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TECHNICAL SERVICES/FEASIBILITY STUDIES II

EQUIPMENT FOR UNIVERSITY OF DAMASCUS
FINAL REPORT

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I. INTRODUCTION

Objectives

Under the direction of AID offices in Damascus and Washington, The VVKR Partnership undertook the task of surveying the educational equipment requests proposed by the Administration and Faculties at the University of Damascus near the end of February this year for the purpose of analyzing the use of AID funds to purchase equipment. The four-man team of Messrs. Ordway, Sheehan, Smith and Dr. Abdalla visited the University for twelve days, meeting with department administrators and faculty members involved with educational equipment requests. They also toured pertinent areas of the University Campus to view existing equipment in place and space availability for new equipment. Additional visits by the team to Amman, Jordan and Cairo, Egypt were made to view computer installations similar to that indicated by the University as well as technical and service/software capabilities of manufacturers in the area. Appendix A shows the trip chronology during the Study Team's visit to the Middle East.

The study team initiated discussions with the SARG Ministry of Planning and received from them equipment lists for some University departments. Faculty level meetings at the University were arranged with the help of Dr. Lotfy, Vice President of Academic Affairs, and Mr. Farouk, Vice President of Administrative Affairs. At these subsequent meetings, additional equipment request lists were given to the team. Some lists were as many as three years old. Prices of certain items have changed dramatically in that time due to inflation and manufacturers' cost changes. Some newer equipment lists that were received directly from the faculty members did not indicate prices. Additional oral deletions and substitutions complicated the issue. Much time was spent in consolidating and updating these lists in addition to assessing departmental equipment requests in the light of curricula justification, instructional expertise, and general educational impact upon the country as a whole.

Scope of Work:

It was discovered that some departments additionally were relying on the study team to generate laboratory equipment requirements from general curriculum descriptions. This was not within the scope of work as originally agreed and is indicated in the faculty discussions and consolidated equipment lists.

Further study will be required to determine availability of specific suppliers and technical support in the region. Consolidation of equipment under as few manufacturers as possible will encourage more reliable service support from a manufacturer or contruct consultant and likely effect a more efficient procurement program.

Philosophy:

The philosophy of the Study Team was to approach the requests made by the University Faculties in the light of modern laboratory equipment technology in the educational/graduate studies environment. It is the Team's strong recommendation that the undergraduate educational experience by augmented by as many "hands-on" experiences with state-of-the-art equipment that is reasonable in the context of financing and University curricula.

Additionally, the team feels its recommendations should not be contrary to recent international discussions, notably but not exclusively by UNESCO, that developing countries should have more attention paid to the development of their own graduate schools. This is in order to develop local, national, and regional expertise. If the problems so undertaken involve some repetition of work already undertaken in industrialized countries, this is not important; it is the acquisition of skills and expertise by indigenous people together with the resolution of problems to suite local or national conditions which is important. This is especially true with respect to commencement of computer curriculum activities prior to hardware delivery and installation. Otherwise, the investment will be at risk, if there is no commitment by the administration and faculty to anticipate and plan for active, working laboratory programs and environments.

Because of the recent law by SARG, barring professors from having private offices where they may offer their services as professionals, the possibility of equipment in certain departments being used for outside research and professional activities should be recognized. The side effects of recognition and innovation, however, will be beneficial to the University; both in attracting the country's brightest minds and creating an educational environment in which student motivation will be heightened by proximity to real work environment and research.

II. GENERAL FINDINGS AND RECOMMENDATIONS

The University of Damascus is the largest University in Syria, located in the largest city in the country, which contains almost 30% of the country's population. The University is a significant source of knowledge and learning for all of Syria. The importance of the University to the economic base of the city is also great.

Under mandate from the SARG, the University is tuition-free, open to all students that have attained an equivalent high school certificate and have adequate scholastic qualifications. Since its inception in 1963, enrollment has risen significantly, approaching 70,000 during the 78 - 79 school year. Recent statistics from the University show enrollment growth during the past three years at about 15% per annum, however, projected growth is anticipated to be less than this over the next two to five years.

The University is located on four distinct campuses within the Damascus Metropolitan area; Main Campus, Medicine, Mechanical & Electrical Engineering, and Agriculture. Both the Faculty of Agriculture and Faculty of Mechanical and Electrical Engineering are more than ten kilometers in different directions from the main campus. The Faculty of Medicine is two kilometers from the Main Campus. Both the Faculty of Science and Faculty of Civil Engineering and Architecture are located in Main Campus buildings.

Though previously hampered by its in-town location, the University is continuing an aggressive building program, especially on the Medical and Mechanical & Electrical Engineering Campuses. The University is still adversely impacted by its growing student enrollment, however, coming to grips with its space problem. General impressions are that equipment requested by the facilities can be housed and utilized sufficiently in existing structures or structure already planned for completion within two years. It should be stressed, however, high technology apparatus, especially computer hardware, requires special environment considerations (i.e. cooling requirements, filtered air, special electric connections for power) not normally anticipated in campus buildings. These will have to be provided where necessary.

Equipment Justification and Servicing

The Study Team considers the needs implicit in the facultys' equipment requests to be genuine and for the most part, believes the University is capable of operating and maintaining new equipment, either through manufacturers' warrantee services, contractual service agreements and/or technical campus personnel. Equipment requiring significant set up preparation, and continuing maintenance service is indicated on the equipment lists. These items should be procured on the basis of technical assistance and continuing maintenance contract availability as well as initial cost and technical specifications.

The feasibility of sharing equipment between two or more University departments was studied at length. While it is likely that a small number of instruments requested for the main campus can be shared (e.g. scanning electron microscope in Chemistry could be used by Geology and Physics departments) the majority of equipment cannot be shared because of conflicting user needs, distances between departments, curricula, and faculty heirarchies that encourage departmental autonomy . Inter-departmental needs can often be met, however, by sharing larger pieces of equipment. This consolidation of equipment is reflected by the lists included in the discussions of individual disciplines.

Computer Requests:

A few departments have requested hardware from vendors that do not have sales/service centers in Syria at this time. To choose such a vendor could cause problems, since the availability of service is extremely important for the proper functioning of any computer facility. The study team will continue investigating the accessibility and reliability of service centers in Syria and surrounding Middle East countries so that a sound recommendation can be made. Prior to returning home, two of the project team members visited service centers and existing user/clients in Amman, Jordan and Cairo, Egypt, to verify the availability of timely and competent service from at least two computer system vendors in those cities. These visits have also aided in determining reliability of certain computer hardware as well.

Basic computer system software and application programs should also be defined and become part of the computer system procurement package. Availability of software from the large hardware vendors is naturally part of their sales package, however, if software is unavailable from the hardware vendor, it should be purchased from other sources.

The Study Team will contact a number of computer manufacturers that presently do not have sales/services centers in Damascus (such as IBM, DEC, CDC) to discover the feasibility of establishing such centers in the near future or providing some other services, if and when the University of Damascus buys their system.

One of the requests put forward by the electrical engineering faculty was for a general purpose computer to be used for normal computations and also for power system applications. The University, as confirmed by the vice president (Dr. Lotfy), wishes to have a general computational facility at the site of Electrical and Mechanical Engineering.

Also, the University Administration has requested this computational facility be used for administrative tasks such as registration, students' grades, etc.

After discussions with both the president and vice president of the University, the team concluded that both the Elec. & Mech. Faculty, and the Administration requests for computers could be satisfied by one large computer system which would operate in both batch and on-line modes. The system would be located in the Faculty of Electrical and Mechanical Engineering. The Administration could be connected to the system via telephone lines, and/or use it in the batch mode; hard copy input/output could be transferred between the Administration building and the computer center. The Administration would be remote from the system, but using the computer in the on-line (time-sharing) mode. They would have to be connected to the computer center by computer terminals at the administration building. This means private lines should be used, not the public existing telephone line.

The other major computer request is from the faculty of Civil Engineering and Architecture. This request is included in that faculty's equipment requests. The Study Team discussed the possibility of Civil Engineering sharing the major computer with the Administration and Mechanical & Electrical Engineering, however, the general consensus was that, if possible, they should have their own computer facility.

Costs and Method of Procurement

Because of the time needed to verify prices with manufacturers and the fact that certain lab equipment was not fully defined, costs are average estimates that a procurement office could expect to pay for current model items manufactured, in most cases, in the in the U.S.A. The sum total for equipment, including that in laboratories not in the originally defined Scope of Work is an estimated $9,025,000. at this time. The Charts in the next section show total estimated costs by department.

The University is not in a position to implement the proposed equipment procurement indicated in this report. Because of USAID's existing procurement personnel, good communications, and logistical support for monitoring contractural agreements (including warrantee details) and shipment, it should implement purchase and delivery.

Once the equipment specification sheets are delivered and consolidated into "packages" or large group proposals for large vendors, USAID may discover an array of items that must be procured on an individual basis. These items may prove to be a time-consuming tender/bid task for USAID. A purchasing office to handle procurement and delivery of only these remaining items may prove a more acceptable alternative.

Departmental Reports

The comments in the next section about individual departments are based on discussions and observations during the University visit, and further study on return to the U.S.A. Generic equipment listings are included. Each line item is given a priority in two categories. The first is according to the degree of need, either expressed by the faculty or determined by the Study Team. Designations are as follows:

1. Greatest need for teaching purposes
2. Great need for teaching and research
3. Primary need for graduate studies and faculty research

The second priority category is according to the degree of servicing and technical assistance required for Faculty/University technicians to acquire reasonable knowledge of apparatus operation and satisfactory utilization.

L-Low — Very little or no technical assistance required. The proper use of apparatus can be accomplished by Faculty and aides/researchers sufficiently prepared in their field of endeavor and having reasonable ingenuity and dexterity.

M-Medium A need for some service and technical assistance for the proper set up and installation of equipment. A warrantee period should be required. The ruggedness, degree of sophistication, and generic nature of parts and construction do not require a continuing maintenance period. For the most part, this designation is for small, plug-in type equipment.

H-High Greatest need for service and technical assistance because of the delicacy, degree of sophistication, and/or proprietary nature of parts and construction. Depending on the kind of equipment, a technician should remain at the university for a length of time to set up and install equipment, while providing training for the proper operation and preventive maintenance tasks. A warrantee period should include troubleshooting technical assistance, parts replacement, and comprehensive protection against faults in manufacture and installation. Procurement of such equipment should be based on the availability of convenient and prompt continuing maintenance contract agreements and adequate field office/technician repair facilities in the area.

Exception and the method of determination are noted in each of the discipline discussions.

