Computer
120) XY-YT Recorder(A4)
121) Air Supply Compressor
122) Pneumatic Servo Demonstrator
123) Pneumatic Servo Advance Training
124) Literatur
125) Function Generator
126) Dual Channel Osciloscope
127) Multimeter Zeron Point Center
128) Probe 100 MHz
129) BNC Cable
130) BNC Adapter
131) High Voltage Amplifier
132) Power Supply +/- 15V/3A
133) Programmable Logic Control
134) PLC Programming Unit
135) PLC Connecting Cable
136) PLC Software
137) PLC Input Simulation
138) Standard Matrix Printer
139) Robot Mechanism
140) Host Controller for Robot
141) Plug-in System Power Supply
142) General Electric Service Comp.
143) Step up-down Transformer
144) Digital Watt/Phase Angle Meter
145) Phase Meter
146) Digital Meter
147) Labo. Bench mountings
148) 3 Phase Induction Motor
149) 3 Syncronous Motor
150) DC Compound Motor
151) Split Phase Motor
152) Shaded Pole Motor
153) Universal Motor
154) Eddy Current Load
155) Inertia Wheel
156) Generator Drive Unit
157) Machine Bed
158) Slip Ring Induction Motor
159) AC 10 Ampere Power Supply
160) DC Power Supply
161) 2 Ampare Power Supply
162) Variable Frequency Supply
163) AC Control Panel
164) Accessories
165) Microtek Intelligent Image Sea
166) Laser Printer
167) Digital Plotter
168) Traffic Light
169) 4 Relay
170) Accessories
171) DC Control Panel
172) Mobil Storage Unit
173) Module Power Supply
174) Tachometer

175) Function Generator
176) Dual Oscilloscope
177) Electrical Local R.C.L.
178) Dissectable Transformer
179) Cutway Power Rect. Transformer
180) Low Distortion Oscillator
181) Noize & Distortion Meter
182) Digital Meter 10A AC
183) Electronics Training System
184) Basic Electricity Training Kit
185) Circuitron Overlay Overhead
186) Microprocessor Learning System
187) Transducer & Inst.Training Kit
188) Slide Wire Rheostat (11, 20, 50 ohm)
189) Fixed Resistance Set
190) Rotary Potentiometer
191) Decade Capacitance Unit
192) Decade Resistance Unit
193) Combination Meter DC
194) Microammeter
195) Dual Range Ammeter
196) Triple Range Voltmeter
197) Dual Tracking Electronics P.S

XI. University of Lambung Mangkurat

(1) Civil Engineering Dept.

1) Flow Visualization
2) Open Channel Flow
3) Current Meter
4) Theodolite (BTM, T2, T0, 080A, KO-S, T20A)
5) Transil Level
6) Level
7) Automatic Level
8) Electric Distance Meter
9) Trumeter
10) Planimeter
11) Marshal Tester
12) Pantograph
13) Measure
14) Staff
15) Pole
16) Stand(tripod)
17) Drawing Table, Chair
18) Concrete Mixe
19) Oven
20) Los Angles Abrasion
21) Sieve Shaker
22) Concrete Test Hammer
23) Cylinder Capping Set
24) Vicst Apparatus
25) Gilmore Apparatus
26) Cylinder Mould
27) Balance
28) Sieve Set
29) Stopwatch
30) Thermometer
31) Le Chaterlier
32) Several Glassware
33) Dutch Cone Penetrometer
34) Oven
35) Balance
36) Picnometer
37) Sieve Set
38) Sieve Shaker
39) Mechanical Mixer
40) Stop Watch
41) Lobo. Unconfined Compress. Test
42) Field Unconfined Compress. Test
43) Extruder
44) Direct Shear Test
45) Consolidation Test
46) Permiability Falling Head
47) Permiability Constant Head
48) Mould
49) Sand Cone Test
50) Mould Elastic Test
51) Triaxial Test
52) Centrifugal Machine

53) PH Meter for Soil
54) Penetrometer
55) Field Permiability Test

APPENDIX 10. LIST OF EQUIPMENT TO BE SUPPLIED

APPENDIX 10 LIST OF EQUIPMENT TO BE SUPPLIED BY OTHER FOREIGN ASSISTANCES

I. University of Sriwijaya

I-1 Civil Engineering Dept.

A. Laboratory: Survey Instrument

1) Integral Bass of Proving Rings
2) 200°C General Purpose Oven
3) 300°C Fan-Circulation Oven
4) Electronic Top Loading Balances
5) Semi Automatic Barances
6) Standard Penetrometer
   Waterbath
   Transfer Dish
7) Mixing Bowl
   Sample Pans
   Stainless Steel Making Spoon
8) Slump Test
   Slump Cone
   Sampling Rod
   Steel Rule
   Base Plate
9) Universal Asphalt Penetrometer
10) Marshal Stability Asphalt Test
   Asphalt Stability Test 110 Vol
   Asphalt Stability Test 220 Vol
   Plastic Flow Indicator
   Marshall Breaking Head
   Spesimen Ejector
   Compaction Mold
   Paper Dish
   Automatic Bitument Compact. 110V
   Automatic Bitument Compact, 220V
   Volt/50 Cycle
   Hot Plate
11) Marshal Stability Asphalt Test
   Asphalt Stability Test 110 Vol
   Asphalt Stability Test 220 Vol
   Plastic Flow Indicator
   Marshall Breaking Head
   Spesimen Ejector
   Compaction Mold
   Paper Dish
   Automatic Bitumen Compact. 110V
   Automatic Bitumen Compact. 220V
   Volt/50 Cycle
   Hot Plate
12) Large Capacity Floor Mounting
   Drying Oven
   Fan Motor
   Transformer
   Thermostat
   Heating Element

Shelf
Switch
Lamp
Step Up
Dial Thermometer
Oven Tray

13) Concrete Penetrometer
Set of Needle Point
Pipette with Rubber

14) Pocket Concrete Penetrometer

15) Concrete Test Hammer
Rubbing Stone
Testing Anvil

16) Marshall Test 25
Marshall Test 25
Breaking Head Stability Mold
Flow Meter
28 KN Load Measuring Ring

17) Marshall Test 25D

18) CBR Marshall Test Machine
Air Bath

19) Water Content Ditermination of Asphalt
Hot Plate
Hot Ex tractor

20) Water Content Ditermination of Petrocleum Product

21) Water Content Ditermination of Bitumenous
Isomantel Electric Header
Bitumenous Mixtures

22) Manual compaction
Compaction Mold
Compaction Pedestal
Compaction Hammer
Paper Dish
Steel Black

23) Determination of Hardness

24) 1100°C Muffle Furnace

25) Ductilometer
Ductilometer for Testing
Briquette Mouldconstructed

26) Cleveland Open Cup
Flash Cup Apparatus

27) Lost on Heating/Tin Film Test
Lost on Heating/Tin Film Oven
Thermometer (IP 47°C)
Metal Container
Aluminium Test
Stainless Steel Test

28) Ring and Ball Apparatus
Ring and Ball Apparatus
Thermometer (IP 68°C)
Thermometer (IP 61°C)
Thermometer (IP 88°C)
Magnetic Stirrer

29) Standard Tar Viscosimeter

30) Sieve Analysis Set
    Lead Receiver and Separator
    Sieves
    Washing Sieve 5 Inch
    Sieves Brush
    Sieves & Agrigate Shakers
31) 100 KN Compression
    500 KN Tension Machine
    100/500 KN Hand Operated
    Pair of Grips 12 mm
    Pair of Grips 20 mm
    Pair of Grips 25 mm
    Lack Wax Crayon
32) Bouyancy Balance
33) Analysis Kit
34) Boulk Density Measuring Set
35) Air Entainment Meter
36) Concrete Mixer
37) Stand Bosshead and Clamps
38) Spatula
39) Trowels
40) Bunsen Burner
41) Vacuum Pump
    Rubber Tubing
42) Moisture Content Tin
    Moisture Content Tin 56 mm
    Moisture Content Tin 90 mm
43) General Equipment Glass
    Beakers
    Beakers and Covers
    Beakers Covers Watch Glass
    Conical Beakers
    Tall Form Beaker
    Measuring Cylinder
    Volumetric Flash
    Conical Flash
    Graduated Pipettes
    Bulb Pipettes
    Burettes
    Weighing Bottles
    Measuring Cylinder
    Dessicator
44) Twenty Second Theodolite
    Telescope
    Horizontal Circle
    Vertical Circle
    Vertical Circle Conpensator
    Sensivity of Level
    Optical Plumet
    Triport
    Carrying Case
45) One Second Theodolite
    Telescope
    Horizontal Circle
    Vertical Circle
    Sensivity of Level

Conpensor
Optical Plumet
Triport
Illumination Battery
Diagonal Eye Piece Prism
Zenith Prism with Dark Filter
Dark Filter
Traversing Target
Carrying Case

46) Electronic Distance Meter
Battery
Battery Charger
Camera Triport Mounting Attch
Standard York Mounting Attch
Triple Replecting Prism
Camera Triport for Dintance MTR
Push Button Calculation
Carrying Case
Instruction Manual in English

47) Electronic Distance Meter

48) Electronic Distance Meter
Standard York Mounting Attch
Battery
Charge
Keyboard Calculator
Basic Distance Measurement
Triple Replecting Prism with Att
Triport for Distance Meter
Carrying Case
Instruction Manual in English

49) Tilting Level
Telecore
Horizontal Circle
Level Sensivity
Triport
Carrying Case
Instruction Manual in English

50) Automatic Level
Telescope
Horizontal Circle

51) Precision Automatic Level
Telescope
Horizontal Circle
Compensor
Sensivity of Level
Triport
Illumination Device
Optical Micrometer
Carrying Case
Instruction Manual in English

52) Abney Level

53) Streoscope
Binocular 8x
Illumination Unit
Tracking Device
Instruction Manual in English

Wooden Case

54) Panthograph
55) Alluminium Ple
56) Tongs
57) Stop Watches
58) Cement Testing Cylinder
59) Gillmore Apparatus
60) Stiffening Time of Mortar Apprt
61) Resistivity Measurement Set for Durability
    4-Pinsoil Resistance Meter
    Thermometer SAS 300 B
62) Vacuum Pump

B. Laboratory: Soil Mechanic

1) Field Density Test Set
2) Liquid Limit Test Set
    Manual Liquid Limit Device
    Casagrande Grooving Tool
    Graduated Cylinder
    Porcelain Mixing Dish
    Stainless Steel Spatula
3) Plastic Limit Test Set
    Plastic Limit Plate
4) Shrinkage Limit Test Set
    Glass Volume Cup
    Laboratory Mercury
    Monel Shrinkage Limit Dish
    Three-Prong
    Shrinkage Limit Plate
    Porcelain Shrinkage Limit Dish
5) Field Compaction Test Set
    Standard Compaction Hammer
    Modified Compaction Hammer
6) CBR Test Set
    Dial Indicators
    CBR Spacer Dish
    Dial Indicator CBR Soil Expansion
    Cutting Edge
    Forney Brand CBR Filter Paper
    Tripod Attachment
    Tripod Attachment
    And 6" Soil Compaction Molds
    Soil Preparation Knife
    Forney Brand
    CBR Surcharge Weights
    Forney Brand CBR Filter Screen
    6" Soil Compaction Mold Assembly
    CBR Sell Plate
7) Field CBR Set
8) LT-30 Series
    Universal Testing Machine
9) Speedy Moisture Tester
10) Speedy Pressure Powder

11) Soil Testing Accessories
    Magnet Holder
12) Soil Sampling Auger Set
13) Drilling Machine
14) Combination Permeameter, Constant or Falli
15) Porous Stones
16) California Bearing Ratio Test Press
17) Soil Vertijack
18) Mini-Scout Pocket
    Seismegraph Set
19) Unconfined Compression Test
20) Direct Gripper Assembly
    Spare Gripper Assembly
21) Soil/Triaxial
22) Standard Triaxial Assemblies
23) Back Pressure Triaxial Assemblies Function
    Triaxial Panel Board
    Triaxial Membrane Jackets
    Triaxial Membranes
    Triaxial Compaction Molds
24) Sand Density Apparatus
25) Large Capacity Field Test Scale
26) High Capacity Consolidation Apparatus
27) Single Proving Rings
28) Gulds Wash Bottle 1 L
29) Polyethylene Wash Bottle 1 L
30) Sample Container
31) Consolidation Loading Weight Set
32) Water Distillation