III. REPORTS ON SPECIFIC FACULTY REQUESTS

A. Faculty of Civil Engineering and Architecture

Civil Engineering Department

- Computer System
- Surveying Lab
- Photography Library and Faculty Reproduction Facilities
- Building Materials and Testing Lab
- Road and Concrete Testing Lab
- Sanitary Engineering Lab

FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE

Persons Contacted:

The study team met with Dr. Omar Karmo, Vice Dean of Scientific Affairs at the faculty's class and office building. Equipment requests were discussed with the following faculty members:

1. Dr. Andrawis Saoud, Head of Roads and Concrete
2. Dr. Radebil Rarazuk, Head of Structures and Concrete
3. Dr. Badura, Head of Structural Analysis.

General Findings:

Civil Engineering historically has been concerned with the quality of the environment. In a country like Syria where the physical infrastructure of roads, dams, and buildings is in its initial stages, the role of the C.E. is doubly significant.

The Civil Engineering Department is concerned with the design, planning, design, construction, and operation of large scale facilities and structures in the environment. The present curriculum includes structural design, water resources development, water supply and pollution control, materials testing, concrete and road construction. It is presently limited to theory in many areas of materials testing and design because of a lack of equipment and computer accessibility. Plans for the future include a greater emphasis on high technical competence and proficiency through "hands-on" experience. A program orienting students to computer-aided design techniques will encourage them to incorporate new concepts during their school years and development as professionals. A need to strengthen the ties between technical efficiency and societal needs is also a consideration. At this time, graduate students must go out of the country to acquire additional skills or perform research.

It should be noted that in Civil Engineering well-equipped facilities not only attract talent and incur the side benefits of recognition and innovation as a result of research and professional services eminating from the department, but could offer an income-producing resource for the department.

Equipment lists which were received previously from the SARG Ministry of Planning were examined. Additional up-dated lists were given to the team for study. Subsequent to the meeting, Dr. Karmo gave the team members a tour of the photography library and faculty reproduction facility, the concrete testing lab, soils testing lab, and hydraulics lab. With the exception of hydraulics, the greatest concern in these areas was the poor and often inoperable condition of most of what little equipment was available for teaching.

Civil Engineering presently has over 3,400 students while architecture has half as many. Both are five-year curricula. The graduating class in Civil will be about 375 and Architecture more than 140 students. The teacher-to-student ratio is about one to 84, and this coupled with the limited number of class/lab hours available during the University's calendar year puts pressure on teachers to use time wisely via teaching aids and well equipped labs.

E ipment Recommendations:

Computers

Even at the undergraduate level, computer-aided design, teaching and research is the state-of-the-art for Civil Engineering in most advanced countries today. The request for computer capabilities is reasonable but the kind and size of equipment, variety of software and periferals/terminals are within the general scope of computer recommendations for the University as a whole. The discussion of curriculum and organization for studies prior to delivery of hardware pertains to this faculty as well. A machine has been outlined in the equipment lists along with recommended software (programs) that should be part of the initial procurement package.

Photography Library and Faculty Reproduction Facilities:

Audio-visual requests should ameliorate some of this problem. The reproduction facility presently has a standard size copier, manufactured by Oce ,and an odorless blueline machine for engineering drawing reproductions. Both are operable and over used. The offset machine (Oce 2110) was in disrepair, but plate making and camera repro apparatus appeared to be still operable. There were no 35 mm cameras, film files, or move projectors in evidence.

The facilities are impacted by high use demand. Requests for A-V equipment are justified. Most of the equipment can be procured from U.S. manufacturers with the exception of the 35 mm camera and video tape recorder. The entries for these two items, if they are to be part of the procurement package,would most advantageously be purchased from a foreign manufacturer, most likely Japanese.

The request for a plain paper copier that accepts 36" wide originals and reduces the image onto sheets maximum 18" wide is a high cost solution to the many reproduction problems similarly experienced by engineering and architecture schools in the United States. The Xerox 1860 unit is the only equipment capable of accomplishing this, and the technical expertise for maintaining this unit is presently not available in the region. Cost is roughly $42,000 which seems greater than is warranted by the needs of a single Faculty within the University. Though it accepts a smaller sheet size and provides limited reduction capabilities a smaller xerography machine has been recommended.

Because of the nature of slide/film making and storage, a "kit" of accessories necessary for proper use of the larger equipment, though not requested by the faculty, has been included in the equipment list.

Surveying Laboratory:

Equipment for surveying includes geodimeters and theodolites which are for direct student use. Some line items were modified because of the high precision (and cost) of those requested for undergraduate applications. This is another group of equipment

that is not available from an American manufacturer. Those recommended are of Swiss design, and though somewhat more expensive, they should be more reliable, rugged and maintenance free. The manufacturer has a number of field offices in the Middle East area.

Laboratories for Building Materials Testing and Road & Concrete

Materials testing lab requests also appear reasonable. Most original equipment is from a 1962-63 UNESCO Grant. Technical literature is presently unavailable at the University for most pieces of equipment in the major labs. Most requested items are new additions to the school with the major exception of the larger units. The existing testers are either damaged or useful in only a limited capacity.

Because of the site visit and the nature of materials testing, the equipment list has been retained in its expanded form to provide the accessories necessary to perform tests under ASTM guidelines. This will enable the department to use the labs for teaching without the need to procure minor items which would keep the labs unusable that much longer. The accessories will enable the faculty to perform materials tests as closely as possible to ASTM specs without having to substitute possibly inferior equipment.

The 400,000 pound compression tester for concrete, manufactured by Tonindustrie in Berlin about 18 years ago has had repeated breakdowns because of controller unit malfunctions. The Universal Testing machine, for compression and tension testing, manufactured about the same time by Losenhausenwerk of Dusseldorf, is unable to reach maximum loadings due to hydraulic system problems. Both testers are basic to the teaching and research of building materials design and technology. It is likely that the existing machines could be repaired, if technical personnel and spare parts were sent to Syria, however, to ameliorate the situation quickly and at the same time update equipment to meet present state-of-the-art specs, equipment should be replaced. This will also make available technical assistance from suppliers

more responsive to repair requests.

A number of field items including the Pavement Skid Testing instrument truck and test trailer, and the highway-runway pavement friction recorder with spare parts are of limited value in teaching basic principles, methodologies, and design to students. Research and consulting will make the most use of these truck-mounted items, and they are therefore, of lowest priority.

Sanitary Engineering:

The last laboratory shown here is Sanitary Engineering. Equipment lists had not been prepared by the University faculty for this lab at the time of the Team's visit. The faculty wishes the Study Team to look at lab parameters and generate curricula and experiments to arrive at an equipment list. This was not part of the original scope of work, but will be done when arrangements for additional work are completed.

Equipment Recommendations:

The following is a generic list of equipment recommended for the Faculty of Civil Engineering and Architecture. The unit price is the suggested list cost that a procurement office can expect to pay for current models in the U.S.A.

FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE/ CIVIL DEPARTMENT/COMPUTER SYSTEM A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Processor (mini) with console stand, display (and/or printer) and keyboard			1	H	1		
2.	512 K Memory			1	H	1		
3.	Card Punch			1	H	2		
4.	Card Reader			1	H	1		
5.	Line Printer, Arabic/English			1	H	1		
6.	Disk Controller			1	H	1		
7.	200 MB Disk Unit			1	H	2		
8.	Magnetic Controller			1	H	2		
9.	Magnetic tap unit			1	H	1		
10.	I/O channel for up to 10 lines			1	H	1		
11.	CRT display terminals			1	H	4		
12.	Keyboard send/receiver, terminals			1	H	2		
13.	Syst. software package such as compiler, macroassembler, operating system, etc.			1	H	1		
14.	Special software (application programs) for civil and architecture engineering computerized structural analysis and design			1	H	1		
	END COMPUTER SYSTEM						Estimated Cost	$300,000.

FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE/SURVEYING LABORATORY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Theodolite micrometer, interval 0.2"			2	M	1		
2.	Theodolite interval scale, micrometer interval 1"			1	M	5		
3.	Geodimeters for Item #2			2	M	2 (3 were requested)		
4.	Single Prism Reflector with plumbing pole and case.			2	M	1		
5.	Theodolite, optical scale interval 1'			1	M	1		
6.	Theodolite, Optical Scale interval 6"			1	M	2		
7.	Mining Transit, Direct Reading to 5'			1	M	2		
8.	Tacheometer (with 2 stadia rods each)			1	M	4		
9.	Automatic Level			1	M	2		
10.	Automatic Builder's Level			1	M	2		
11.	Automatic Level			1	M	2		

FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE/SURVEYING LAB B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
12.	Double Prism Square with plumb staff			1	M	10		
13.	Survey compass with staff Sipe-Sumner patter with tripod and field case			1	M	5		
14.	Tripod for Theodolites			1	L	15		
15.	Tripod for high precision Theodolite			2	L	2		
							Estimated Cost	$131,575.
	END SURVEYING LAB							

FACULTY PHOTOGRAPHY LIBRARY AND FACULTY REPRODUCTION FACILITIES

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Film Reader microform information (e.g. microfiche)			1	L	1		
2.	Film library and accessories with drawer units for slides, filmstrips, microform and tapes for labeling; dividers, etc.			1	L	1		
3.	16mm movie camera 100' film capacity			2	L	1		
4.	16 mm camera zoom lens, 16-100 mm f1.9			2	L	1		
5.	Aluminum case for movie camera and lens			2	L	1		
6.	35 mm SLR camera with built-in light meter 50 mm lens			1	L	1		
7.	16mm sound movie projector , 18 & 24 fps, speaker auxiliary eq. 220V 50c/s, 1 phase AC			1	L	1		
8.	Slide projector for 2x2's 5" F/2-8 lens 220V 50 c/s, 1 phase A.C.			1	L	1		
9.	Slide trays for 140 slides each			1	L	5		
10.	Filmstrip/slide projector classroom model 220 V 50c/s 1 phase with cover carrying							

FACULTY OF PHOTOGRAPHY LIBRARY AND FACULTY REPRODUCTION FACILITIES B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	(#10 continued)							
10. cont'd.	case, 2 x 2 stackload slide changer, extra projection lamp	I		1	L	1		
11.	Large pull-down projection screen 96" x 120"	I		1	L	2		
12.	Portable Projection Screen 70"x 70"	I		1	L	3		
13.	Color video tape recorder systems with ½" tape, records unit, T.V. camera, CRT previewer	I		1	L	1		
14.	Large Format Office Copier			2	H	1		
15.	Offset Copier			1	M	1		
16.	Offset plate maker			1	M	1		
17.	Supplies for item nos. 14 and 15			1	L	1		
18.	35 mm filmstrip slide projector silent			1	L	1	Estimated Cost	$20,000.
	END PHOTOGRAPHY LIBRARY AND FACULTY REPRODUCTION FACILITIES							

FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE/LABORATORY FOR BUILDING MATERIALS AND TESTING LAB A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	General Equipment Set for Concrete Laboratory. All 220V. 50c/s 1 phase. Similar to: AC. for schools as described							
1.	Testing Machines Compression Testing Machine with dual 12" gauges of 4000,000 and 100,000 lbs.			1	H	1		
2.	Hydraulically operated 15,000 kg. tensio-compression testing machine (metric model) with the accessories below.			1	H	1		
3.	Mechanical Crosshead					1		
4.	12" Platen Set					1		
5.	Cement Cube Attachment					1		
6.	Platen Assembly					1		
7.	CBR Attachment					1		
8.	Hubbard Field Attachment					1		
9.	Mortar Bond Strength Unit					1		
10.	Flexure attach. for 6 x 6 to 30" specimens					1		
11.	Brick Flexure attachment					1		
12.	Flexure tool, hydraulic cent. mortars					1		

FACULTY LABORATORY BUILDING MATERIALS AND TESTING LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
13.	Soils Cement Flexure Attachment					1		
14.	Grip and Fixture Adapter Set					1		
15.	Type AA grips smooth for tension tests					1		
16.	Type cc grips, bolt test fixtures					1		
17.	Cloth Grips					1		
18.	Fabric gripping fixtures					1		
19.	Fixture for molded plastic					1		
20.	Plywood and Glue Block Grips					1		
21.	Shearing Fixtures					1		
22.	Cement Briquette Grips					1		
23.	Wire Grips					1		
24.	Dual 8½" diameter guages capacity with 15,000 kg			2	L	1		
	Scales and Balances							
25.	Direct Reading Scale, scoop pan, bench type 500 gms.			1	L	1		
26.	Balance Scoop and Counter Weight			2	L	1		

FACULTY BUILDING MATERIALS AND TESTING LAB C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
27.	Weight Set, 4000 gram			2	L	1		
28.	Analytical Balance, 200 gram			2	L	1		
29.	Analytical Weight Set			2	L	1		
30.	Reading Platform Scale, 200 lbs.			2	L	1		
31.	Laboratory Balance, 2 pan, 2000 grams			2	L	1		
32.	Weight Set, 2000 grams			2	L	1		
33.	Solution Balance, 20 kg.			2	L	1		
34.	Triple Beam Balance			2	L	2		
35.	Field Scale, 35 lbs. (15.9 kg.)			1	L	1		
36.	Eureka Testing Outfit (Dunagan)			1	M	1		
	Heating and Utility Equipment							
37.	Drying Oven, inside dimensions 37 by 19 by 25 inches, maximum 355°C, 230/50/60/1 phase			2	M	2		
38.	Automatic Infra-Red Drying Oven to 450°F			1	M	1		
39.	Electric Furnace to 2000°F			1	M	1		
40.	Large Hot Plate, 12 by 24 inches			2	L	1		
41.	Air Compressor, 30 gallon tank, 150 psi			2	M	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
42.	Vacuum-Pressure Pump, 0.3 mm Hg. 10 liters/min.			2	M	1		
43.	Automatic Water Still, 3 gallon/hour			2	M	2		
44.	Automatic Low Water Cut-Off			2	L	2		
45.	Moist Room Humidifier			1	M	2		
46.	Humidistat Controller			1	M	2		
47.	Laboratory Mixer			1	L	2		
48.	Storage Tank for Water Still			2	L	1		
	Gradation and Sizing Equipment							
49.	Automatic Sieve Shaker for 8" diameter sieves			2	L	1		
50.	Sieving Timer, 1 to 56 minutes for shaker			2	L	1		
51.	Testing Sieves, U.S. Standard 8" diameter, Brass of the following sizes:							
	#4			2	L	2		
	#8			2	L	2		
	#10			2	L	2		
	#14			2	L	2		
	#16			2	L	2		
	#20			2	L	2		
	#30			2	L	2		
	#40			2	L	2		22

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	#50			2	L	2		
	#60			2	L	2		
	#80			2	L	2		
	#100			2	L	2		
	#140			2	L	2		
	#170			2	L	2		
	#200			2	L	2		
52.	Brass Pan			2	L	2		
53.	Brass Cover, less ring			2	L	2		
54.	Aggregate Shaker with (5) sieve trays, one each of: 2"; 1½", 1", 3/4"; ½" and pan			2	L	1		
55.	Extra Sieve Tray, size 3/8"			2	L	1		
56.	Extra Sieve Tray size #4			2	L	1		
57.	Fine Sieve Brush			2	L	2		
58.	Wire Sieve Brush			2	L	2		
59.	Sieve Shaker, hand operated for 8" sieve			2	L	1		
	Miscellaneous Equipment							
60.	Pyrex Beakers, 100 ml			2	L	12		
61.	Pyrex Beakers, 250 ml			2	L	12		
62.	Pyrex Beakers, 600 ml			2	L	12		

FACULTY/ BUILDING MATERIALS AND TESTING LAB F

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
63.	Graduated Cylinders 100 ml			2	L	12		
64.	Graduated Cylinders 250 ml			2	L	12		
65.	Graudated Cylinders 500 ml			2	L	12		
66.	Wash Bottles, 1000 ml			2	L	2		
67.	Equipment Stands, mobile 4 wheel			2	L	6		
68.	Universal Time Switch, range 60 hours by hours and minutes			2	L	1		
69.	Universal Time Switch, range 60 minutes by minutes and seconds			2	L	1		
70.	Mechanical Timer, up to 30 minutes			2	L	1		
71.	Timing Device, 0 to 30 minutes, manual set			2	L	1		
72.	Laboratory Timer, Remind-O-Clock, 12 hours			2	L	1		
73.	Laboratory Crusher			2	M	1		
74.	Laboratory Pulverizer			2	M	1		
75.	Metal Thermometer, 0 to 180°F			2	L	2		
76.	Metal Thermometer, 50 to 300°F			2	L	2		

FACULTY /BUILDING MATERIALS AND TESTING LAB

G

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
77.	Metal Thermometer 50 to 500°F			2	L	2		
78.	Saran Tubing, 1/8" O.D. (25 foot roll)			2	L	1		
79.	Saran Tubing, 1/4" O.D. (25 foot roll)			2	L	1		
80.	Saran Tubing, 3/8" O.D. (25 foot roll)			2	L	1		
81.	Rubber Tubing, 1/8" I.D.			2	L	25'		
82.	Rubber Tubing, 3/16" I.D.			2	L	25'		
83.	Copper Tubing, 1/4" O.D. (25 foot roll)			2	L	1		
84.	Copper Tubing, 3/8" O.D. (25 foot roll)			2	L	1		
85.	Copper Tubing, 1/2" O.D. (25 foot roll)			2	L	1		
86.	Lot assortment of 100 brass fittings			2	L	1		
87.	Tubing cutter for plastic and copper tubing			2	L	1		
88.	Flaring Tool for plastic and copper tubing			2	L	1		
89.	Desiccator, 200 mm diameter			2	L	1		
90.	Desiccator Plate			2	L	1		
91.	Battery Syringe			2	L	2		
92.	Beakers, aluminum 500 ml			2	L	12		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
93.	Dial Indicators, 0.3000 inch range x 0.0001"			2	L	4		
94.	Dial Indicators, 1.000 inch range x 0.001", clockwise			2	L	3		
95.	Dial indicators, 1.000 inch range x 0.001" counterclockwise			2	L	3		
96.	Soil Martar			2	L	2		
97.	Soil Pestle			2	L	2		
98.	Laboratory Truck, 20" x 42", 4 wheels			2	L	2		
	Suggested Equipment Set for Concrete Testing Lab 'A' for Teaching and Routine Testing.							
	All 220V. 50 c/s 1 Phase AC							
	Time of Setting of Hydraulic Cement							
	1. Normal Consistency of Hydraulic Cement							
99.	(10) CT-1 Vicat Tester			1	L	1		
100.	Final Set Needle Attachment			1	L	1		
	2. Compressive Strength of Hydraulic Cement Mortar							
101.	Flow Table			2	L	1		
102.	Flow Caliper			2	L	1		26

FACULTY BUILDING MATERIALS AND TESTING LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
103	Plastic Tamper			2	L	1		
104.	Cube Mold			2	L	1		
	3. Specific Gravity of Hydraulic Cement							
105.	Le Chatelier flask			1	L	1		
	4. Abrasion of Coarse Aggregate							
106.	Los Angeles Abrasion Machine			1	M	1		
	5. Specific Gravity, Absorption of Fine Aggregate							
107.	Unstopped Volumetric Flask (500 ml)			2	L	1		
108.	Cone mold and tamping rod			2	L	1		
	6. Specific Gravity, Absorption of Coarse Aggregate							
109.	Density Basket			2	L	1		
	7. Unit Weight of Aggregate							
110.	Measure, 1/10 cu. ft.			2	L	1		
111.	Measure, ½ cu. ft.			2	L	1		
112.	Measure, 1 cu. ft.			2	L	1		
113.	Tamping Rods			2	L	2		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
114.	Laboratory Vibrator			2	L	1		
	8. Slump Test for Consistency of Concrete							
115.	Slump Cones			2	L	2		
116.	Tamping Rods			2	L	2		
117.	Soiltest Folding rule, 6 foot			2	L	1		
118.	Compressive Strength of Concrete Cylinders							
118.	Cylinder molds, 6" Heavy duty			2	L	24		
119.	Basic Concrete Tester, 250,000 lb. capacity with 12" gauge and electric pump attachment			1	L	1		
	10. Making and Curing Concrete Specimens							
120.	Cylinder molds, 6" heavy duty			2	L	3		
121.	Cylinder capping set			2	L	1		
122.	Beam forms, 6" x 6" x 30"			2	L	4		
	11. Flexural Strength of Concrete							
123.	Flexure attachment, 20,000 lb. capacity			2	L	1		
	12. Air Content of Freshly Mixed Concrete							