C. Laboratory: Hydraulics, Hydrology, Trigation

1) Universal Setting Flume
2) Filterability Index Apparatus
3) Drainage and Sewage
4) Hydraulics Bench
    Dean Weight Precision Pressure Gauge Calibrator
    Hydrostatics Pressure Apparatus
    Basic Weir Apparatus
    Bernaulli's Theorem Demonstration Apparatus
    Impact of Jet Apparatus
    Pipe Friction Apparatus
    Osdorne Reynold's Apparatus
5) The GWT Test Kit
6) Laminar Flow Analysis Table
7) Inclinometer
8) Basic Hydrology System
9) Tachometer
10) Barometer

D. Laboratory: Computer

1) Computer
2) Printer
3) Copier Machine
4) Drafting Machine
5) Overhead Projector
6) Printer
7) Computer
8) Computer
9) Computer
10) Printer
11) Slide Projector
12) Desk Jet Printer

I-2 Electronical Engineering

A. Control Laboratory

1) Servo System Trainer
   Increment Encoder
   Quadrature Decoder
   Digital Survo Controller
   Analogue Outrput Unit
   Power Supply
2) Storage Oscilloscope
3) X-Y/t Recorder
4) Trans. & Instrumentation Kit
5) Transfer Function Analyzer

B. High Voltage Laboratory

1) Multitest Set
   Impulse Capacitor, Capacitance 10.000 PF
   Impulse Capacitor, Capacitance 25.000 PF
   Load Capacitor, Capacitance 1.200 PF
   Measuring Capacitor, Capacitance 100 PG
   Measuring Resistor, Resistance 280 Ohm
   Charging Resistor, Resistance 10 Ohm
   Charging Resistor, Resistance 2.5 Ohm
   Wave Front Resistor, Resistance 260 Ohm
   Wave Front Resistor, Resistance 245 Ohm
   Wave Front Resistor, Resistance 132 Ohm
   Wave Front Resistor, Resistance 71 Ohm
   Wave Front Resistor, Resistance 43 x 1 Ohm
   Wave Front Resistor, Resistance 26 x 1 Ohm
   Wave Front Resistor, Resistance 25 x 1 Ohm
   Wave Front Resistor, Resistance 14 x 1 Ohm
   Wave Front Resistor, Resistance 8 x 1 Ohm
   Wave Tail Resistor, Resistance 6100 Ohm
   Wave Tail Resistor, Resistance 2400 Ohm
   Wave Tail Resistor, Resistance 1200 Ohm
   Wave Tail Resistors, Resistance 282 x 1 kOhm
   Wave Tail Resistors, Resistance 982 x 1 kOhm

Wave Tail Resistors, Resistance 49 x 1 kOhm
Load Capacitance, Resistance 0 - 0.9 nF
Load Capacitance, Resistance 0.9 x 2.5 nF
Load Capacitance, Resistance 2.6 - 5.2 nF
Load Capacitance, Resistance 5.6 - 11 nF
HV Silicum Rectifier, Resistor 100 kOhm
Support Insulator, AC Voltages 100 kV
HV Connection 200 kV
HV Connecting 300 kV
Grounding Switch, Electrically Operated
Electrode
Discharge Rod
Sphere Gap, Elect. Operated
Drive for Sphere Gap, with Insulating Shaft
Connecting Cup
Floor Pedestal
Suspension Plate
Connecting Rod
Spare Bar
Digital Peak Voltmeter
Impulse Voltmeter
DC Voltmeter
Low Voltage Divider
Coaxial Measuring Cable
Electronic Trigger Sphere
Triggering Device
Compressed Gas Capacitor
Vessel for Vacuum & Pressure
Space Bar
Corona Cage
Oil Testing Cup
Measuring Spark Gap, Electrically Operated
Space Bar

C. Digital Laboratory

1) Digital System Trainer
2) Integrated Circuit
   Logic Trainer
3) Micro. Applicat. Trainer
4) 40 MHz Oscilloscope

D. Basic Electricity Laboratory

1) Basic Electricity and Electronics Kit
2) 20 MHz Dual-Trace Oscilloscope
3) Function Generator
4) Multimeter
5) Electronic Wattmeter

E. Elect. Power Distribution Laboratory

1) Power System Simulator
2) Portable Time Domain Refect
3) Insulation Tester
4) Reactive Power Compensation
5) Earth Tester

F. Electrical Machine Laboratory

1) Electrical Machine Kit
2) Power Electronics System
3) 20 MHz Oscilloscope
4) X/Y Recorder

G. Electronics Laboratory

1) Electronics Constructor
2) Industr. Electronic Trainer
3) Power Supply

H. Telecommunication Laboratory

1) Analogue Communication System
2) Digital Communication System
3) Telephone System Tuitor
4) Transmission Line Demonstrator
5) Digital Frequency Meter

I. Measurement Laboratory

1) Student Brige
2) Students DC Potentiometer
3) Phasor Meter
4) Transformer Ratio Brige
5) Student Mutual Indicator
6) Simulated Transmission Line
7) Galvanometer
8) Standard Decade Resistance Box
9) Standard Decade Resistance Box
10) Decade Capacitance Box
11) Precision Decade Capacitance
12) Stand. Decade Capacitance Box
13) Decade Inductance Box
14) Standard Decade Inductance Box
15) Galvanometer
16) X/Y Recorder

I-3 Chemical Engineerings

A. Chemical Engineering I

1) Thermal Conductivity System
2) Radiation Test System
3) Double Pipe Heat Exchanger
4) Free and Forced Convection Apparatus
5) Film and Drop Condensation Unit
6) Heat and Mass Transfer
7) Fluidization and Fluid
8) Liquid Phase Chemical Reactor
9) Tubular Flow Reactor Bed Head Transfer Unit
10) Corrosion Studies Kit Analogy Unit
11) Solid Handling Study Bench
12) Recommended Instruments and Accessories
    Gas Cylinder with Regulator
    Electronic Top Loading Balance
    Stop Clock
    Refractometer

B. Chemical Engineering II

13) Fractional Distilation Unit
14) Gas Absorption Column
15) Cooling Tower
16) Unit for Determination of Diffusion-Coefficient
17) Liquid Mixing Apparatus
18) Tray Drier
19) Liquid/Liquid Extraction Unit
20) Double Effect Evaporator
21) Plate and Frame Filter and Accessories
    1x Gas Cylinder with Pressure Regulator
    1x Stop Clock
    1x Conductivity Meter
    1x Triple Beam Loading Balance
    1x Refractometer

C. Process Control

22) Stirred Tank with Data Logger Card for LAB Computer
23) Microcomputer
24) Integrated Process Control Technology System The System Consist of Following Module:
    a. Electrical Console Module:
    b. Process Module
    c. Level Control Module
    d. Pressure Control Module
    e. Flow Control Module
    f. Temperature Control Module
    g. pH Control Module
    h. Computer Control and Data Logging Module
    i. Programmable Logic Control Module
    j. Remote Set Point Control Module
    k. Two Channel Laboratory Recorder

25) Air Compressor
26) Control and Instrumentation Study Station
27) Microscope
28) Hot Plate
29) Water Bath
30) Shawer Bath
31) Oven
32) Balance
33) Balance
34) Balance
35) Incubator
36) Blender/Miner
37) Stirrer Magnet
38) Bunsen Burner
39) Test Tube
40) Graduated Pipette
41) Erlenkeyer Flask
42) Funnel
43) Mortar
44) Thermometer
45) Beaker Glass
46) Measuring Cylinder
47) Volumetric Flask
48) Burette & Stand
49) Petri Dish
50) Portable pH Meter
51) pH Meter with Printer
52) Conductivity Heater with Built in Printer
53) Spectroprotometer
54) Kjeldahl Distillation/Digestion Assembly
55) Rotary Evaporator
56) Shaker
57) Water Purifier
58) Heaters Mantles
59) Aeration Unit
60) Ion Exchange
61) Sewage Treatment System
62) Liquid Sedimentation Apparatuseng
63) Recommended Instrument and Accessories
    - 1x Stop Clock
    - 1x Triple Beam Loading Balance 2610 gr.
      Sensitivity 0.1 gr.
    - 1x Electronic Top Loading Balance
    - 1x Colorimeter
    - 1x Pedestal Spring Balance
    - 1x Cartridge Deioniser Flow Rate Up to 90 Liters/Hour
    - 1x Replacement Cartridge Pack
    - 1x Beaker Cell Electrolytic

I-4 Mining Engineering

A. Mineral Processing Laboratory

1) Single-toggle Fine Reduction Jaw Crusher
2) Laboratory Hammer Crusher
3) Laboratory Disc Mill Type 1 C.
4) Laboratory Ball Mill Pilot Plant
5) Spiral Classifier
6) Conical Ball Mill Pilot Plant
7) Wet Grind. Pilot Plant
8) Pilot Plant Shaking Screen
9) Laboratory Vibrating Screen Medium Size
10) Laboratory Current Washer with 4 Cell
11) Laboratory Air Classifier
12) Laboratory Testing Screen
13) Laboratory Screw Classifier 200 MM
14) Eccentric Jigging Machine, Pilot Plant
15) Shaking Table, Type 1
16) Pilot Plant Flotation Machine
17) Lab. Strong Field Magnetic Separator
18) Laboratory Permanent Magnet Drum Separator
19) Laboratory Tube Magnet
20) Pilot Plant, Heavy
21) Laboratory Flotation Machine
22) Laboratory Drum Filter Type A
23) Covering Hood
24) Automat. Sample Devider
25) Lab. Plate Feeder

B. Coal Analysis Laboratory

1) Riffles-holmes, Model 5, Galvanized Steel
2) Crusher-mill, Motor Driven Dry Crusher-hand Mill
3) Sulfur Analyzer-part 1760
   - Rapid Sulfur Analyzer-preiser
4) Preiser Ultimate Analysis Family
5) Coal Ashing
   - Furnace-thermoline
6) Moisture Analyzer-boekel
   - The Speedy Moisture tester
7) Mettler AE and AM series Balances
   - Mettler J Series Balance
8) Torbal Torsion Balance
   - Pans
9) Pyrometer
10) Oxygen Bomb Calorimeter
11) Calorimeter Programmer
   - Digital Printer
   - Paper Tape Refil.
12) Replacement Bucket
13) Tester for Calorimeter Jackets

14) Platinum Crucibles
    - Capacity 10 ml,
    - Capacity 20 ml
15) Volatile Matter Determine
    - Transformer
    - Replacement heating unit
    - Crucible Support
16) Vacuum Pump
17) Air Compressor
18) Pulverizer
19) Jaw Crusher

C. Mineral Dressing Laboratory

1) Jaw Crusher
2) Crushing Jaw
3) Crushing Jaw
4) Lateral Wedges
5) V-Belts
6) Sieving Machine
7) Sieving Machine Acc.
    - Rose Head
    - Collector Bottom
    - Brush, Nylon
8) Vibrating Machine
9) Vibrating Machina Acc.
10) Floating Machine
11) Floating Cell
12) Agitator
13) Wet Grind. Pilot Plant
14) Spiral Classifier
15) Shaking Table
16) Humprey Spiral Concent
17) Heavy Medium Separator
18) High Tension Separator
19) Scann. Photo Sedimentograph
20) Sedimentation Balance
    - Weighing, Table with Table Attachment
    - Sedimentation Jar
    - Thermostat
    - Recording Paper
    - Recording Pen

D. Laboratory of Ore Microscopy

1) Cutting Machine
    - Specimen Holder, Stone Clamp
    - Specimen Holder, Cemeting Disk with Plastic Cup
    - Cutting Table
    - Wax. Cement No.2 100g Complete Set of Cutting
    - Compraising

Grinding Accessories:
- Grinding Disc, Silicon Carbide Mounted, Hardness, J. Granulation 20
- Ditto, Granulation 46
- Ditto, Granulation 80
- Ditto, Granulation 200
- Ditto, Hollowed-out in the Centre
- Grinding Disc, Bronze
- Grinding Disc, for Emery-Paper Disc
- Set of 100 Emery-paper Discs, 20 each of 5 Various Granulation

Polishing Accessories:
- Tester Disc, for and with 1 Thick Cloth
- Ditto, for and with 1 Thin Cloth
- Set of 5 Thick Cloths
- Set of 5 Thin Cloths

Grinding Media
- Course Granulation 100
- Medium Granulation 230
- Medium Granulation 280
- Fine Granulation 400 (pasty)
- Very Fine Granulation 600
- Very Fine Granulation 800 (pasty)
- Extra Fine Granulation 1000

Polishing Material
- Red Powder
- Green, Chromium Oxide
- Argillaceous Earth, Powder
- Polishing Section (KOLB 74)
- Mineral Opaque Polishing Section, with of the Manual of Experiment and Description of each Mineral

2) Grinding & Polishing Machine
3) Lacoste and Romberg Ravity Meter

E. Petroleum Laboratory

1) Burning Test Apparatus
   Buring Test Replacements
   Glass Chimney Pack of 6
   Wicks Pack of 50
   Flamegauge Sta
2) Smoke Point Apparatus Seta
   Smoke Point Apparatus Replacement & Access
   - Candle, Polished Chorme
   - Wick Pack of 100
   - Instrument Case for Smoke Point Apparatus, Tripod Stand and 5 Additional Candles
   - Sighting Device for Smoke Pot Apparatus to Fasilitate Reading and to Eliminate Parallax
3) Cloud and Pour Point
   Cloud and Pour Point
   Colour Comparator

4) Seta-Lovibond
   - Sample Containers
   - Sample Containers for Routine Work Pack of 10 Lamp Colou Temperature 2705°C Kelvin
5) Marsh Funel
   Viscometer
6) Rheometer
7) Viscometer Cup Heater
8) Rotary Viscometer

F. Mine Surveying Laboratory

1) Theodolite
2) Automatic Self Levelling
3) Planimetere
4) Theodolite
   - Survey Accessories
5) Prism Square
   - Prism Square
6) Pantograph
   - Counterbalancing Weight
   - Drawing Head
7) Geological Hammer
   - Geological Hammer, Chisel Tail
   - Geological Hammer, Pick Tail

G. Geology Laboratory

1) Crystal Models Made of Wood
   - Crystal Models Made of Glass
2) Minerals and Ore Collection
   - Fluorescent Minerals Collection
   - Mineral Hardness Specimens Set
3) Hardness Pencils Set
4) Geological Hammer
5) Orienteering Compas
6) Abney Level
7) Brunton Compass
8) Folding Magnifier
9) Folding Double Magnifier
   - Magnifying Glass
10) School Microscope
   - Set of 4 Mignon Batteries
   - Transformer
   - Spare Lens Bulb
11) Student and Laboratory Microscope Binocular
12) Carl Zeiss Transmitted Light Polarizing and Research Microscope Standard 18 Pol, Binocular
13) Fossils Set
   - Fossil & Fossil Rreplicas Set
   - Rock Set
   - Rock Collection
   - Thin Rock Sections Sets
   - Collection of Rock Forming Minereng
   - Collection of 60 Mineral Thin Sections

- Ore and Metals Display Lapidary Machine, Universal, Switched
- Lapidary Machine, Double Grinding
- Lapping Machine
- Set of Geotectonicalk Models

14) Transmission Electron Microscope em 109
15) Terraloc 12 Cahnnel Digital Seismograph
16) Terraloc 24 Channel Digital Seismograph
17) Induced Polarization Instrument
18) Signal Enhancement Seismograph
19) Fluorescence Microscope
    - Carl Zeiss Reflected Light Plarizing Laboratory

H. Mine Ventilation Laboratory

1) Single Inlet Blower with Motor & Drive
   - Single Inlet Blower with Motor & Drive
2) Manometer
   - Manometer
3) Rsirling (Sling) Psychorometer
4) Mercury Barometer
   - Mercury Barometer
5) Vane Amenometer
   - Spare Battery
6) Pierometer
   - Extension RCD 1 M Long
   - Extension RCD 2 M Long
   - Extension RCD 1 M Long
   - Extension RCD 2 M Long
   - Extension RCD 3 M Long
   - Plastic Tubing
   - Water Level Indicator
   - Piezometer
   - Frequency Counter
   - Spare batteries
7) Gas Detector Oxygen Indicator
8) CO Detector for Coal Mine
9) SO2 Mini Monitor
10) NO2 Mini Monitor
11) Pocket Type H2S Mini Monitor
12) Combination Type Oxygen, Methane Detector
13) Combination Type Oxygen H2S
14) Combination Type Oxygen CO Detector
15) Careotec Portable Type CO, CO2 Detector

I. Mineral Analysis Laboratory

1) Gas Chromatograph
   - Bubble Tower Assembly
   - Drying Tube Assembly
   - Standard Column Assemble
   - Recorder Cable
   - Indication Drierte & Septums

2) Atomic Absorption Spectropnotometer
   - Automatic Programer
   - System I Data Translator
   - System II Data Translator
   - Furnace Interface

II. University of Syiah Kuala

II-1 Mechanical Engineering (MS)

1) Universal Turning Laties with Accessories
   - Spare Parts Set

1a) Accessories
   - Driving Plate with Pin
   - 3 Jaw Chuck
   - 3 Jaw Drill
   - Adjustable Quick-Change Tool Post
   - Set of Tool Holders
   - Face Plate 250 mm Dia., with 8 Slots
   - Safety Lathe Dog
   - Set of 17 Collets 2010mm in Steps of 0.5mm with Collet Holder
   - Revolving Center MT 2
   - Half Center MT 2
   - Steady Rest Max. Dia. 70mm
   - Vertical Drilling and Milling
   - Spare Parts Set

1b) Set of Tools for Lathe

2) Universal Milling Machine, with Accessories Tools
   - Spare Parts Set

2a) Optional Accessories
   - Machine Vice
   - Autolock Chuck
   - Set of Clamping Device for T-slot 12mm
   - Universal Dividing Head and Tail Stock

2b) Set of Milling Tools

3) Pillar Drilling Machine
   - Spare Parts Set

4) Bench Type Drilling Machine
   - Spare Parts: Set of 1 V-belt and Spring

4a) Set of Drills

4b) Electric Hand Drilling Machine

5) Shaping Machine
   - Spare Parts: V-belt

6) Hydraulic Heavy Duty Power Hacksaw

7) Horizontal Surface Grinding Machine
   - Spare Parts: Main Power Supply Switch

8) Pedestal Workshop Grinding Machine

9) Hydraulic Press

10) Guillotine Shearing Machine

11) Sheet Folding Machine

12) Spot Welding Machine
   - Spare Parts: Set of 40 Spare-electrodes

13) Arc Welding Machine
   - Spare Parts: Set of 5 Damping-resistors

14) CNC turning Lathe for Education
   - Spare Parts: Set of 25 Spare-fueses

15) Sheet Bending Roll

16) Precision Micrometer Set

17) Precision Vernier Caloper

18) Precision Dial Caliper

19) Set of Dial Caliper Gauge

20) Magnetic Base for Dial Indicator
21) Bench Vice
22) Universal Tool and Cutter Grinder
- Spare Parts Set
23) Oxy-Acetylene Welding and Cutting Set
24) Tap and Dies Set in Box
25) Set of Hand Tools
26) Set of Tools in Box
27a) Workbench with 40mm Top Plate 1500 x 600mm
26b) Workshop Cabinet with Partition for Tools in Drawers
27) Sheet Metal Cabinet
28) Dual Channel Multi Range Strip Chart Recorder
- Spare Parts: Set of Fine-fuses
29) X-Y Recorder
30) Cutting Force Measuring
31) Universal Testing Machine
32) Universal Hardness Tester
- Spare Parts: Set of 5 Spare-lamps
33) Impact Testing Machine
34) Universal Cut-Off Machine for Metallurgical Lab.
- Spare Parts Set
35) Belt Sander for Metal
- Spare Parts: Spare Contract-Wheel
36) Grinding & Polishing Machine
- Spare Parts: Set of 1 Driving-belt and 1 Sealing
37) Reflected Light Binocular Microscope for Metallography
38) Camera for Reflected Light
39) Ultrasonic Flow Detector with Accessories
- Spare Parts: Set of 10 Fuses
40) Plastic Moulding Machine for Samples
- Spare Parts: Set of 1 Temperature-fuse and 1 Sealing
41) Induction Furnace for Melting & CaSTING
- Spare Parts Set
42) Universal Sand Strength Tester
43) Sand Rammer
44) Moisture Tester for Sand
- Spare Parts: Spare Heating Element
44a) Weighing Scale
45) Green Sand Hardness Tester
46) Laboratory Sieving Machine
- Spare Parts: Set of 5 Spare-fuses
47) Sieves
48) Sand Permeability Tester
49) Sand Mixer
50) Optical Pyrometer
- Spare Paarts: Set of 1 Photo-element and 1 Switch
51) Sand Moulding Machine
- Spare Parts: Set of Sealings
52) Compressed Air Equipment
- Spare Parts Set
53) Sand Blast Machine
- Spare Parts Set
54) Electric Hand Tools
54a) Electric Drill
55) Graphite Crucible

56) Universal Wodworking Machine
- Spare Parts: Set of V-belts

57) Bandsaw for Wood
- Spare Parts: Set of V-belts

57a) Hand Tools

58) Muffle Furnace

59) Temperature Measuring Unit

60) Strip Chart TY Recorder

61) X-Y/YT Recorder

62) Potentiometer

63) Strain Gauges

64) Thermocouple Wires

64a) Measuring Amplifier
- Spare Parts: 034A Set of 10 Spare-fuses

65) Carbon Determination Apparatus

66) Programable CE Meter (see item 035)

67) Nozzle Flow Apparatus
- Spare Parts: Compete Set of Sealings

68) Ventury Meter (see item 001)

69) Orifice Meter Test Reg. for Calibration (see item 001)

70) Rota Meter Calibration Test (see item 001)

71) Oil Hydraulic System

72) Oil Hydraulic Training Unit

73) Oil Hydraulic Training Unit

74) Centrifugal Fan Testing Set
- Spare Parts: Set of Sealing-elements and 10 spare-fuses

75) Level Control Apparatus with Experimental Pane
- Spare Parts Set

76) Laboratory Bench for Testing Industrial Control Components
- Spare Parts: Set of 10 Spare-fuses

77) Liquid Level and Pressure Control Test Stand
- Spare Parts: Set of Quick-coupling-element and 10 spare-fuses

78) Saybolt Universal Viscometer
- Spare Parts: Set of 5 Spare-flasks

79) Redwood Viscosimeter
- Spare Parts: Set of 5 Spare-flasks

80) Flash Point Tester
- Spare Parts: Spare-cup

81) Mechanical Balance

82) Digital Stop Watch

83) Air Compressor

84) Automotive Electrical System

85) Ignition System

86) Fuel System

87) Plug-in Automotive System

88) Automotive System

89) Power Panel System
- Spare Parts for Automotive electrical Sys. Comprising Code No.MS-41-007

90) 4 Stroke Diesel Engine on Test Stand
- Spare Parts: Spare-oil-filter and V-belt

91) Sectional 2 Stroke Engine on Stand

91a) Sectional 4 Stroke Gasoline Engine

92) Exhaust Gas Tester

93) Adiabatic Bomb
- Spare Parts Set
94) Electric Grinder
95) Electric Hand Drill
96) Drafting Machine
97) Sectioned Model of Differential Gear
98) Sectioned Model Standard Gear Transmission Box
99) Gear Transmission Models
100) Wall Chart
101) Personal Computer
101a) Uninterruptable Power Supply
101b) Consumables
102) Experimental Refrigeration Unit
102a) Freon Detector
103) Experimental Heat Exchange Unit
104) Air Conditioning Testing Unit
- Spare Parts Set
105) Dew Point Determination Apparatus
106) Sling Psychrometer
107) Aspiration Psychrometer
108) Vacuum Pump
109) Potentiometer
110) Thermocouple with Measuring Amplifier
111) Volt Meter
112) Ampere Meter
113) Single Channel Chart Recorder
114) X-Y Recorder
115) Telescoping Gauge
115a) Bevel Protractor
116) Plug Gauge
117) Adjustable 60 and not 60 snap Gauge
118) Set of Radius Gauge
119) Tread Pitch Gauge
120) Visual Comprator Stand with 8mm Bore
121) Measuring Machine
122) Dial Gauge
123) Set of Gauge Blocks
124) Machinist Rules
125) Vernier Depth Gauge
126) Precision Vernier Caliper, Capacity 150mm
126a) Precision Vernier Caliper, Capacity 300mm
127) Vernier Height Gauge Micrometer
128) Micrometer Caliper
129) Caliper Type Inside Micrometer
130) Inside Micrometer
131) Micrometer Depth Gauge
132) Super Micrometer
133) Tool Maker Microscope
134) Optical Projector
135) Outside Caliper
136) Inside Caliper and Divider
137) Surface Gauge
138) Granite Surface Plate
139) Measuring Equipment (Set of Measuring Tools)
139a) Measuring Equipment (Straight Knife Edge Set)