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
124.	Air Meter, $\frac{1}{4}$ cu. ft.			1	L	1		
	13. Scales and Balances							
125.	Aggregate Scale, 70 lbs. by 0.02 lb.			2	L	1		
126.	Multipurpose Scale, 36 lb. by 0.01 lb.			2	L	1		
127.	Triple Beam Scale, 2610 grams by 0.1 gram			2	L	1		
128.	Solution Balance, 20 kg. by 1 gram			2	L	1		
	14 Sieving and Sizing Apparatus							
129.	Soiltest Aggregate Shaker with following Screens: 2", $1\frac{1}{2}$", 1", 3/4", $\frac{1}{2}$" and Pan			2	L	1		
130.	1 Each Screen Tray $3\frac{1}{2}$", 3", $2\frac{1}{2}$", 3/8" and #4.			2	L	1		
131.	Sieve Shaker			2	L	1		
132.	Testing Sieves, U.S. Standard 8" diameter brass, of the following sizes:							
	#4 Sieve, 8" dia.			2	L	1		
	#10 Sieve, 8" dia.							
	#20 Sieve, 8" dia.			all sieves				
	#30 Sieve, 8" dia.							
	#40 Sieve, 8" dia.							
	#60 Sieve, 8" dia.							
	#80 Sieve, 8" dia.							
	#100 Sieve, 8" dia.							
	#200 Sieve, 8" dia.							
	Brass Pan							

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Brass Cover			2	L	1		
	$3\frac{1}{2}$" Sieve, 8" dia.			all sieves				
	3" Sieve, 8" dia.							
	$2\frac{1}{2}$" Sieve, 8" dia.							
	2" Sieve, 8" dia.							
	$1\frac{1}{2}$" Sieve, 8" dia.							
	1" Sieve, 8" dia.							
	3/4" Sieve, 8" dia.							
	$\frac{1}{2}$" Sieve, 8" dia.							
	3/8" Sieve, 8" dia.							
	Fine Sieve Brush							
	Coarse Sieve Brush							
	1" Sample Splitter							
	Quartering Canvas							
	15. Mixing Equipment							
133.	Laboratory Mixer			2	L	1		
134.	Mixing Bowls			2	L	4		
135.	Cement Pans			2	L	4		
136.	Cement Plate			2	L	2		
137.	Trowels			2	L	2		
	16. Miscellaneous Equipment							
138.	Moisture Tester			1	L	1		
139.	Sample Bags Type 1			2	L	24		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
140.	Sample Bags Type 2			2	L	24		
141.	Cement Mold Brush			2	L	1		
142.	Cylinder Carrier			2	L	1		
143.	Straight Edge			2	L	2'		
144.	Rubber Gloves			2	L	2 pair		
145.	Armored Thermometers			1	L	2		
146.	Gas Fired Aggregate Oven			1	L	1		
147.	Curing Cans			2	L	24		
148.	Humidifier			1	L	1		
149.	Humidistat			1	L	1		
150.	Stop Watch			2	L	1		
151.	Organic Set			1	L	1		
152.	pH Test set			1	L	1		
	Suggested Supplementary Testing Equipment for Cement and Concrete Lab 'B' Teaching and Routine Testing. All 220V 50 c/s 1 phase AC							
	17. Tensile Strength of Hydraulic Cement Morta							

FACULTY/BUILDING MATERIALS AND TESTING LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
153.	Briquette Testing Machine			1	M	1		
154.	Briquette Molds			2	L	2		
155.	Tensile Test Sand, 100 pounds			2	L	1		
	18. Bleeding of Cement Pastes and Mortars							
156.	Cement Bleeding Apparatus			2	L	1		
	19. Fineness of Portland Cement by Air Permeability							
157.	Blaine air permeability apparatus			1	L	6		
	20. Fineness of Portland Cement by the Turbidimeter							
158.	Wagner Turbidimeter			1	L	2		
	21. Heat of Hydration of Portland Cement							
159.	Heat of Hydration Apparatus			1	L	1		
	22. Sampling Hydraulic Cement							
160.	Bulk Cement Tube Sampler			2	L	1		
161.	Packaged Cement Tube Sampler			2	L	1		
	23. Time of Setting of Hydraulic Cement by Gilmore Needles							

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
162.	Gilmore Apparatus			1	L	1		
	24. Comparing Concrete on Basis of Bond Developed with Reinforcing Steel							
163.	Bond of Concrete Apparatus			1	L	1		
	25. Flow of Portland Cement Concrete							
164.	Flow Table			2	L	2		
165.	Tamping Rod			2	L	2		
	26. Rate of Hardening of Mortars Sieved from Concrete Mixtures							
166.	Special Proctor Penetrometer Assembly			1	L	1		
	27. Potential Alkali Reactivity of Cement Aggregate Combinations							
167.	Test Bar Molds			1	L	2		
168.	Reference Points, 100			1	L	1		
169.	Hard Rubber Tamper			1	L	1		
170.	Length Comparator			1	L	1		
171.	Mortar Bar Container			1	L	1		
	28. Miscellaneous Equipment							

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
172.	Yield Bucket, 1/3 cu. ft., ASTM			2	L	1		
173.	Chapman Flask			2	L	2		
174.	Cement Mixing Cylinder, 150 ml			2	L	2		
175.	Balance, 2Kg. by 0.1 gram			2	L	1		
176.	Weight Set, 2 Kg.			2	L	1		
177.	Laboratory Vibrator			2	L	1		
	Portland Cement Concrete Laboratory Supplemental Equipment for Field and Laboratory Work.							
	220V 50 c/s 1 Phase AC							
178.	Concrete Mixer, 3½ cu. ft.			2	L	1		
179.	Concrete Vibrator			2	L	1		
180.	30" Flow Table with 6 3/4" x 10" flow mold			2	L	1		
181.	Sonometer with built-in Oscilloscope for concrete specimens			1	M	1		
182.	Concrete Air Meter, ¼ cu. ft. capacity			1	L	1		
183.	Concrete Air Indicator Kit			1	L	1		
184.	Slump Test Set			2	L	2		

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FACULTY /BUILDING MATERIALS AND TESTING LAB

Q

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
185.	Extra Slump Cone			2	L	2		
186.	Slump Cone Base			2	L	2		
187.	LeChatelier Flask			2	L	16		
188.	Chapman Flask			2	L	6		
189.	Organic impurities Test Set			1	L	1		
190.	Sand Equivalent Test Set			1	L	1		
191.	Extra Sand Equivalent Cylinders			1	L	6		
192.	Quality of Water Test Set			2	L	1		
193	1/10 ft^3 Unit Weight Measure, ASTM			2	L	1		
194.	1/3 ft^3 Unit Weight Measure, ASTM			2	L	1		
195.	1/2ft^3 Unit Weight Measure, ASTM			2	L	1		
196.	1 ft^3 Unit Weight Measure, ASTM			2	L	1		
197.	Tamping Rods, 24" long			2	L	4		
198.	Concrete Pans, 24"x 24" x 3" deep			2	L	4		
199.	Pails, galvanized (3½ gallon)			2	L	2		
200.	Shovels			2	L	2		
201.	Conical Mold and Tamper			2	L	2		

FACULTY /BUILDING MATERIALS AND TESTING LAB

R

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
202.	Pycnometer Top and Jar			1	L	1		
203.	Concrete Test Hammer			2	L	1		
204.	Graduated Impurities Test Bottles			2	L	12		
205.	Sodium-Hydroxide Solution, impurities test			2	L	6		
206.	Color Chart			2	L	1		
207.	Hard Rubber Mallets			2	L	2		
	Cylinder and Beam Equipment							
208.	6" x 12" x $\frac{1}{4}$" thick wall concrete cylinder molds with base plate			2	L	12		
209.	6" x 12" Cardboard Cylinder Molds, dozen			2	L	8		
210.	Capping set with vertical capper, ladle, compound warmer, 50 lbs. compound and cylinder carrier			2	L	1		
211.	Capping Compound (50lb. carton)			2	L	1		
212.	Concrete Micrometer			2	L	1		
213.	6" x 6" x 24" concrete beam forms			2	L	2		
214.	6" x 6" x 36" concrete beam forms			2	L	2		

FACULTY /BUILDING MATERIALS AND TESTING LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
215.	Third Point Loading Devices for Flexure			2	L	1		
216.	Accelerated Concrete Strength Curing Tank			2	L	1		
217.	Accelerated Compressive Strength Mold			2	L	6		
218.	Concrete Tongs			2	L	1		
	Strain Gauge for Cylinders, Beams, and Block Shrinkage							
219.	Multi-position Strain Gauge			1	L	1		
220.	Contact Points			1	L	24		
221.	Brass Inserts (100 per lot)			1	L	1		
222.	Contact Seats			1	L	6		
223.	Invar Master Bar			1	L	1		
224.	Strain-gauge Punch Bar			1	L	1		
	Cement and Mortar Testing							
225.	Cement Autoclave, for soundness test			1	L	1		
226.	Autoclave Gaskets (packages of 100)			1	L	1		
227.	Test Bar Holder			1	L	1		

FACULTY/BUILDING MATERIALS AND TESTING LAB

T

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
228.	One Inch Test Bar Mold			1	L	4		
229.	Two Gang Test Bar Mold			1	L	4		
230.	Two Inch Test Bar Mold			1	L	4		
231.	Contact Points (package of 100)			1	L	2		
232.	Soiltest Length Comparator			1	L	1		
233.	Vicat Apparatus, needle and mold			1	L	8		
234.	Vicat Needle			1	L	8		
235.	Vicat Mold			1	L	8		
236.	Flow Table, 10 inches			1	L	2		
237.	Flow Caliper			1	L	1		
238.	Pat Mold			1	L	1		
239.	Cement Testing Cylinder			1	L	2		
240.	Cement Cube Mold, 2 inch, with base			1	L	6		
241.	2" x 4" Cement Cylinder Molds			1	L	6		
242.	100 lbs. Cube Test Sand			1	L	1		
243.	100 lbs. Tensile Test Sand			1	L	1		

FACULTY/BUILDING MATERIALS AND TESTING LAB

U

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
244.	Water Retention Apparatus			1	L	1		
245.	Cement Briquette Tester			1	L	1		
246.	Cement Briquette Mold			1	L	4		
247.	5 Quart Mortar Mixer			1	L	1		
248.	Clearance Adjustment Bracker for CT-345			1	L	1		
249.	Soiltest Mortar Penetrometer			1	L	1		
250.	Blaine Fineness Apparatus			1	L	1		
	Manuals							
251.	Composition and Properties of Concrete Manu			1	L	1		
252.	ASTM Concrete Manual			1	L	1		
253.	ASTM Mineral Aggregates and Concrete Manual			1	L	1		
							Estimated Cost	$88,000
	END- BUILDING MATERIALS AND TESTING LAB							

FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE/ROAD AND CONCRETE LABORATORY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Pachometer			1	L	4		
2.	Hi-Lo Detector			2	L	1		
3.	Container of red dye			1	L	1		
4.	Buzzer indicator system for Hi-Lo detector			1	L	1		
5.	Pavement skid testing instrument truck and test trailer			3	M	1		
6.	Road roughness indicator			3	M	1		
7.	6" Hubbard-Field Stability Set			1	M	1		
8.	British portable skid resistance tester			1	L	1		
9.	Highway runway pavement friction recorder with all spare parts			3	L	1		
10.	(not used)							
11.	Moisture meter set			1	L	1		
12.	Moisture Scout			1	L	1		
13.	Pins for probe, 1 dozen			1	L	2		
14.	Moisture Balance			1	L	1		

FACULTY /ROAD AND CONCRETE LABORATORY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
15.	250-watt infrared lamp for L-195-8			1	L	6		
16.	Interval Timer			1	L	2		
17.	Replacement torsion wire - 5 grams			1	L	1		
18.	Moisture Tester - speedy			1	L	1		
	Moisture Tester - super speedy			1	L	1		
	Speedy Moisture Tester - speedy			1	L	1		
19.	Aluminum Case			1	L	2		
20.	Calibration Kit			1	L	1		
21.	Bouyoucos Moisture Meter			1	L	1		
22.	Bouyoucos soil blocks, gypsum			1	L	1		
23.	Bouyoucos bridge			1	L	1		
24.	Top pan precision balance			1	L	2		
25.	Seismograph			1	M	1		
26.	Marshal automatic test set 220/50/1 phase			1	M	1		
27.	Pocket Penetrometer, case of 6			1	L	2		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
28.	NASA water film depth gauge			1	L	2		
29.	Metric Field Scale			1	L	1		
30.	Gasoline Core Sample Drill with complete set of thin wall coring bits and thin wall diamond bits			1	M	1		
31.	Portable Gasoline Diamond, core drilling machines with accessories/2 sets (2) of bits and adaptors			1	M	2		
32.	Soil Color Chart			1	L	3		
33.	Tropical Soil Chart, set of 2			1	L	3		
							Estimated Cost	$166,000
	END ROAD AND CONCRETE LAB							

FACULTY /SANITARY ENGINEERING

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
							Estimated Cost	$30,000.

B. Faculty of Mechanical and Electrical Engineering

Electronics Department

- TV Lab and Studio
- General Electronics Lab
- Telecommunications Lab
- High Precision Instruments Lab
- Radio
- Electroacoustics Lab
- Semiconductor Lab
- Radar Lab
- Microwave Lab
- Audio Visual Aids Lab
- Electronics Maintenance Lab
- Mechanical Workshop
- Automatic Control Lab
- Laser Lab
- Computations and Electrical Measurements Lab

Electrical Power and Machinery Department

- Hybrid Computer Lab
- Digital Computer Lab
- Electrical Machines Lab
- Protective Gear Circuits Lab
- Network Analysis Lab
- Telemetry and Communications Lab
- Computer Control Lab

Mechanical and Production Engineering Department

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPT.

Persons Contacted:

1. The Dean of the Faculty
2. Dr. Kamal Nagi, Vice Dean
3. Dr. Hassan Rishi, Head of Electronics Department

General Findings:

The department started in 1963 and currently has about 800 students in the five-year program. The department laboratories now occupy an old building on the M and E Campus. A new building is planned with the land already allocated adjacent to the present location. Construction completion is expected about one year from now.

The existing electronics laboratory is used for teaching only, and is very poorly equipped. It consists of out-dated equipment. Only experiments dealing with basic concepts of electricity, measurements, and vacuum tube experiments can be illustrated in the existing laboratory. Teaching of electronic circuitry theory and design is nonexistent. The lab does not have equipment to handle Integrated Circuit Electronics or discrete transistor circuitry.

Nor is there equipment existing for research use. The department requested a number of complete laboratories: one for each aspect (or specialization) of the many areas of electronics. This includes applications such as television, telecommunications, radio, electroacoustics lab, semiconductor, radar lab, etc.

The equipment lists submitted are different from those originally submitted to the Study Team by the Syrian Ministry of Planning. The information presented to the team regarding the electronic laboratories varied in detail from one laboratory to another. In

some cases, complete equipment lists were given while in other cases, only the generic names of the labs were given. For some labs only the purpose, size, and kinds of experiments to be performed were available. The faculty in these cases is depending on the Study Team to use their expertise in deciding the exact equipment needs for given labs. Information about modern scientific equipment is usually not available in Syria. The faculty's obvious motive in not presenting specific equipment lists was to have the most up-to-date and cost effective equipment available from the U.S.A.

Even though all the Electronic Lab requests are legitimately for teaching, some of them could also support research work by department staff.

Equipment Recommendations:

The following is a generic list of equipment recommended for this department. The costs shown are the average a procurement office could expect to pay for current models, manufactured in the U.S.A. (or elsewhere, if required.)

Estimated cost for the entire department is $1,355,000.

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPT./TV LAB AND STUDIO WITH CONTROL ROOM A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Color TV monitor (PAL/SECAM): with 59-65 cm picture tube : 220V 50Hz			1	M	2		
2.	TV Oscilloscope (possible to select individual scanning line and field, CCIR standard, 220V, 50Hz)			1	M	2		
3.	TV test line generator and inserter			1	M	2		
4.	Sweep generator for video band (30 Hz to 10 MHz)			1	M	2		
5.	Sweep generator for VHF (up to 300 MHz)			1	M	2		
6.	Field-strength meter for TV antennas VHF bands and U.H.F. bands			1	M	4		
7.	Color TV test pattern generator (PAL/SECAM), with RGB and complete color video signal outputs and VHF output			1	M	2		
8.	Noise generator (for video band, up to 10 MHz)			1	M	2		
9.	Electronic voltmeter with 30 KV voltage divider			1	M	2		
10.	Benches for the following TV experiments:			1	M	12		
	a. Study of vertical scanning b. Study of horizontal scanning c. Study of Sync-generator elements d. Forming of Synchronizing signal (A synch portion of a compositive picture signal)							

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	e. Synchronization in TV receiver f. Study of linear (HF and LF) distortions of video signal g. DC restoration h. Influence of a camera-preamplifier noise on a TV picture i. Aperture correction j. Gamma correction Each bench should have associate power supply (220V, 50Hz) and video monitor (CCIR system with 17 cm-picture tube) and complete accessories and spare parts for 5 years.							
11.	A closed-circuit TV with progressive scanning, 300 lines, 50 fields and cable communication line with a length about 300 m.			1	M	1		
	<u>Educational benches for study of color TV principles</u>							
12.	Educational bench for study of PAL encoder and decoder.			1	M	2		
13.	Benches for study of SECAM encoder and decoder			1	M	2		
14.	Trainer for study and experiments on color TV receiver for PAL and SECAM systems with possibility to create defects and perform repairs by replacing of components			1	M	2		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
15.	Transportable video-cassette TV unit allowing broadcast recordings on color and black and white cassettes.			1	M	1		
16.	Television Colorimeter (giving color coordinates in XYZ system and UV CLE-60 system)			1	M	1		
17.	Luminance meters (portable) for TV receivers			1	M	2		
18.	Luxmeters (for 1-10000 lux)			1	M	2		
19.	Sine squared pulse and bar generator			1	M	2		
20.	Color television cameras and associated camera control units (with PAL encoder)			1	M	2		
21.	Television switcher for PAL system (with special-effect unit)			1	M	1		
22.	PAL/SECAM Transcoder			1	M	1		
23.	SECAM encoder			1	M	2		
24.	Sync generator (adaptable for PAL and SECAM system)			1	M	2		
25.	Color T.V. monitor (PAL & SECAM)			1	M	2		
26.	Color TV test pattern generator (PAL/SECAM)			1	M	1		
27.	Compact color TV video tape recorder (PAL/SECAM)			1	M	1		
28.	Floor-stand microphones			1	M	2		

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPT./TV LABORATORY AND STUDIO W/CONTROL RM.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
29.	Hi-Fi cassette recorders			1	M	2		
30.	Sound Mixer			1	M	1		
31.	Associated spare parts and accessories			1	M	1		
32.	Optional Accessories kit and instructional manuals			1	M	1		
							Estimated Cost	$90,000
	END TV LAB AND STUDIO WITH CONTROL ROOM							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPT./GENERAL ELECTRONICS LABORATORY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Power Supply 0-35V, 0-3A			1	M	12		
2.	Power Supply 0-75V, 0-6A			1	M	10		
3.	Power Supply 0-350V, 0-2A			1	M	10		
4.	AVO Meters			1	M	30		
5.	Signal Generator (sine-square wave)			1	M	4		
6.	Dual trace oscilloscope (15 mhz and 100 nsec. sweep rate)			1	M	4		
7.	Dual trace oscilloscope (150 mhz and less than 5 nsec. sweep rate)			1	M	4		
8.	Electronics Avometers			1	M	2		
9.	Double Pulse generator			1	M	2		
10.	Q-meter			1	M	2	Estimated Cost	$500,000

END
GENERAL ELECTRONICS LAB

Item Description

Note: Only the type of experiments to be performed in the lab are shown here.

An equipment list will be completed as part of the expanded scope of work.

General: 1) No. of students 24
2) Level is final year undergraduate in Electronics & lst year in Postgraduate'

1) a. Cable & Transmission Line
b. Junction Cable
c. Balancing Technique
d. Coaxial Cable and necessary measuring equipment such as Echo pulse technique
e. Network simulation

2) Carrier system of low capacity
a. Telegraphy
b. Telephony

3) P.C.M. and Delta Modulation Technique as applied on cable and radio

4) Automatic Exchange (Training purpose)
a. Cross Bar System (END TO END)
b. Uniselector system (END TO END)
c. Electronic system (END TO END)

5) Microwave Line of Sight Low Capacity full solid state - END TO END

6) V.H.F. Duplex operation with Automatic Dialing facilities (END TO END)
1 Fixed Station (2 Mobile)

7) CARRIER on power line
Lowest Capacity (END TO END)

Item Description

8) Necessary Maintenance Equipment for the above mentioned systems.

9) Spare parts for the above items for 5 years period.