II-2 Chemical Engineering (TK)

1) Gas Chromatography System with Accessories
2) Gas Meter, Wet Test with Accessories
3) Gas Meter, Dry Test
4) Gas Analysis Apparatus
5) Gas Sampling Tubes
6) Ultra Thermostatic Bath
7) Kit of Spare Parts to Item TK-11-106
8) Compact Circulation Thermostat, Digital
9) Shaking Thermostatic Water Bath
10) Kit of Spare Parts to Item TK-11-008
11) Multi Purpose Motor for Continuous Operation
12) Circulation Pump
13) Kit of Spare Parts to Item TK-11-010
14) Centrifugal Pump
15) Kit of Spare Parts to Item TK-11-011
16) Labs Jacks
17) Water Distilling Apparatus
18) Kit of Spare Parts to Item TK-11-013
19) Laboratory Demineralizer
20) Lab Jack
21) Lab Jack
22) Bod Unit
23) Laboratory Demineralizer 4 Bed Type
25) Kit of Spare Parts to Item TK-11-019
26) Digital Spectrophoto Meter UV/VIS
27) Turbidimeter Digital
28) Kit of Spare Parts to Item TK-11-021
29) Laboratory Hydraulic Press
30) Laboratory Sieving Machine
31) Sieves US Standard ASTM
32) Touchless Phototachometer, Analog Type
33) Kit of Spare Parts to Item TK-11-025
34) Touchless Phototachometer, Digital Type
35) Kit of Spare Parts to Item TK-11-026
36) Flowmeter, Rotameter for Liquids and Gases
37) Kit of Spare Parts to Item TK-11-027
38) Stirrer Motor
39) Stirrer Motor
40) Stirrer Motor
41) Shaft Stirrer
42) Shaft Stirrer
43) Shaft Stirrer
44) Shaft Stirrer
45) Magnetic Stirrer
46) Contact Thermometer Straight Stem
47) Laboratory Immersion Pump
48) Circulating Pump
49) Kit of Spare Parts to Item TK-11-038
50) Circulating Pump
51) Kit of Spare Parts to Item TK-11-039
52) Centrifugal Motor Pump Self Priming
53) Rotary Pump
54) Ball Mill Roller with Balls
55) Macro Kjeldahl Digestion and Distilling App. Combined Unit

56) Kit of Spare Parts to Item TK-11-043
57) Automatic Titrimeter System
58) Karl Fisher Coulometric Titration
59) Laboratory Fermentor Modular System
60) Kit of Spare Parts to Item TK-11-048
61) Steam Generator
62) Sterillizer, Lab. Model for Sterillization of Nuitrients
63) Kit of Spare Parts to Item TK-11-050
64) Heating Mantle in Round Metal Housing
65) Power Supply Unit
66) Kit of Spare Parts to Item TK-11-052
67) Comparator
68) Laboratory High Speed Centrifuge
69) Kit of Spare Parts to Item TK-11-054
70) Top Loading Precission Balance
71) Refrigerator with Deep Freezer
72) Calorimeter Thermostat
73) Kit of Spare Parts to Item TK-11-057
74) Universal Hydrometer
75) Capillary Viscometry
76) Cannon-Fenske Routine Viscometer
77) Kit of Spare Parts to Item TK-11-060
78) Single Stage Standard Gas Pressure Regulator
79) Portable Multimeter Digital
80) Stopwatch
81) Thermocouple Wire
82) Digital Temperature Meter
83) Multichannel Recorder
84) Compact Circulator Thermostat
85) Kit of Spare Parts to Item TK-11-067
86) Laboratory Reaction Vessel with Stirrer
87) Heating Tape
88) Reaction Apparatus
89) Reaction Apparatus
90) Moleculer Weight Measurement
91) Laboratory Reactor
92) Apparatus for Reaction
93) Oil Bath for Distillation Flask
94) Fractional Distillation Apparatus
95) Fractional Distillation Apparatus
96) Thin Film Evaporator
97) Auto Transformer
98) Immersion Heater
99) Large Tool Kit
100) Dryer Electric
101) Kit of Spare Parts to Item TK-11-082
102) Column Holders
103) Glass Blowing Kit
104) Cutting Scissors for Metal
105) Drilling Machine
106) Cutter for Glass Tubes and Pipes
107) Welding Machine
108) PVC Welding Device
109) Water Heater
110) Fluid Friction Apparatus
111) Kit of Spare Parts to Item TK-11-091

112) Free and Forced Connective Heat Transfer Apparatus
113) Solid Liquid Extraction Unit
114) Liquid-Liquid Extraction Unit
115) Gas Absorbtion Column
116) Tray Dryer
117) Laboratory Spray Dryer
118) Kit of Spare Parts to Item TK-11-097
119) Automatic Air Compressor
120) Liquid Phase Chemical Reactor
121) Kit of Spare Parts to Item TK-11-099
122) Tubular Flow Reactor
123) Kit of Spare Parts to Item TK-11-100
124) Corrosion Studies Kit
125) Capillary Viscosity Measuring Intrument Automatic
126) Digital pH Meter
127) Bath
128) Multi Purpose Motor
129) Diaphragm Air Pump
130) Rotary Liquid Pump
131) Column Borosilicate
132) Bubble Cap Fractioning Distillation
133) Psychrometer
134) Viscometer Schott
135) Petri Dishes Culture
136) Pipette
137) Tube Fermentation
138) Gas Regulator for Different Gases
139) Vacuum Gauge
140) Mercury, Pure 1 kg Flask
141) Metal Thermometer
142) Solenoid Valve
143) Solenoid Valve
144) Vacuum Gauge
145) Syring for Liquid Sample
146) Syring for Gas Sample
147) Hot Plate
148) Kit of Spare Parts to Item TK-11-126
149) Computer P.C.
150) Matrix Printer Standard
151) Voltage Stabilizer
152) Flask, Erlenmeyer
153) Flask, Assorted Set
154) Desiccator, Vacuum
155) Immersion Cooler
156) Kit of Spare Parts to Item TK-11-132
157) Thermometer:
- Steam Thermometer 260mm
- Steam Thermometer 300mm
158) Glass Tubing Duran
159) Beaker
160) Weighing Bottle
161) Stopcock Straight Bore
162) Rectangular Glass Tank
163) Blower
164) Amperemeter
165) Voltometric Titration

166) Dehumidifier
167) Laboratory Filter Press

APPENDIX 11. OUTLINE OF 11 TARGET UNIVERSITIES

APPENDIX 11: OUTLINE OF 11 TARGET UNIVERSITIES

I. UNIVERSITY OF SYIAH KUALA

1. OUTLINE

The University of Syiah Kuala is located about 8 km. from the center of Banda Ache City, 22 km. from Balang Bintang airport and 38 km. from Malahayati port.

The University was established in June 1961 and certified officially as a state university in April 1962. The oldest faculty is the Faculty of Economics. Successively the Faculty of Veterinary Science, Faculty of Law, Faculty of Engineering, Faculty of Agriculture and Faculty of Education were established. The latest faculty established was the Faculty of Medicine. At present there are 15,000 students and 500 teaching staff in the 35 departments of these seven faculties.

Besides the faculties, the University has diploma courses in Secretary Training, Teacher Training, Management, and Sports & Recreational Facilities. There are also a Computer Center, Public Relations Office (HUMAS), Printing Office, Development Center, Social Science Research and Training Center (PLPILS), Language Center and Open University (UT). The university is quite active in education as well as in helping the development of the Ache region through the activities of its institutions.

2. FACULTY OF ENGINEERING

The Faculty of Engineering was established in September 1963 and has three departments: the Department of Civil Engineering, Department of Chemical Engineering and Department of Mechanical Engineering.

2.1 Department of Civil Engineering

The Department of Civil Engineering started first with ten students studying six semesters. In 1971 it adopted the present nine semester system. The numbers of students and teaching staff are shown in Table I-1.

There are four laboratories: soil, hydraulics, surveying and concrete. It is planned to set up a road laboratory and to expand the hydraulics laboratory and the wood material laboratory in the near future.

The Department has a history of nearly thirty years and the laboratories are relatively well-equipped but many of the instruments are old. The Concrete Laboratory has many strength testing machines. But equipment for concrete experiments, to build experimental materials and balances etc. are relatively scarce. There is an unbalance in the equipment provision. The Soil Laboratory has enough instruments for student practice. However, some testing machines are too old to use. It seems necessary to replace these old machines and to provide consumables for soil testing. Instruments for surveying practice are in adequate. It is necessary to equip the Surveying Laboratory with more theodolites and levels to up the education level. The Hydraulics Laboratory has only an open channel. It is desirable to provide it with equipment necessary to conduct experiments related to water resources development, prevention of flood, erosion of coastal line which are critically important in the Ache region.

2.2 Department of Mechanical Engineering

There are four laboratories: Workshop, Material Testing Laboratory, Energy Conversion Laboratory and Heating and Cooling Laboratory. It is planned to set up three new laboratories in the near future: an Engineering & Machine Design Laboratory: an Engineering & Machine Design Laboratory, and a Hydraulic Laboratory and Manufacturing Process Laboratory. It is desirable to strengthen the Workshop and the Engineering & Machine Design Laboratory to develop maintenance capability since maintenance services and provisions of spare parts are not satisfactory in this region. In these circumstances, it is desired to supply equipment for the Machine Design & Engineering Laboratory and instruments necessary to develop maintenance capability. It is necessary to avoid duplication with the equipment which are assumed to be provided from Germany.

2.3 Department of Chemical Engineering

The number of students is large reaching four hundred fifty. However, the teaching staff is relatively small compared to the number of students. It is desirable first to increase the number of teaching staff.

At present, there is only one small laboratory for chemical engineering experiments. The construction of a new laboratory is planned to start in 1991. More than half of the facilities available at present are those which are used in common for various kinds of experiments in chemical engineering and those for the measurement of material properties and instrumental analysis. Therefore, it is not necessary to provide those kinds of instruments. The department lacks instruments for heat transfer, flowage, absorption, extraction and drying experiments. Since fertilizer, cement and food processing industries are developing in this region, it is necessary to increase instruments for pulverulent bodies. It is also considered desirable to provide instruments for fermentation since there is a course in microbial chemistry.

3. BILATERAL AND MULTILATERAL ASSISTANCE

Germany has provided the Department of Mechanical Engineering and the Department of Chemical Engineering with a certain amount of equipment. In the selection of equipment, unnecessary duplication must be avoided. The priority in the HEDS project will be placed on consumables and the small equipment necessary for daily operations.

Table A-11-1 University of Syiah Kuala

	Civil Engineering Department	Mechanical Engineering Department	Chemical Engineering Department
Enrollment	446	171 1/	450
No. of freshmen		247(1990)	
No. of Lecturers	49	24	15
Undergraduate	31	24	12
Master	14	-	-
Doctor	2	-	3
No. of Laboratories	4	4	1
	1) Soil Mechanics lab. 2) Hydraulic Lab. 3) Land Survey lab. 4) Structure lab.	1) Work Shop 2) Material testing lab. 3) Conversion energy lab. 4) Heat & Refrigeration lab.	1) Chemical Engineering lab. will expand in the future 1) Unit Operation lab. 2) Unit process lab.

II. UNIVERSITY OF NORTH SUMATERA

1. OUTLINE

This University was established in September 1957 and is located at Jalan Universitas No.9 USU. Medan, North Sumatera. It is the largest university in Sumatera. Fig is the organizational chart of the University. There are nine faculties: the Faculty of Medicine, Faculty of Law, Faculty of Agriculture, Faculty of Engineering, Faculty of Economics, Faculty of Dentistry, Faculty of Literature, Faculty of Mathematics and Natural Sciences and Faculty of Social and Political Sciences. Besides these faculties there are five diploma courses. The total number of students excluding those in diploma courses is 11,939. The number of teaching staff excluding those in diploma courses is 1542, of which 1,283 are S1 degree holders, 203 are S2 degree holders and 56 S3 degree holders.

2. FACULTY OF ENGINEERING

The Faculty of Engineering was established in September 1959 with only one department, Department of Civil Engineering. At present, there are four departments: the Department of Civil Engineering, Department of Mechanical Engineering, Department of Electrical Engineering, and Department of Industrial Engineering & Management. The Department of Industrial Engineering & Management has two programmes: Industrial Engineering & Management Programme and Chemical Engineering Programme.

2.1 Department of Civil Engineering

The Department of Civil Engineering is the biggest department of the Faculty of Engineering. The teaching staff is 79 strong including 15 who are now studying abroad. Two of these have PhD degrees and those who are abroad now are expected to obtain a master's or doctor's degree in the near future.

Students number about 550 with 100 to 120 new entries every year. Table II-1 shows the detailed breakdown of the students, teaching staff, and the names of the laboratories.

The Concrete Laboratory (468 m²) and the Hydraulics Laboratory (524 m²) are separately housed. The Soil Laboratory, the Road Laboratory and the Survey Laboratory are accommodated in a three-story building, on the first floor, the second floor and the third floor respectively. Every laboratory has rooms spacious enough to accommodate more equipment. The Hydraulics Laboratory is equipped with many experimental facilities provided by an ADB loan last spring. They are not yet in operation. The Surveying Laboratory has less equipment than other laboratories. Although the Department has requested the provision of high precision surveying instruments, it is recommended to provide this laboratory with standard transits or theodolites, levels, plane table sets, staves, poles, linentapes and so on, since up to about 110 students carry out practice in one subject at one time.

Mr. Lubis, Department Head requested that the HEDS project provide each laboratory equally with equipment without giving a priority to a particular laboratory as the Department is very big and one laboratory is equal to a department in size and there is no priority order for the laboratories. In our view, it is not necessary to provide much new equipment. It is desirable to provide the Surveying Laboratory with the equipment mentioned above, the Soil Laboratory with standard penetration testing sets and plate bearing testing sets, and the Road Laboratory with testing machines for abrasion of aggregate.

2.2 Department of Mechanical Engineering

There are four laboratories and the University is considering an expansion of the Workshop and the Metal Laboratory.

(1) Workshop (one-story house of 13 x 25 m)

There are a lathe, a drilling machine, a grinder, a balance, a spot welder and so on which are required for student practice. However, some of these must be replaced. This workshop is relatively well equipped and can repair experimental instruments to some extent. Two courses in practice are conducted in this workshop: 1) basic practice using files and level plates, 2) use of a lathe and various machine tools. The Workshop also conducts practice for about 100 students of other universities such as North Sumatera Islamic University and Medan Area University.

(2) Metal Laboratory

This laboratory is in a corner of the Workshop. It is a metal testing laboratory and equipped with a universal testing machine, a torsion tester and a charpy tester. They are relatively well maintained. It conducts eight practical courses: 1) drawing of a stress-distortion curve of soft steel, 2) observation of rupture of soft steel by the backling test, 3) measurement of metal hardness and comparison with the results of experiment 1), 4) casting process, construction of molding, fine structure inspection of castings.

(3) Energy Conversion Laboratory (one-story house of 18 x 25 m)

It is equipped with a small wind tunnel, an adiabatic thermoheater, a steam engine, a diesel engine, a Fransis turbine, a centrifugal pump, a solar energy conversion device, an air conditioner and a balance tester. The quality of the machines is the best and the quantity the largest among the mechanical engineering departments under the HEDS project.

The Laboratory conducts eight practical courses: 1) adiabatic thermoheater experiment, 2) performance test of internal combustion engine, 3) open channel experiments using Fransis turbine and pump and so on. It also conducts these experiments for about 200 students from other universities in Medan.

(4) Drawing Studio

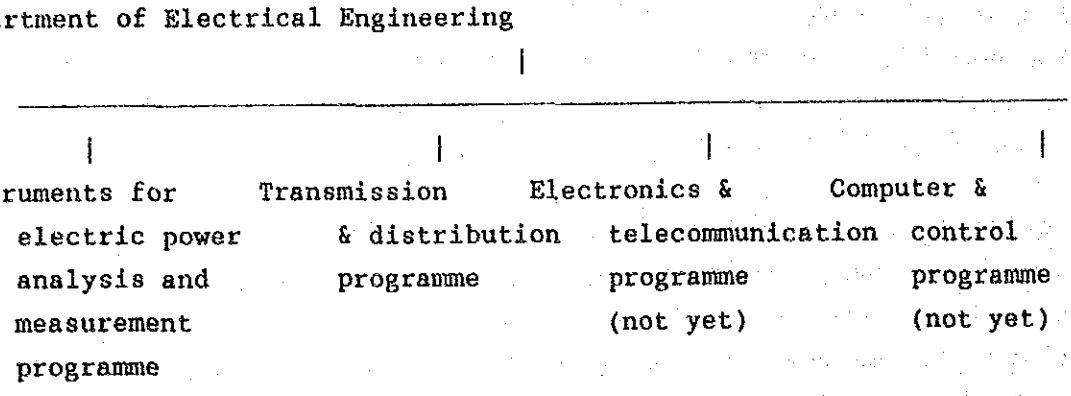
There are 25 sets of drawing table with drafter and 24 drawing tables. The studio is big enough to accommodate more equipment. The studio will move to a new building in the near future. Mechanical drawing, practice in machine elements and calculation practice are conducted at this studio.

2.3 Department of Electrical Engineering

The Department places most emphasis on high voltage technology.

Sumatera is planned to be a center of heavy industries in Indonesia and supply of electric power is the most important issue of the electrical engineering in this region. At present the Department has two programmes: 1) instruments

for electric power analysis and measurement programme, and 2) transmission and distribution programme. However, it plans to set up two new programmes: an electronics & telecommunication programme, and computer & control programme. Electronics and telecommunication is another priority area of electrical engineering in Indonesia in view of its vast expanse of territory. The present number of students is 526.



There are nine laboratories: (1) Electric circuit, (2) Measurement, (3) Basic electrical engineering, (4) Electric machines, (5) High voltage technology, (6) Transmission and distribution, (7) Electronics, (8) Telecommunication, (9) Computer and control. Of these laboratories, four laboratories ((1) to (4)) have instruments necessary to conduct basic experiments, but many of them are out of order and must be repaired. A number of voltmeters, ammeters, frequency meters, power factor meters etc. in the Basic Electrical Engineering Laboratory and the Electric Circuit Laboratory remain out of order because the parts are not available to repair them. Recently some instruments were purchased using an ADB loan for the Telecommunication Laboratory, the Computer and Control Laboratory, the Basic Electrical Engineering Laboratory and Transmission & Distribution Laboratory. These new instruments a waiting testing and adjustment by the manufacturers. The Electronics Laboratory has oscilloscopes, function generators etc. but no equipment for I.C. practice. The Measurement Laboratory has such instruments as microvoltmeters, earthing testers, R-C-L bridges etc. but lacks other essential instruments. The Distribution & Transmission Laboratory is a waiting the installation test of a network analysis device which was purchased by an ADB loan. The High voltage Technology Laboratory has an impulse voltage generator and an insulation test device, but no other devices. The ADB loan did not provide this Laboratory with any equipment. Since the Department places major emphasis on high volt-

age technology, it puts top priority on this Laboratory in the selection of equipment to be received under the HEDS project. The Computer and Control Laboratory is equipped with only one personal computer (RAM 640k, 2 floppy disk drivers) and a Servomechanism experimental equipment of FEEDBACK (interfaced with two personal computers for control) which were provided under the ADB loan. Although the Laboratory can accommodate 50 sets of personal computers, there are no personal computers for student and staff use in computer training. There are two other personal computers in the administration office of the Department of Electrical Engineering. However, these are used only for administrative purposes.

In view of the above we recommend that priority in the selection of equipment should be placed on the equipment necessary for high voltage technology experiments, some measurement instruments and personal computers for the student computer training.

Table A-11-2 University of North Sumatera

	Civil Engineering Department	Mechanical Engineering Department	Electrical Engineering Department	Industrial Management Department	Chemical Engineering Department	Total
Enrollment	527	467	479	405	368	2246
No. of freshmen (1989)	66	68	65	57	38	294
No. of Lecturers	83	43	42	27	21	216
Undergraduate	65	36	38	17	21	178
Master	16	4	3	6	-	29
Doctor	2	3	1	3	-	9
No. of Laboratories	7	4	9	6	4	
Name of Laboratories	Land Servey lab. Concrete lab. Soil Mechanics lab. Hydraulics lab. Highway lab. Drawing lab. Material Testing lab.	Work Shop Metallurgy lab. Energy Conversion lab. Drawing Room	Electrical Circuit lab. Electronics lab. Telecomunication lab. Computer lab. Electrical Measurement lab. Electrical Power lab. Transmission and Distribution lab. Electrical mechanics lab. High Voltage lab.			

III. NOMMENSEN UNIVERSITY

1. OUTLINE

This University was founded in 1954 in memory of Dr. Nommensen who devoted his life to the improvement of the living of Batak people in the middle of 19th century. The main campus is located in the central part of Medan. At present there are eight faculties: the Faculty of Business Administration, Faculty of Law, Faculty of Agriculture, Faculty of Animal Husbandry, Faculty of Economics, Faculty of Engineering, Faculty of Education and Faculty of Arts & Literature. The total number of students is 11,916 in 26 S1 degree courses and 11 diploma courses. The teaching staff is 413, of which 166 are full-time regular staff, 25 are seconded from other institutions, 7 are guest lecturers from abroad, 49 are on a contract of two years and 166 are part-time lecturers from outside.

Besides the faculties, there is a research center for science, technology and arts, and a computer center for the administration such as wage calculation, management of student examination, management of student personal data etc.

2. FACULTY OF ENGINEERING

The Faculty has three departments: civil engineering, mechanical engineering and electrical engineering. The number of students is 1378 in 1989/90. The laboratories are shown in Table III-1. The equipment in the laboratories is well maintained and the experimental practice of students is well organized. The floor space of the laboratories is not large enough and expansion is planned.

2.1 Department of Civil Engineering

There are three laboratories: concrete, soil and surveying. They are relatively well equipped compared with most other universities. However, they do not have a triaxial compression tester, a universal tester or a CBR tester.

2.2 Department of Mechanical Engineering

There are three laboratories: workshop, material testing and rotating machine testing. The total area of the three laboratories is not so large, about 300 m^2. It is planned to build a fluid machine laboratory, a steam turbine laboratory, a heat transfer laboratory and a thermodynamics laboratory. The list of requested equipment includes rather big instruments. It is necessary to take into consideration the progress of completion of the new buildings in the provision of equipment.

2.3 Department of Electrical Engineering

There are five laboratories: workshop, electric power machines, electronics & telecommunications, computers, and electronic circuits. The university priorities in the selection of equipment are in the following order; the computer Laboratory, the Workshop, the Electric Power Machine Laboratory, and the Electronic Circuit Laboratory.

IV University Medan Area, UMA

Medan City, North Sumetera State

1. Outline

This is a private university which was founded in 1983 in Medan city the capital of the North Sumetera State. It consists of seven faculties which are the Agricultural Faculty, Engineering Faculty, Economics Faculty, Law Faculty, Political and Social Sciences Faculty, Psychology Faculty and Biology Faculty. The student population totals 8,000 and teaching staff is 226 strong. The Engineering Faculty is composed of the departments of Civil Engineering, Architecture, Mechanical Engineering, Electrical Engineering and Industrial Engineering. The total number of students in the Engineering Faculty is 850, and teaching staff is 49 strong. Almost all of the staff possess Grade S1 Degrees, while three hold S2 level qualifications. There are no staff members with S3 level qualifications at present.