10) Documents in English 5 copies

11) Experiment Hand Books

12) Active antennas each for H.F., V.H.F. Bands

Estimated Cost $130,000

(does not include automatic exchange equipment)

END
TELECOMMUNICATIONS LAB

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/HIGH PRECISION INSTRUMENTS LAB FOR GRAD. LEVEL GEN. ELECT./

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Pulse generator			2	M	12		
2.	Function generator			2	M	12		
3.	T.V. sweep generator			2	M	10		
4.	AM-FM V.H.F. Signal generator			2	M	10		
5.	Digital Multipurpose meter			2	M	20		
6.	Digital counter/timer			2	M	10		
7.	Double Trace Oscilloscope			2	M	10		
8.	Storage Oscilloscope (2 channel)			2	M	10		
9.	Spectrum analyser			2	M	5		
10.	Double line recorder			2	M	10		
11.	X-Y recorder			2	M	15		
12.	Universal curve tracer (with storage display)			2	M	5		
13.	Polaroid camera (with adapters)			2	M	5		
14.	Power supply 0-70V adjustable, 0-6A			2	L	20		
15.	Power supply 0-35V, 0-2A			2	L	20		
16.	Power supplies (all adjustable) rating: 0-20 V.D C, 2A			2	L	5		

FACULTY FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/HIGH PRECISION INSTRUMENTS LAB FOR GRAD. LEVEL B
GEN. ELECT/ELECTRONICS DEPT

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	0-10 V.D.C., 4A			2	L	5		
	0-40 V.D.C., 1A			2	L	5		
	0-100 V.D.C., 3A			2	L	5		
	0-320 V.D.C., 2A			2	L	5		
17.	High Power Supplies rating: 0-20 V.D.C., 50A			2	L	5		
	0-60 V.D.C., 20A			2	L	5		
18.	High Precision Power Supplies: rating: 0-20 V.D.C., 2A			2	L	5		
	0-4 V.D.C., 2A			2	L	5		
19.	Resistance Attenuators (500 MH.DC.)			2	L	40		
20.	RF Power meter to measure the forward and the reflected power.			2	M	40		
21.	Field Strength meter S			2	M	2 for ea sub band		
22.	Uncoded parametric amplifier			2	M	4		
23.	Logic state analyser			2	M	3		
24.	A complete set of IC troubleshooters for total solution of IC logic testing, simplifying digital fault findings, dynamic indicating of logic activity, use in circuit IC functional tester and stimulator-response testing of digital ICs.			2	M	2		
25.	Noise generator DC-1 GHz			2	M	5		54

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/HIGH PRECISION INSTRUMENTS LAB FOR GRAD. LEVEL GEN. ELECT/

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
26.	Display units (various types)			2	M	10		
27.	Digital RCL meter (of high precision)			2	M	5		
28.	Decadic Capacitor			2	M	20		
29.	Digital DC Voltmeter			2	M	10		
30.	Sampling Oscilloscope (high sensitivity) frequency range up to 20 GHz			2	M	5		
31.	V/F convertor (high precision)			2	M	5		
32.	Wave form analyser, programmable frequency up to 2 GHz			2	M	5		
33.	High resolutionn time interval meter range lower than 10 n.s. (high precision)			2	M	10		
34.	Digital Thermometer (high precision)			2	M	10		
35.	Logarithm Voltmeter			2	M	10		
36.	Electronic Analog RF Voltmeter			2	M	10		
37.	Impedance diagraph (Smith Chart)			2	M	2		
38.	Polyscopes			2	M	10		
39.	Digital Recorders			2	M	5		

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/HIGH PRECISION INSTRUMENTS LAB FOR GRAD. LEVEL GEN. ELECT/ ELECTRONICS DEPT. D

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
40.	Variable Phase Generator			2	M	5		
41.	Frequency Counter up to 18 GHz			2	M	2		
42.	Signal generator sets up to 18 GHz			2	M	2		
43.	Precision Computing Counter system frequency 400 MHz (direct)			2	M	2		
44.	Q- Meter			2	M	5		
45.	Milliohm meter (high precision)			2	M	5		
46.	Analog resistance meter			2	M	5		
47.	Digital clocks (continuous display of month, day, hour, minute.)			2	M	10		
48.	Digital comparators (dual and single)			2	M	10		
49	Thermistor and platinium resistance ther meter			2	M	50		
50.	Programmable Counter/timer			2	M	10		
							Estimated Cost	$60,000.
	END HIGH PRECISION INSTRUMENTS LAB							

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Note: This lab consists of two parts.							
	A. General equipment list.							
	B. A list of experiments for which required equipment has not been selected.							
	B. General Requirements							
1.	RF power meter, 100 watt			1	M	2		
2.	FM/AM signal generator, 10 kite-10 MHZ			1	M	4		
3.	Carrier Deviation Meter			1	M	4		
4.	AF Power Meter			1	M	2		
5.	0, 1% universal bridge			1	M	4		
6.	AF signal source			1	M	4		
7.	110 MHZ Spectrum Analyser			1	M	2		
8.	MF Transmission Measuring set			1	M	4		
9.	Distortion factor meter			1	M	4		
10.	Non-Linear distortion analyser			1	M	2		
11.	MF attenuator			1	M	2		
12.	AM/FM modulation meter			1	M	2		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
13.	Frequency counter			1	M	2		
14.	AF Power Amplifier			1	M	2		
15.	Electronic Voltmeter			1	M	2		
16.	Masteringer Multimeter			1	M	4		
17.	Noise generator (RF range)			1	M	4		
18.	Associated spare parts and accessories			1	M	-		
	B. Educational Benches for Following Experiments							
a.	Measuring the sensitivity of radio receivers			1	M	2		
b.	Measuring the selectivity of radio receivers			1	M	2		
c.	Study of AFC (automatic tuning circuit) in FM and AM (short-wave band) receivers.			1	M	2		
d.	Study of AGC circuit in radio receiver			1	M	2		
e.	Study of frequency conversion in superhethrodyne radio receivers (with one or two frequency changers)			1	M	2		
f.	Study of tracking in radio receivers			1	M	2		
g.	Study of AM and FM detectors			1	M	2		
h.	Measuring of non-linear distortion in radio receivers			1	M	2	Estimated Cost included in High Precision Instrument Lab	
i.	Noise figure measurement			1	M	2		
	END -- RADIO LAB							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/ELECTROACOUSTICS LABORATORY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Beat frequency oscillator (AF range)			1	M	2		
2.	Frequency analyser (AF range)			1	M	2		
3.	Measuring Amplifier (AF range)			1	M	2		
4.	Level recorder (AF range)			1	M	4		
5.	Electronic Voltmeter			1	M	4		
6.	Condenser Microphones			1	M	10		
7.	Dynamic Microphones			1	M	10		
8.	Piezoelectric Microphones			1	M	10		
9.	Measuring Microphones			1	M	5		
10.	FET Preamplifiers (AF range)			1	M	10		
11.	Moving-coil loudspeakers			1	M	10		
12.	Measuring (Hi-Fi) Loudspeakers			1	M	5		
13.	Sound-proof chamber (3 x 3 x 3 m)			1	M	1		
14.	Phase-meter (AF range)			1	M	2		
15.	Randon-noise generator			1	M	4		
16.	Sine Randon generator			1	M	4		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
17.	Frequency Spectrometer			1	M	2		
18.	Sound level calibrator			1	M	4		
19.	Turntable			1	M	2		
20.	Recorder and rolls of recording paper.			1	M	2		
21.	Package of Polar Diagram charts			1	M	4		
22.	Stereophonic gliding frequency recordings			1	M	2		
23.	Response test unit (AF range)			1	M	4		
24.	Audio Frequency Response Tracer			1	M	4		
25.	Real-Time 1/3 octave analyzer consisting of: Frequency Analyzer, Control and display unit.			1	M	2		
26.	Four channels Hi-Fi magnetic tape recorder			1	M	2		
27.	Hi-Fi cassette recorder			1	M	2		
28.	Spare parts and accessories to all above mentioned devices and instrumentation			1	M			
29.	Instructional manuals for operation and maintenance			1	M	5		
	END ELECTROACOUSTICS LAB						Estimated Cost included in High Precision Instruments Lab	

Item Description

The requests for these laboratories are shown below as submitted by the department faculty to the study team. The requests do not specify equipment, but rather the objectives and types of experiments to be illustrated in the labs . These descriptions can be eventually translated into specific equipment needs, however, the cost of such a laboratory, in its entirety, could be high in relation to its teaching value.

Industrial organizations usually have such equipment for mass production and research purposes.

The economic justification for such a lab is not sufficient unless the faculty intends to manufacture integrated circuits.

In the U.S.A., few universities have such labs. Most universities in fact take their students on field trips to industrial installations to see such lab facilities.

A scaled down version of the given request, however, could be obtained with a reasonable and justifiable cost.

Item Description

SEMI CONDUCTOR LABORATORIES

These laboratories are divided into three parts:
- Microelectronic laboratory
- Semi-conductor physics and optoelectronics laboratory
- Semi-conductor application lab. (general electronic lab)

Part I: Microelectronic Laboratory

Object: Education, training, research and medium scale production.

Level: Undergraduate and Post graduate students

Constitution: Three principal blocks (sections):
1. Thick-film and Microstrip
2. Printed circuits board and stripline
3. Monolithic and thin film.

Requirements:
1. State of the art semi-automated equipment
2. Stringent environmental control
3. Stringent safety regulations
4. Extensive coverage of the technology
5. Technical staff training

The three microelectronics laboratories are proposed to be linked and modular laboratories.

Estimated Utilization:
1. Undergraduate:
   3rd and final year: 100 students (2 day/week)
2. Postgraduate 20 students (4 days/week)

Item Description

A - Thick-film & Micro strip section:

According to the following process stages, it is necessary to supply the necessary equipment and materials to assure design, fabrication and tests of devices and components.

Design:

Circuit design, breadboarding, testing, thick film design, computer aided design drawing, scribing, photo reduction.

Screen preparation:

Direct/indirect emulsion impregnation, exposure, washing, backing material removal, direct/indirect photo etched metal mask production.

Screen printing:

Substrate preparation,cracking, leveling, drilling, cleaning, ink preparation.

Dry and fire:

Drying, curing, substrate firing, cooling.

Measure and trim:

Parameter measurements and monitoring, air abrasive trimming laser trimming.

Assembly:

Different possibilities

Encapsulation and protection:

Item Description

Quality assurance - properties measurements - electrical tests.

Environmental tests:

Thermal shock, vibration, atmosphere, strength, hardness, operating life, storage.

Applications:

Measurement, performance, operational test

B. Printed Circuit Board and Stripline Section:

According to the following process stages, it is necessary to supply the necessary equipment and materials to assure design, fabrication and tests of fabricated boards and strips:

Design and art work
Photo reduction
Board or blank preparation
Photo printing
Chemical processing
Plated through hole process
Multilayer board process
Testing and quality assurance
Component mounting and assembly
Maintenance and recovery
Environmental tests
Applications

Item Description

C. Monolithic and Thin Film Section

A similar arrangement is necessary in this section of Microelectronics in order to achieve design, fabrication and necessary tests of the fabricated devices:

Semi-conductor integrated circuits process stages:

- Design and material preparation
- Diffusion
- Epitaxial growth
- Surface geometry control
- Metallization for interconnection
- Assembly and packaging
- Quality assurance and testing
- Properties measurements, electrical and environmental test.