The Asahan Project has been in progress in the North Sumetera State since 1980. This project involves the construction of what will be the largest multi-purpose dam in Indonesia using the water source at Lake Toba. Already a number of electric power stations and aluminum refineries are in operation. Moreover, construction of new power stations is currently being carried out and industrialization is in progress. The universities of North Sumetera state are expected to provide the high grade engineers needed to support this industrial development. UMA obviously will play its part in fulfilling this need.

The UMA campus includes the old campus situated close to the center of Medan City and the new campus built on the outskirts. Total campus area of the two together is about 30,000 sq. m., making this the largest of the private universities. Classrooms and laboratories at the new campus are still in construction and the University management has a dynamic attitude to expansion.

2. Engineering Faculty

Part of engineering education is carried out at the old campus at present. However, once the buildings currently in progress are completed all engineering education will be transferred to the new campus.

2.1 Civil Engineering Department (including the Architecture Department).

There are approximately 300 students in Civil Engineering and about 100 in Architecture. The teaching staff for both departments totals 20 members, almost all of whom hold S1 degrees. One staff member possesses a S2 degree, but none hold S3 level qualifications at present. Laboratories at tached to the departments are 1) a Surveying Practice laboratory 2) a concrete testing room 3) a Soil Mechanics laboratory but no provision is made currently for a hydraulics laboratory or a road testing facility. Moreover, equipment in all three existing laboratories is extremely inadequate. The quantity of theodolites and levels available in the Surveying Practice room need to be, at least, doubled (at present there are only four). In the Soil Mechanics laboratory even relatively inexpensive items are lacking. It is necessary to provide a liquid limit device and a particle size analysis set. Also the laboratory must be suitable for undertaking dynamics experimentation such as constant heat permeameter testing and triaxial testing.

Equipment is also lacking in the Architecture Department and provision is particularly overdue. In the Design Drawing Room there is a certain amount of student work on exhibition but there were no drawing tables. As design drawing is an important course it is proposed that, at least, 40 drawing tables be provided.

2.2 Mechanical Engineering Department

This department contains four laboratories which are for Design drawing, Metal Material Testing, Fluid Dynamics and Workshop activities. The Drawing Room is a single room 150 sq. m. equipped with 20 Drawing tables.

The Metal Materials Testing Room is a single room 400 sq. m. but this room is shared with a laboratory of the Civil Engineering Department. As

experimental equipment it is provided with only two lathes and a Universal testing machine.

The Fluid Dynamics Laboratory and Workshop are virtually non operative, being simply rooms of 400 sq. m. each equipped with only ten Presses.

At present, student training and practice is done at the Mechanical Engineering Department of USU, and there is a desire to equip the laboratories promptly so that such training can be carried out with the university's own facilities.
Equipment considered necessary for the laboratories is as follows;

1) Design Drawing Room

The space available seems slightly cramped but there is room for installation of a certain amount of equipment.
2) Metal Materials Testing Room

It is necessary to remodel existing buildings and repair a certain amount of current equipment. Equipment which is judged inadequate includes; a shaping machine, Pedestal Drilling Machine, Grinder, Cutting grinder, Bend saving machine, Charpy Impact Machine, Hardness tester, Muffle furnace (1000 degrees Celsius),etc.

3) Fluid Dynamics Laboratory

There is no equipment in this laboratory at present. Therefore, it is considered necessary to equip this with a complete set of fluid dynamic testing devices (fluid volume measuring apparatus employing a triangular weir and orifice meter) , a centrifugal pump and Francis turbine.

4) Workshop

There is no equipment in this workshop. Equipment considered necessary includes a combustion engine, three phase induction motor and drafting machine.

2.3 Electrical Engineering Department

There are currently 282 students in the department and like many other universities of Sumetera emphasis is place on high voltage engineering here. However, it seems that the department intends to shift its focus towards electronics and electrical communications in the future. The department has nine laboratories for 1)electric measurement 2) electrical energy conversion 3) electrical circuitry 4) digital and control systems 5) electrical communications 6)basic electronics 7)electrical machinery 8) high voltage and for 9) electrical transmission and distribution. Experimental apparatus for each laboratory consists of individual kits which were designed and built by the teaching staff. For High Voltage generating apparatus discarded parts received from the National Electric Power Company are used and these are assembled for the intended purposes.

There is a strong regional demand for engineers in High Voltage since the port of Medan area is the third largest international port in Indonesia. However, the high cost of the equipment involved means that provision is impossible due to university budget restrictions.

The laboratories are slightly cramped. Inspection took place in mid summer and so dust was observed in the laboratories but otherwise everything was well organized and in order. All equipment has been supplied autonomously and no external aid received to date. The quantity and variety of equipment is small because of this. As the teaching staff are young they manifest considerable enthusiasm and have for example made up their own kits for teaching and training purposes.

2.4 Industrial Engineering Department

There are about 200 students in the department which has an Industrial Statistics Room and Chemical Laboratory. As general courses for freshmen and sophomores are conducted in the Chemical laboratory the only practical room which exclusively belongs to this department is the Industrial Sta-

tistics Room. There are seven teaching staff all of whom hold S1 grade qualifications.

The equipment of this statistics room is very poor at present, consisting of dice, marbles, stop watches, microgauges and callipers of which only one or two of each remain. Desks were set in the laboratory but no experiment benches and so it seems to function only as a lecture room.

Provision of experimental equipment for statistics tests in accordance with student numbers is of basic importance. In particular an increase in such basic equipment as callipers, micrometers, stop watches ,etc. is considered appropriate. It is desirable that the university ensure the installation of test benches to meet the increased equipment provision.

V. DARMA AGUNG UNIVERSITY

1. OUTLINE

Darma Agung University is a private university established in 1979 and located in the central part of Medan. It has only S1 degree courses (undergraduate courses) without S2 (master's degree) or S3 (doctor's degree) courses. At founding it consisted of three faculties: engineering, agriculture and industrial engineering. However, in 1987 the Faculty of Industrial Engineering was separated from the University and was made an independent institute named INSTITUT SAINS DAN TEKNOLOGI T.D. PARADEDE (ISTP).

Darma Agung University and ISTP are on the same campus and owned by T.D. Paradede Foundation. These two institutions are closely related sharing part of experiment facilities with teaching staff working at both. A new building is to be completed by the end of October 1990 and almost all laboratories of the electrical engineering department of the University will move to the new building. Practice in the electronics engineering and digital control courses of ISTP are to be conducted in the laboratories of the Department of Electrical Engineering of the University in the new building.

The University consists of the Faculty of Social and Political Sciences, Faculty of Law, Faculty of Economics, Faculty of Engineering, Faculty of Education, Faculty of Literature, and Faculty of Agriculture. ISTP consists of the Faculty of Industrial Engineering, Faculty of Civil Engineering and Planning, and Faculty of Mineral Engineering. The total number of students in both institutions is 14,743.

The Faculty of Engineering of the University has three departments: the Department of Civil Engineering, Department of Electrical Engineering and Department of Mechanical Engineering. Equipment which is to be used by the students of the Department of Computer & Information Technology, Department of Communication and Electronics, Department of Architecture, Department of City Planning, Department of Mining Engineering and Department of Geology of ISTP is also included in the list of requested equipment. The total number of students in the engineering departments of both institutions is 2,509 and of teaching staff is 122, of which 109 have a S1 degree, 10 a S2 degree and 3 a S3 degree.

There have been no foreign donations of equipment and no financial assistance from the Ministry of Education and Culture. All the facilities and equipment had to be purchased from its own financial sources. In these circumstances, the facilities are relatively poor. Private universities are required to keep competent teachers in order to attract good students. So it seems that they need to pay two or three times higher salaries than those of state universities.

Many of the experimental instruments were assembled by the teaching staff themselves and are well organized and arranged. They are carefully maintained. The teaching staff member in charge of each laboratory is responsible for the maintenance of equipment in that laboratory and if damages are caused to the equipment in his charge by careless mistakes, he is responsible for the damages and must pay for the repair costs in some cases. This system makes the teaching staff more careful in the operation and maintenance of equipment.

The subject on which this University places most emphasis is computer education. Two computer training rooms at ISTP are equipped with 70 personal computers for student training. This is the largest stock of personal computers in the universities we surveyed this time. Computer laboratories will be set up in the new building and use of the most popular application programmes such as Wordstar, Dbase III etc. will be taught to all the students.

2. FACULTY OF ENGINEERING

As mentioned before, the Faculty of Engineering has three departments: the Department of Civil Engineering, Department of Electrical Engineering and Department of Mechanical Engineering.

2.1 Department of Civil Engineering

Students number 380 and teaching staff is 37 strong. The laboratories are the Surveying Laboratory, Concrete Laboratory, Soil Laboratory, and Drawing Room. There is no hydraulic laboratory. The necessity of doing hydraulics experiments are increasing more and more because flood prevention, river improvement, irrigation etc. are critically important subjects in this region. The teaching members of hydraulics are strongly requesting the establishment of a

hydraulic laboratory. However, it seems quite difficult to realize this request because of lack of funds. The list of the requested equipment does not include any equipment for hydraulics experiments for the reason that at present there is no hydraulics laboratory yet and a limit of the total amount was put to each department request.

(1) Surveying Laboratory

There are four theodolites, three staves and several poles in the room of about 20 m². The available instruments such as theodolites, levels etc. are old but are well maintained and in good condition. There are no plane table sets. About 70 students take surveying practice in one semester. The quantity of the available equipment is very small. It is necessary to have more poles, staves and tapes to conduct appropriate practice efficiently.

(2) Concrete Laboratory

At present a room about 100 m² is shared with the Soil Laboratory. The instruments including glassware are poor and old. However, their maintenance is very good. It is necessary to have a set of testers for concrete strength test using Schnitt hammer, for aggregate abrasion test and for bending strength tests of concrete; molds to make bodies to be tested; and balances etc. This laboratory will move in the new building which is now under construction and the new laboratory space (275 m² to be shared with the soil laboratory) will be large enough to accommodate the above mentioned equipment.

(3) Soil laboratory

After the completion of the new building now under construction, this laboratory will move in the new laboratory with the concrete laboratory. As mentioned before, the area of the new laboratory is 275 m² to be shared with the concrete laboratory. However, the area allocated to the soil laboratory is far larger than the present one. At present it lacks a mechanical analysis of soil tester, a triaxial compression tester and permeability tester which are indispensable for student's experiments. Besides these, provision of molds (10 cm, 15 cm) and glass wares is to be considered.

2.2 Department of Electrical Engineering

The Department has four laboratories: measurement, circuit, basic electronics and basic electrical control. After the completion of the new building, new laboratories such as telecommunication, distribution, control and energy conversion are to be set up.

The size of an average class in experimental practice is 100 students and the class is divided into groups of four students each. Since only one set of equipment is available, it takes a lot of time for all students of a class to finish one experiment. For measurement and circuit experiments there is one training kit each for the handling of thyristor, oscillator, D.C./A.C. convertor, resistor, double beam slide rheostat etc. However, meters to measure the characteristics of these instruments are insufficient. Although there is no high voltage technology laboratory, some experiments on high voltage measurement are conducted.

The University considers that priority should be given to equipment for energy conversion and distribution experiments. However, we consider that more equipment is necessary for measurement, circuit and basic electronics experiments since there is not enough equipment for these basic experiments at present.

2.3 Department of Mechanical Engineering

Students number 295 and the teaching staff is 20 strong. Many of the teaching staff also work for the University of North Sumatera. There are nine semesters. The odd number semester starts in September and the even number semester starts in March. It is required to attend nine semesters and to take 160 credits to graduate. Usually most students take more than five years to graduate.

The Department of Mechanical Engineering has four laboratories: Workshop, Drawing, Metal Testing, and Machine Performance Testing. The Drawing Room belongs to the Architecture Department of ISTP and is used jointly by the Department of Mechanical Engineering and Department of Civil Engineering of Darma Agung University. Most machines of the Workshop are worn out and unfit for use. However, at present there is no plan to replace them with new ones

and the staff members are operating them carefully so as to keep them in use. The Machine Performance Testing Laboratory has a Pelton turbine, a series and parallel pump, a refrigerating plant model and a calorimeter which were purchased on the University's own funds and installed in June 1990. The Metal Laboratory particularly lacks equipment. It strongly requests a universal testing machine. A universal testing machine is the only equipment requested by the Department of Mechanical Engineering.

The available equipment is at present very scarce and old, but it is well maintained. A universal testing machine which is the only equipment requested by this Department is also requested by the Department of Civil Engineering. It is not necessary to equip one university with two units. It is recommended that both departments jointly use one machine.

2.4 Department of Production Engineering

The Department of Production Engineering is one of the departments of the Faculty of Industrial Engineering in ISTP. The Faculty of Industrial Engineering has three departments: computer & information technology, telecommunication & electronics, and production engineering. The equipment requested from the Department of Computer & Information Technology is for basic computer training of all the students of the University and ISTP and to be shared with the Faculty of Engineering of the University. The equipment requested from the Department of Telecommunication & Electronics of ISTP is for shared use with the Department of Electrical Engineering of the University.

The Department of Production Engineering has courses in textile chemistry, textile machinery, textile technology and food nutrition science. Statistics experiments occupy the most important place in the basic training in the Department. However, the instruments for statistics experiments are only one or two sets of dice, nails, stopwatch, micrometer and slide caliper. The practice or experiments in the curricula are only statistics experiments, computer programming, and practice outside school. Other subjects are taught solely by lectures. Such practice as measurement of process time is useful if it is done at a real production line. It is not appropriate to set up an imitation of a production line on the campus. More equipment for the statistics experiments and new equipment necessary for plant design practice is recommended to be provided under the HEDS project.

Table A-11-5 Daruma Agun University

	Civil Engineering Department	Mechanical Engineering Department	Electrical Engineering Department		Mining engineering Department
Enrollment	380	295	357	491	120
No. of freshmen (1989)	71	82	81	105	30
No. of Lecturers	37	20	16	21	15
Undergraduates	32	19	15	18	15
Master	5	1	1	3	0
Doctor	0	0	0	0	0
No. of Laboratories	3	4	4	3	3
Name of Laboratories	Land Survey lab. Concrete lab. Soil Mechanics lab.	Work Shop Drawing lab. Material testing lab. Mechanical testing lab.	Electrical Circuit lab. Measuring lab. Basic Electronics lab. Power Control lab.	Statistic lab. Drawing lab. Food and Nutrition analysis lab.	Mineral Analysis lab. Land Survey lab. Evaluation (Chemical Analysis) lab.

VI THE ISLAMIC UNIVERSITY OF NORTH SUMATERA

1. OUTLINE

This University is a private university and located about 1.8 km south of the center of Medan. It is about 30 km on a normal road and 22 km on the highway from Belawan port which is the third largest port in Indonesia.

It was recognized as a university in June 1952. There are 3 faculties in religion, 5 faculties in social sciences and 3 faculties in science and technology including agriculture. Its education is based on Islamic teaching and beside local students there are lots of students from Malaysia, Thailand and the Philippines too. The total number of students is 7,898 as of August 1990; 1,722 in the Faculty of Agriculture, 1,691 in the Faculty of Law, and 1,025 in the Faculty of Economics.

2. FACULTY OF ENGINEERING

The Faculty of Engineering has four departments: civil engineering, electrical engineering, mechanical engineering and industrial engineering. Students number 735 and the teaching staff is 105 strong, of which 90 have a S1 degree, 6 a S2 degree, and no S3 degree holder.

Almost all practice and experiments of engineering education in this university are conducted at the University of North Sumatera. This situation remains unchanged since the inception of the Faculty of Engineering. Although there is a room which claims to be a laboratory, it looks like just a store room.

2.1 Department of Civil Engineering

There is no laboratory and only theoretical lectures are given at the university. Students of this Department number about 230. They are instructed to do practice and experiments at the University of North Sumatera and must pay expenses for the experiments on their own. However, a new DGHE regulation will make it difficult for this University to continue to send its students to the University of North Sumatera to be trained in practice. The University is now constructing their own laboratories. The financial situation of the

university is not so bad for a private university and it seems to be easy enough to secure sufficient floor space for the necessary laboratories. The teaching staff is 29 strong and most of them are also teaching at the University of North Sumatera. There are no S2 degree holders. It is critically important to increase the number of the teachers with higher qualifications. The university hopes that experiments on concrete, soil mechanics, asphalt, surveying and hydraulics can be given on its own campus. However, it may be difficult to realize this plan without any bilateral or multilateral assistance. It is recommended to provide equipment for surveying, soil experiments and concrete experiments.

2.2 Department of Mechanical Engineering

There are four laboratories: workshop, metal, drawing and welding. However, these only exist in name and there is no substantial equipment. The teachers strongly request to conduct practice for students in its own campus, but the university does not seem to have taken any measures in this direction for a long time. The teachers hope to set up ametal laboratory, a workshop and a welding laboratory in the near future.

2.3 Department of Electrical Engineering

The conditions of this Department are more or less the same as those of the two departments mentioned above. The teachers plan to conduct experiments on basic electricity, circuits, electronics, communication, logic circuit, electric measurement, distribution, electric machine control, high voltage technology etc. in its own campus. The question whether this plan could be realized by themselves alone remains. Under the HEDS project, it is desirable to provide basic measurement instruments only first and to postpone the provision of other instruments to the second stage while training the staff members at ITB.

2.4 Department of Production Engineering

The situation of this Department is similar to that of others. Only statistics and probability experiments which do not require much equipment are conducted on campus. Although there is a request for equipment to be placed in the planned laboratories, it is considered appropriate to provide equipment

which can be placed in rooms available with small modification. The university is also planning to remodel class rooms so that some can be used as laboratories.

Table A-11-6 North Smatera Lslam University

	Civil Engineering Department	Mechanical Engineering Department	Electrical Engineering Department	Industrial Engineering Department
Enrollment	227	158	205	145
No. of freshmen (1989)	75	75	75	75
No. of Lecturers	29	36	36	39
Undergraduates	29	34	34	37
Master	0	2	2	2
Doctor	0	0	0	0
No. of Laboratories	0	0	0	1
Name of Laboratories	Essentially non-existent	Essentially non-existent	Essentially non-existent	Industrial Statistic lab.

VII UNIVERSITY OF ANDARAS

1. OUTLINE

The University of Andaras is in Padang, the center of West Sumatera. The population of Padang is about 150,000. Padang has an airport and an international port (Telkbayur) which exports cement, coal, fertilizer etc. The industries in the Hodan area where another port is located are cement, coal, rubber, palm oil etc. The University of Andaras was established in 1955 as the center of higher education in West Sumatera and to help promote industries in this region. It is the oldest state university in Sumatera. However, the Faculty of Engineering was established quite recently, in 1985. The main building of the university is in the center of the city, but the buildings of the Faculty of Engineering and the Faculty of Mathematics and Natural Sciences are in the northern part of the city. The University has a Faculty of Agriculture, Faculty of Animal Husbandry, Faculty of Mathematics and Natural Sciences, Faculty of Economics, Faculty of Engineering, Faculty of Medicine, Faculty of Law, and a Faculty of Literature. A new campus is now under construction with an ADB loan in the eastern part of the city. The Faculty of Mathematics and Natural Sciences is planned to move into the new campus. The University is expected to play a central part of the development of the economy, industry and education in West Sumatera.

2. *FACULTY OF ENGINEERING*

2.1 Department of Civil Engineering

The Department was established in 1986 and has no graduates yet. The economy of Padang and its surrounding areas has been supported by agriculture so far. But this area is now preparing to diversify its economy into one based on more manufacturing industries. So the construction of the infrastructures for industrial development and of the facilities for agricultural development is becoming critically important.

There is a 16 strong teaching staff and 185 students in the Department. The number of students will increase rapidly as industries develop in this region.

The Department has four laboratories: 1) surveying, 2) soil testing, 3) concrete testing and 4) road. Basic experiments are given except for hydraulics. Establishment of a hydraulics laboratory is strongly requested. After the Faculty of Mathematics and Natural Sciences moves into the new campus. the Faculty of Engineering will have more space for laboratories which can accommodate more equipment. The equipment presently available is not enough for the S1 level education. The Surveying Laboratory needs standard levels and theodolites. The Soil laboratory needs a triaxial compression tester, a CBR tester and a permeability tester. The Concrete Laboratory will need more strength testers. Considering the important role of civil engineering in the West Sumatera development, it will be necessary to provide a universal compression tester (capacity 100 ton) as requested.

Table A-11 University of Andalas

	Dept. of Civil Eng.	Dept. of Mech Eng.
Number of students	185	203
Number of teachers	27	14
S1	19	7
S2	7	5
S3	1	2
Laboratories	Soil Lab. Road Lab. Surveying Lab. Concrete Lab.	Metal Lab.

VIII UNIVERSITY OF SRIWIJAYA

1. OUTLINE

The University is in Palemban, South sumatera. It is located near the Musi river which flows northward through South Sumatera and 5 km southwest of Palembang airport. It was founded in October 1960 with three faculties: the Faculty of Economics, Faculty of Law and Faculty of Engineering. Besides these faculties there are now a Faculty of Education, Faculty of Medicine, Faculty of Agriculture, Faculty of Social and Political Sciences, and Faculty of Mathematics and Natural Sciences. There are three diploma courses in: education, economics, and technology. In 1989, the students numbered 10,196 with 1,030 teaching staff, including those of diploma courses. A new campus is under construction at a location of 38 km from the present campus and expected to be completed in December 1992. The Faculty of Engineering will move into the new campus.

2. FACULTY OF ENGINEERING

The Faculty was established in October 1960 with Department of Civil Engineering and Department of Mining Engineering. In 1964 the Department of Chemical Engineering was set up and in 1977 the Department of Electrical engineering and Department of Mechanical Engineering. Table VIII-1 shows the number of the students, teachers and the name of the laboratories in the Faculty.

There are nine semesters and an average student takes a maximum 5.5 years and a minimum of 4.5 years to graduate. The Department of Electrical Engineering, Department of Mechanical Engineering and Department of Mining Engineering lack equipment for experiments and students must go to ITB to be trained in some practices at their own expense. Students are also required to practice at of cement, petroleum chemistry, fertilizer, tin factories etc. for two to four months before graduation. About 70% of the subjects in the curricula is common to all the universities and the remaining 30% is decided freely by each university to suit the local conditions. About 70% of the graduates remain in Sumatera and 30% find jobs in other regions.

2.1 Department of Civil Engineering

This Department is 30 years old, being the oldest in the Faculty of Engineering. The teaching staff is 37 strong, of which 23 have a S1 degree, 11 a S2 degree and no S3 degree holder. Four S1 holders are now studying to obtain a S2 degree at universities in Indonesia and three S2 holders are studying to obtain a S3 degree abroad. Of the universities receiving assistance under the HEDS project, the quality of the teaching staff of this Department is rather good and the University is making efforts to upgrade their quality further.

There are three laboratories: surveying, soil and hydraulics. The Surveying Laboratory is shared with the Department of Mining Engineering. The present laboratories are rather small in area, but the new buildings on the new campus will provide enough space for laboratories. Further a road laboratory and a concrete laboratory are to be set up on the new campus. The University will purchase equipment for concrete and road experiments as well as some equipment for soil and hydraulic experiments with the ADB loan. The HEDS project is expected to provide equipment for soil experiments and surveying practices which are not included in the ADB project.

2.2 Department of Mechanical Engineering

2.3 Department of Electrical Engineering

Students number 289 and the teaching staff is 26 strong. There are six laboratories: (1) circuit, (2) electric power conversion, (3) high voltage and measurement, (4) distribution, (5) electronics & telecommunication, and (6) control & computer. However, at present only some experiments on circuits, electric machines and radios are conducted. The teaching staff have assembled training kits for these experiments and prepared manuals. The students are required to assemble a simple instrument (e.g. regulator) in the last semester. The presently available equipment is rather poor. But in 1992 ne laboratories will be built on a new campus which is now under construction and a lot of equipment will be purchased with an ADB loan. The Department places emphasis on high voltage technology for the same reason as the University of North Sumatera. However, it is also considering to place emphasis on electronics in the future. In the selection of equipment provision the following two points were taken into consideration. As mentioned before, the Department

regards high voltage technology as the most important field. However, due to the lack of facilities, students must go to ITB to be trained in practice. Therefore the Department must at least have enough equipment for basic experiments on high voltage technology. Another point is to avoid unnecessary duplication of equipment with that to be provided by the ADB loan. At present, some basic equipment for high voltage technology and measurement instrument necessary for basic electricity experiments are under review. Some personal computers are also necessary for student computer training since at the moment there are no computers which the students and teaching staff can use for electrical engineering studies.