Thin-film devices process stages:

- Design and material preparation
- Vacuum evaporation and sputtering technique
- Film thickness control
- Anodization
- Pattern generation
- Quality assurance and testing
- Environmental test

Part 2: Semi-conductor physics and optoelectronic laboratory

Object: Education, training, and research

Level: Undergraduate and postgraduate students.

Item Description

Estimated utilization: 3rd and last year: 100 students (2 days/week)
Post-graduate : 20 students (4 days/week)

Proposed experiments program:

Undergraduate level:

1. Light emission diode characteristics measurements.
2. Photo sensible device measurements
3. Photo couples(isolator) characteristics measurements
4. Optoelectronic modulation & demodulation
5. Measurements of transistor, diodes, U.J.T., thyristor, Triac, Diac, F E T and Mos FET B.F. Characteristics (universal tester)
6. Hot carrier and PIN diode characteristics measurements
7. (C-V) analysis and related techniques
8. The lock-in amplifier as a semi conductor capacitance/conductance meter.
9. Measurements of S.C. thermal properties. (S.C. = semi-conductor)
10. Photo counting and photo multiplier measurements
11. Measurement of t_f and f_T.

Item Description

12. Measurement of $r_{bb'}$ and h_{fe} in H.F.
13. Semi conductor minority life-time measurement (L.I.A.)
14. Strip-line component measurements with network analyzer.
15. MOSFET & Dual MOST Characteristics and parameters measurements.
16. Y - parameters measurements.

Post Graduate Level

1. Diffusion length measurement (L_{PN}, L_{np})
2. Diffusion constant measurements (D_{PN}, D_{np})
3. Surface recombination rate measurements
4. I.R. Quantum counting (L.I.A.) (Lock-in amplifier)
5. Laser stabilization (Lock in Ampl.)
6. Surface state measurements
7. S Parameters measurements
8. Determination of P & n
9. Measurements of C_T in darkness and with illumination.
10. Dynamic resistance of photo diode as a function of
    Mobile-ion measurement in Silicon dioxide

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPT/SEMICONDUCTOR LAB

Item Description

11. Second harmonic generation in laser-excited Ga-As Samples
12. Hall effect measurement by a L.I.A.
13. Chopped frequency response measurements of photo detector.
14. Precise measurement of semi conductor function impedance by (2 LIA)
15. Precise measurement of tunnel diode parameter (L.I.A.)

Part 3: Semi-conductor applications laboratory

Object: Education, training and research.

Level: Undergraduate student

Estimated utilization:	2nd year students:	100 students (2 days/week)
	3rd year students:	100 students (2 days/week)
	Last year students:	80 students (2 days/week)

Proposed Experiments Program:

1. Semi conductor noise figure consideration
2. Cascade noise figure of I.C. Amplifiers
3. Measurements of internal noise of op. amp.

Item	Description
4.	Measurements of op. amp. characteristics & parameters
5.	Measurements of active filters characteristics & parameters
6.	Phase sensitive detector and balanced modulator
7.	Bridge balancing and the two phases L.I.A.
8.	Op. amp. open loop gain and phase measurements by L.I.A.
9.	Phase-locked loop design and measurement
10.	Regulator (I.C. and discrete) characteristics measurements
11.	Distortion and intermodulation measurements
12.	V.H.F. - MOSFET Application
13.	R.F. application of Dual-gate MOST
14.	Measurement of Burst (Popcorn) noise in Linear I.C.
15.	Application of wide-band I.C. power amplifier
16.	Phase-lock application
17.	Floating measurements and guarding
18.	Multiplication and division by logarithmic conversion.

END
SEMI-CONDUCTOR LABS

Estimated Cost $50,000
(includes printed circuit shop, but not integrated circuit manufacturing facilities which are extremely expensive.)

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	RADAR SYSTEM							
1.	Transmitter			2	M	1		
2.	Receiver			2	M	1		
3.	Antenna			2	M	1		
4.	Ranging System			2	M	1		
5.	Servo Performance System			2	M	1		
6.	List of necessary and additional measuring equipments for adequate operation and maintenance.			2	M	1		
	LASER RADAR							
7.	Range Finder			2	M	1		
8.	Tracking Radar			2	M	1		
9.	Laser Radar for measuring the average refractive index.			2	M	1		
	RADAR IMPROVEMENTS SYSTEMS							
10.	Additional unit for conventional radar to increase effective range			2	M	1		
11.	ECCM Receiver to add protection against jamming			2	M	1		
12.	List of spare parts for 5 years and complete accessories for the equipment above.			2	M	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	RADAR -E C M & TARGET SIMULATING							
13.	Jamming Transmitter			2	M	1		
14.	Target Simulating Unit			2	M	1		
15.	Altimeter Unit:			2	M	1		
16.	Antenna			2	M	3		
17.	System for Automatic Identification and Analysis of Radar Parameters			2	M	1		
18.	Accessories for above equipment			2	M	1		
19.	Technical manual in English for equipment above.			2	M	5		
							Estimated Cost	$30,000
							(does not include ECM or Lasar Radar which is highly sophisticated equipment and is subject to some export restrictions from the U.S.A.)	
	END RADAR LAB							

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	COAXIAL-CABLE MEASUREMENTS							
1.	I.F. Amplifier (20-30 MHZ) Solid State			1	M	5		
2.	V.H.F. & U.H.F. Oscillator 0.056 -5GHZ			1	M	10		
3.	Power Supply - all oscillators, self-operated, without external power supply			1	M	5		
4.	Low-Pass filter			1	M	5		
5.	Slotted line			1	M	5		
6.	Fixed Attenuators							
	Attenuation / Freq. range GHZ / Max. Power							
	3dB / D.C.-10 / (1-2) watts			1	M	10		
	6dB / D.C.-10 / (1-2) watts					10		
	10dB / D.C.-10 / (1-2) watts					10		
	20dB / D.C.-10 / (1-2) watts					10		
7.	Mixer rectifier			1	M	5		
8.	Matched loads:			1	M	15		
9.	Short Circuit			1	M	10		
10.	Microwave oscillator, square wave			1	M	3		
11.	Tuning Stub			1	M	10		
12.	Standing wave indicator (indirect detector)			1	M	6		
13.	Open Circuit			1	M	5		
14.	Termination			1	M	10		
15.	Airline			1	M	15		
16.	T Junctions			1	M	10		

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/MICROWAVE LABORATORY B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
17.	90°L Bend			1	M	5		
18.	Matched Siiding termination			1	M	5		
19.	Adjustable air-line, 20 cm			1	M	5		
20.	Double-stub tuner (with tuning elements)			1	M	5		
21.	Patch Cords			1	M	50		
22.	Coaxial-cables			1	M	20		
23.	Directional Coupler			1	M	2		
24.	Coaxial Bolometer & its power head			1	M	2		
25.	Admittance meter			1	M	4		
26.	Susceptance Standard calibrated stub			1	M	5		
27.	Conductance Standard			1	M	5		
28.	Variable air capacitor			1	M	4		
29.	Constant impedance adjustable air-line			1	M	3		
30.	Complete set of stands			1	M	10		
31.	Components mount			1	M	6		
32.	Clamps			1	M	10		
33.	Dipole & Parasitic elements			1	M	2		
34.	Coaxial isolation			1	M	2		
35.	Micro meter vernier			1	M	3		
36.	Adjustable attenuator			1	M	2		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
37.	Cable connectors			1	M	50		
38.	Trombone Constant-Impedance			1	M	1		
39.	Preamps (U.H.F.)			1	M			
40.	Mixer Rectifier			1	M	3		
41.	Voltmeter Rectifier			1	M	3		
42.	Voltmeter detector (matched)			1	M	3		
43.	Bias Insertion Unit			1	M	3		
44.	Rotary joint			1	M	3		
45.	Coupling Probe			1	M	3		
46.	Insertion Unit			1	M	4		
47.	Series Inductor			1	M	2		
48.	U-Line Sector			1	M	2		
49.	Component Mount			1	M	2		
	WAVE GUIDE MEASUREMENTS							
50.	Klystron & Klystron mount			1	M	6		
51.	Gun oscillator			1	M	3		
52.	Directional Coupler			1	M	16		
53.	Frequency meter			1	M	6		
54.	Crystal detector			1	M	6		
55.	Direct reading variable attenuator			1	M	6		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
56.	Direct reading variable attenuator			1	M	6		
57.	Slotted Section			1	M			
58.	Matched termination			1	M	20		
59.	Fan or Blower			1	M	6		
60.	Power supply & cables			1	M	6		
61.	Double beam oscilloscope			1	M	6		
62.	Adjustable short-circuit			1	M	6		
63.	Standing wave meter			1	M			
64.	Standard reflection			1	M	8		
65.	Power-meter and thermistor mount			1	M	4		
66.	Transmission type wave-meter			1	M	4		
67.	X Band standard gain horn			1	M	4		
68.	Adapter · Coax-wave guide			1	M	4		
69.	Coaxiable cable			1	M	50 ft.		
70.	Time - domain Reflectometer			1	M	2		
71.	Oscilloscope (one beam)			1	M	2		
72.	Component mount			1	M	6		
73.	Coaxial inductor			1	M	2		
74.	Ferrite-isolator			1	M	3		
75.	Circulator			1	M	2		
76.	Straight wave guide section			1	M	6		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
77.	D.C. millivoltmeter			1	M	5		
78.	Tunable Chrystal Mount			1	M	3		
79.	Isolator (Broad Band)			1	M	2		
80.	Flap attenuator			1	M	6		
81.	Rotary Vane attenuator			1	M	2		
82.	Slotted section crystal probe			1	M	6		
83.	Barreter			1	M	6		
84.	Matched sliding termination			1	M	4		
85.	Mismatch sliding termination			1	M	4		
86.	Slide screw tuner			1	M	6		
87.	Attenuation calibrator			1	M	2		
88.	Fixed attenuator			1	M	15		
89.	Adjustable detector mount			1	M	5		
90.	Crystal type IN 23			1	M	100		
91.	Wave guide load			1	M	100		
92.	Wave guide clamp			1	M	100		
93.	Backward oscillator & power supply			1	M	2		
94.	T.W.T. Amplifier with P.S.U.			1	M	2		
95.	Magnetron and its power supply			1	M	2		
96.	Blower			1	M	2		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
97.	High Power Load			1	M	2		
98.	Galvanometer			1	M	2		
99.	Twisted wave guide			1	M	10		
100.	E - BEND wave guide			1	M	10		
101.	H - BEND Wave guide			1	M	10		
102.	Flexible wave guide			1	M	10		
103.	Phase Shifter			1	M	6		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Strip Line & Mirco Strip Line Measurements							
	A. Micro Strip Measurements							
a.	Attenuation Measurements			1	M			
b.	Transmission Measurements			1	M			
c.	Reflection & insertion losses measurements			1	M			
d.	Surface-state measurements			1	M			
e.	Dielectric-Constant measurement (high & low value)			1	M			
f.	Phase measurements A complete bench for each measurement is preferable.			1	M			
	B. Strip-line Measurements							
g.	Transmission & Reflection measurements			1	M			
h.	Phase measurements			1	M			
i.	Dielectric constant measurement			1	M			
j.	Attenuation & impedance measurements			1	M			
k.	A complete bench for each measurement is required.							
	END MICROWAVE LAB						Estimated Cost	$100,000