2.4 Department of Chemical Engineering

There are three laboratories: microbiology, unit process, and unit operation. The Microbiology Laboratory is doing process experiments, particularly those of graduation thesis, microbiology experiments and petroleum chemistry experiments. The Unit Process laboratory is conducting synthesis experiments in industrial chemistry. The Unit Operation Laboratory is conducting unit operation experiments in chemical engineering.

The unit process and unit operation laboratories are very small and floor spaces is not large enough to accommodate 20 students. The University requests the following equipment for unit operation experiments: (1) distillation column, (2) absorber, (3) rotary drier, (4) evaporator, (5) wetted wall column, (6) heat exchanger. In the selection of equipment the following points must be considered in addition to avoiding duplication with equipment provided under the ADB loan project. The purpose of a rotary drier is to investigate the relation between the drying speed and water contents. Since the performance of a small scale machine is not very good, a box type drier is recommended. As to evaporators it is necessary to prepare a single effected evaporator and a double effected evaporator. A wetted wall column is difficult to handle and the analysis of the experiment is also difficult. It is considered in appropriate as a student experiment. Whether this equipment is to be provided or not will be studied further in the detailed design at a later stage.

2.5 Department of Mining Engineering

The Department is one of the oldest departments dating back to the founding of the University and one which the Faculty of Engineering backs strongly. Students number about 200 and teaching staff is 30 strong. All the practices and experiments are conducted on its own campus. There are seven laboratories as shown in Table VIII-1. The Basic Geology Laboratory is used also by the Department of Civil Engineering. In general the laboratories are well equipped. The University places emphasis on energy exploitation and its major concerns are oil and coal. Equipment for experiments with oil and coal, and microscopes are requested by the University. Provision of equipment for oil and coal experiments and for mineralogy experiments under the HEDS project must avoid duplication with equipment from the ADB.

3. OTHER ASSISTANCE PROGRAMME

The ADB loan project will (1) construct a new campus, (2) purchase equipment for the Faculty of Medicine and the Faculty of Agriculture, (3) train staff members at ITB, and (4) train 20 teachers for 6 months in Australia, Singapore or Thailand. This loan project also will provide some equipment to five departments which are included in the HEDS project. The Vice Rector and the Dean of Faculty of Engineering told us that a list of equipment to be provided by the ADB loan would be finalized in December 1990. However, the ADB office in Indonesia confirmed that the present list is the final one and there would be no more amendments. Therefore, this report uses the present version of the list of equipment by ADB loan in the selection of equipment in this HEDS project.

Table A-11-8 Sriwijaya University

	Civil Engineering Department	Mechanical Engineering Department	Electrical Engineering Department	Chemical Engineering Department	Mining Engineering Department
Enrollment	300	ca350		250	40
No. of freshmen (1989)	50	60	-	50	200
No. of Lecturers	38	22	22	37	30
Undergraduates	24	18	12	22	14
Master	14	3	10	9	12
Doctor	-	1	-	6	4
No. of Laboratories	3	2	9	3	7
Name of Laboratories	1) Land Survey lab. 2) Concrete lab. 3) Hydraulics lab.	1) Energy lab. 2) Work shop After the completion of new laboratories construction, 3) Meterial testing lab. and 4) machinery with motors lab. will be opened	1) Control lab. 2) High Voltage lab. 3) Digital lab. 4) Basic Electronics lab. 5) Power lab. 6) Electrical Machinery lab. 7) Electronic Circuit lab. 8) Tele Communication lab 9) Precision Measurement lab.	1) Micro Biology lab. 2) Unit Process lab. 3) Unit Operation lab.	1) Evaluation and Analysis lab. 2) Microscopy lab. 3) Mineral Analysis lab. 4) Rocks and Minerals Sample lab. 5) Crystallography lab. 6) Petroleum Engineering lab. 7) Basic Geology lab.

IX UNIVERSITY OF LAMPUNG

1. OUTLINE

The University is about 10 km west of Bandar Lampung, 15 km from Lampung airport and 5 km from Panjang port. It has a Faculty of Law, Faculty of Economics, Faculty of Education, Faculty of Agriculture, Faculty of Mathematics and Natural Sciences, Faculty of Social and Political Sciences, Faculty of Engineering and an Agricultural Polytechnic. Beside these, there are a computer center and research institutions for chemistry, botany and physics. The campus is very large, the main campus being 65 ha. and the Agricultural Polytechnic campus 35 ha. The total number of students is 8500 and teaching staff is 650 strong.

2. FACULTY OF ENGINEERING

The Faculty of Engineering has only one department: the Department of Civil Engineering. The Department was set up in 1968 on strong request from Lampung Province, but it was closed in 1972 due to a lack of teaching staff. It was reopened in 1983 as a diploma course of three years. Students number 250 and teaching staff is 25 strong, of which only one is a S2 degree holder and the rest are S1 degree holders. It is making efforts to increase higher degrees holders. The Faculty has applied to DGHE for upgrading the diploma course to the S1 degree course. It has requested equipment for S1 degree course experiments.

There are six laboratories: surveying, soil, concrete, road, hydraulics and a workshop. The laboratories are well organized and maintained. Practice covers a wide range of subjects for a diploma course. The hydraulics laboratory is relatively well equipped compared with the other universities under the HEDS project. Equipment for road experiments is little. It is desirable to provide equipment for road experiments, surveying and concrete experiments.

X UNIVERSITY OF TANJUNGPURA

1. OUTLINE

The University of Tanjungpura is near the center of Pontianak on the west coast of Kalimantan. Pontianak is a port town at the mouth of Kapuas river one of the biggest rivers in Indonesia, and has a large trade with Singapore and Malaysia. The University is situated about 1 km south from the center of the city and has a large campus. It was established in August 1967 starting with the Faculty of Law, Faculty of Economics, Faculty of Agriculture and Faculty of Engineering. Later a Faculty of Social and Political Sciences and a Faculty of Education were set up. Students number about 8500 and teaching staff is 559 strong.

2. FACULTY OF ENGINEERING

The Faculty has two departments: the Department of Civil Engineering and Department of Electrical Engineering. Students number 988 teaching staff is 64 strong, of which 59 are S1 degree holders and 4 are S2 degree holders. There is no S3 degree holder.

Table A-11-10 University of Tanjung Para

	Dept. of Civil Eng.	Dept. of Elec. Eng.
Students	688	377
New enrollments	104	59
Teaching Staff	42	20
S1	40	18
S2	2	2
S3	0	0
Laboratory	Surveying Concrete Soil Hydraulics Road	Basic electronics High voltage technology System control Energy conversion Distribution

2.1 Department of Civil Engineering

Teaching staff is 40 strong. Students number 648. One hundred fifty new entries are expected this year. There are three laboratories at present: ;surveying, concrete and soil. Hydraulics and road laboratories are not yet built. For hydraulics experiments the students go to the Provincial Government laboratories to be trained. For road experiments the students are trained outside the campus. The teaching staff are mostly young and work in good cooperation with each other to improve the teaching quality.

(1) Survey Laboratory

The Laboratory has an area of 30 m^2, and is well organized. It has seven theodolites and five levels. They are well maintained. However, the quantity of equipment is not enough since as many as 150 new students enter every year and 70 to 80 of them take surveying practice. Although expensive theodolites are requested from this project, it is more important to increase standard theodolites and levels. Furthermore plate table sets, staves, poles and tapes need to be increased.

(2) Concrete Laboratory

The presently available equipment is very scanty. Even if all the equipment requested were provided, it would still not be enough for S1 programme experiments. Also, equipment for characteristic testings of mortar and cement will be needed.

(3) Soil Laboratory

The Laboratory has an area of 240 m^2. The quantity of existing instruments is moderate and those necessary for the S1 programme available. However, if any of them should have trouble, the students would have difficulty to continue experiments because of inadequate numbers of instruments. It is also necessary to have a triaxial compression tester and a permeability tester.

(4) Hydraulics Laboratory

At present there is no facility for hydraulics experiments. A building which was a library is being remodelled as laboratories. A hydraulics laboratory will be set up in this building. The teachers have been training their students in hydraulics experiments at places outside the campus. They are now busy preparing to set up a laboratory of their own. Kapuas river, one of the biggest rivers in Indonesia flows near the University and the river improvement to prevent floods and to channel water safely is important for the economic development of West Kalimantan. Therefore, it will be necessary to set up a hydraulics laboratory in this university for the development of West Kalimantan.

(5) Road Laboratory

There is no facility for road experiments. However, a road laboratory will also be set up in the building mentioned above. At present, the students are trained in practice at places outside the campus. The construction of more roads is one of the development targets in this region and this requires more qualified road engineers graduated from this university. It is important to set up facilities to raise the level of practical engineers.

2.2 Department of Electrical Engineering

There are five laboratories: basic electronics, high voltage technology, system control, energy conversion and distribution. Beside these, there is a computer training room. The characteristic features of this department are: 1) the teachers are young, 2) lack of educational equipment and 3) the laboratories are small. Young teachers are generally very keen on improvements of teaching quality. They have assembled several experimental kits and used them for their student practice before they get educational kits for electrical measurements and energy conversion experiments from Australia. Some of the laboratories have purchased such educational kits as mentioned above with bilateral assistance, but generally they are poorly equipped. As mentioned above, there are training kits for electrical measurements, transformer and electric energy conversion donated by Australia and they are carefully maintained. Beside these, there are only one or two ammeters, voltmeters, ohmmeters and oscilloscopes.

Top priority in the request is placed on equipment for high voltage experiments. High voltage experiments are part of the compulsory course for majors in electric power control technology. Nevertheless the students have to go to ITB to receive practice training at their own expense due to lack of equipment. Most of the students need to work to earn money for this by withdrawing from school for a time. This request aims at relieving the students of this financial burden.

Second priority is given to equipment for training in basic electronics, such as a LAN system and work stations. These instruments were not on a priority list of requested equipment previously submitted. However, the teaching staff of electronics and computers are most competent in the Department and it is considered to be a good idea to make computer education one of the strong points of the University.

XI UNIVERSITY OF LAMBUNG MANGKURAT

1. OUTLINE

The University is a state uiversity situated about 2 km south of the center of Banjarmasin, Capital of South Kalimantan, 30 km from the Banjarmasin airport, and has an area of about 50 ha. Banjarmasin is in marsh on the lower Barito river. Good rattan grows in this area and rattan manufacturing is flourishing. This area is also famous for diamond production.

The University was a private university established in September 1985 with a Faculty of law, Faculty of Economics, Faculty of Politics and Faculty of Agriculture. It became a state university in November 1960 by government decree 5 to upgrade the local higher education quality. At present there are eight faculties: Faculty of Education, Faculty of Economy, Faculty of Law, Faculty of Engineering, Faculty of Social and Political Sciences, Faculty of Agriculture, Faculty of Forestry, and Faculty of Fisheries. Students number 7,905 and teaching staff is 658 strong.

2. FACULTY OF ENGINEERING

There is only the Department of Civil Engineering in the Faculty. Students number about 600 and teaching staff is 37 strong, of which 35 are S1 degree holders, 2 S2 degree holders and no S3 degree holder.

There are four laboratories: soil, structure, hydraulics and road. There is no surveying laboratory. Surveying practice is conducted at the road laboratory.

Main equipment for student experiments is available. There are no spares of equipment of relatively short life (e.g. instruments for measurement of specific gravity, instruments for liquidity testing and plasticity testing etc.) There is only one tester for each experiment theme, so if there should be trouble, no experiments could be conducted any more for that subject. The laboratory is well arranged. It has almost no equipment for on-site testing. It may need to be supplied with basic outdoor testing equipment.