Best Available Document

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/AUDIO VISUAL AIDS LAB A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	16 mm projector and accessories			1	M	1		
2.	8mm sound cassette projector and accessories			2	M	2		
3.	8 mm sound spool projector and accessories			2	M	1		
4.	35 mm slide projector and accessories			1	L	1		
5.	Epidiascope and accessories			1	L	1		
6.	Radio cassette recorder			2	L	1		
7.	Assembly of a slide projector, epidiascope and multiplexer for working with one compact color TV camera. Desk stand. 625 line std.			2	M	1		
8.	Color TV camera, free standing			2	M	1		
9.	Synch, generator and video amplifier for color TV cameras			2	M	1		
10.	Compact video tape recorder			1	M	1		
11.	Video cassette recorder			2	M	1		
12.	Color TV monitors			2	M	12		
13.	Instantaneous interpreting system for two languages			3	H	1		
14.	Complete set for microfiche printing and reading system			2	M	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
15.	Photo-copy machine			1	H	2		
16.	Modern Tirage machine			2	M	1		
17.	Drawing Tables (medium size)			1	L	3		
18.	Large screen with adjustable and portable stand for projection			1	L	3		
19.	Complete Technical Educational Films sets on the following subjects: computer, semiconductor, microwave, satellite, cables, laser, television, switching, pulse code modulation, industrial electronics, infra-red technology, micro-electronics, control, logics and cybernetics			1	L		Estimated Cost	$60,000.
	END AUDIO VISUAL AIDS LAB							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/ELECTRONICS MAINTENANCE LABORATORY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Universal, 1, 7 GHz Oscilloscope			1	M	1		
2.	10 MHz 2 (channel) oscilloscope			1	M	2		
3.	AC current probe and amplifier			1	M	1		
4.	Probe power supply			1	M	1		
5.	Active FET probe			1	M	1		
6.	Multimeter			1	M	4		
7.	DC Microvoltmeter			1	M	4		
8.	Sine-square wave oscillator			1	M	2		
9.	Pulse generator			1	M	1		
10.	Multitester			1	M	2		
11.	Pattern generator			1	M	1		
12.	Signal injector			1	M	2		
13.	D.C. power supply unit			1	M	2		
14.	Sweep generator			1	M	1		
15.	Testing signal generator			1	M	1		
16.	Universal characteristic Tracer			1	M	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
17.	Antenna Testing			1	M	2		
18.	Impedance Tester			1	M	2		
19.	Inductance Boxes			1	M	4		
20.	Capacitance Boxes			1	M	4		
21.	Q-Meter			1	M	1		
22.	IC Tester			1	M	3		
23.	IC Trubelshuter			1	M	3		
24.	Phase-meter (Digital 50 M.Hz)			1	M	2		
25.	Selective Amplifier			1	M	3		
26	Spectrum Analyser			1	M	1		
27.	Synchronous Detector (lock-in amplifier)			1	M	1		
28.	Variable Phase function generator			1	M	1	Estimated Cost	$60,000
	END ELECTRONICS MAINTENANCE LAB							

MECHANICAL WORKSHOP FOR

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/ ELECTRONICS LABORATORIES A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Small Drill with accessories $\frac{1}{4}$" bit			3	L	2		
2,	Medium drill with accessories, 3/8" bit			3	L	2		
3.	Bench lathe with accessories			3	L	2		
4.	General purpose standard screw cutting lathe with accessories for all operations			3	L	2		
5.	Universal kit			3	L	10		
6.	Vice 3" width			3	L	10		
7.	Small vice, $1\frac{1}{2}$" width			3	L	10		
8.	Soldering kit			2	L	20		
9.	Small riveting machine			3	L	5		
10.	Shearing and bending (plates)machine about one meter width.			3	L			
11.	Tool kit, hammer, spanner, etc.			3	L	2		
12.	Cutting machine medium size with accessories			3	L	2		
13.	Coil winding machine			1	M	1		
14.	Coil winding machine, wave winder, progressive wave winder			1	M	1		
15.	Air suction and compression cleaning system			3	L	1		83

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPT/MECHANICAL WORKSHOP FOR ELECT. LAB B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
16.	Electronics tool kit			1	L	10		
17.	Set of files			3	L	20	Estimated Cost	$20,000
	END MECHANICAL WORKSHOP							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/AUTOMATIC CONTROL LAB A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Complete modular servo system			1	M	4		
2.	Oscilliscope			1	M	4		
3.	Function Generator			1	M	3		
4.	Variable phase function generator			1	M	2		
5.	Frequency Response Analyser			1	M	1		
6.	Oscilliscope Camera			1	M	1		
7.	Numerical Control Kit			1	M	2		
8.	Corelator			1	M	1		
9.	Trainer			1	M	1		
10.	Control Simulator			1	M	2		
11.	Electronic Voltmeter			1	M	2		
12.	Electrical Gyroscope Trainer			1	M	1		
13.	Frequency Sweeper			1	M	2		
14.	Variable phase oscillator			1	M	1		
15.	Phase Measuring Generator			1	M	1		
16.	Servokit			1	M	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
17.	Servo Components System with computing resolver			1	M	1		
18.	AC Servomotor			1	M	1		
19.	Servo Tacho Generator			1	M	1		
20.	AC Tacho Generator			1	M	1		
21.	Synchro (CX)			1	M	1		
22.	Synchro (CDX)			1	M	1		
23.	Synchro (CT)			1	M	1		
24.	Synchro (TX)			1	M	1		
25.	Synchro (TDX)			1	M	1		
26.	Synchro (TR)			1	M	1		
27.	AC Linear			1	M	1		
28.	D.C. Motor 12 V			1	M	1		
29.	D.C. Motor 6 V			1	M	1		
30.	D.C. Tacho			1	M	1		
31.	Servo Amplifier A.C.			1	M	1		

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/AUTOMATIC CONTROL LAB C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
32.	Helipot (10 ohm - 125 kohm)			1	M	1		
33.	Helipot (10 ohm - 6480 ohm)			1	M	1		
34.	Motor Potentiometer			1	M	1		
35.	Servo Quad Power Supply Unit			1	M	1		
36.	Servo Amplifier D.C.			1	M	1	Estimated Cost	$60,000
	END AUTOMATIC CONTROL LAB							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/LASER LABORATORY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	An educational accessory arrangement which contains the following:							
	• two optical benches			1	M	1		
	• two triangular supports			1	M	1		
	• a Frensel zone plate			1	M	1		
	• a diffraction grating rotatable holder			1	M	1		
	• an iris diaphram with removable special lens			1	M	1		
	• set of convenables lenses			1	M	1		
	• set of pin hole and other necessary accessories.			1	M	1		
	These various items have to be delivered in one instrument case.							
2.	Educational Interferometer Arrangement			1	M	1		
3.	Educational holographic arrangement			1	M	1		
4.	Helium - Neon gas laser			1	M	1		
5.	Laser transmitting assembly			1	M	1		
6.	Laser receiving assembly			1	M	1		
7.	Digital laser communication system			1	M	1		
	Laboratory of Laser General Application system							

FACULTY MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRONICS DEPARTMENT/LASER LABORATORY B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
8.	Nanosecond risetime			1	M	1		
9.	Particle size analyser			1	M	1		
10.	Q-switched and normal mode neodymium doped glass laser			1	M	1	Estimated Cost	$150,000
	END LASAR LAB							

FACULTY OF MECHANICAL AND ELECT. ENGINEERING/ELECT. DEPT/COMPUTATIONS AND ELECT. MEASURING INSTRU. & SYSTEMS LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Linear Electronic and analog computation							
1.	1. Analog computer			1	M	1		
2.	2. Linear and non-linear equations simulators			1	M	1		
3.	3. Linear and hybrid circuits			1	M	1		
	Educational digital computer system							
4.	4. A digital computer system demonstrator (kit)			1	M	1		
5.	5. Core memory trainer			1	M	1		
6.	6. Digital equipment system trainer to provide an arithmetic unit and core store realizing the basic operations of addition, subtraction, multiplication and division, also the principles of information storage and retrieval, and step-by-step construction of a program.			1	M	1		
7.	7. System for dynamic studies of Computer essential functions and programation to realize the following configurations: a. Synchronous sequential system b. Sequential system with stored program c. Software-Hardware interaction d. Basical software			1	M	1		

FACULTY OF MECHANICAL AND ELEC. ENGINEERING/COMPUTATIONS AND ELECTRONICS MEASURING INSTRU. & SYSTEM LABS

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
8.	Educational manuals in 5 copies, necessary accessories, benches, demonstration racks, storage units, auxiliary items and spare parts sufficient for 5 years.			1	L	1		
	Analog measuring instruments and systems:							
9.	- measuring comparator			1	L	4		
10.	- inversed convertor			1	L	4		
11.	- recording device			1	L	2		
12.	- DC and AC static compensator			1	L	4		
13.	- Balanced automatic bridges compensator			1	L	2		
14.	- DC and AC astatic automatic compensator			1	L	2		
15.	- Balanced automatic bridges			1	L	2		
16.	- DC automatic compensator with X - Y display			1	L	2		
17.	- Balancing sweep systems for measuring amplitude and phase.			1	L	1		
18.	- sweep systems for arithmetic operations			1	L	1		
	Digital measuring instruments and systems							
19.	- digital/digital convertor			1	L	8		

Best Available Document

FACULTY OF MECHANICAL AND ELEC. ENGINEERING/COMPUTATIONS AND ELECTRONICS MEASURING INSTRU. AND SYSTEMS

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
21.	- analog/digital convertor			1	L	8		
22.	- voltage/frequency convertor			1	L	4		
23.	- voltage/time convertor			1	L	4		
24.	- digital decoder and display			1	L	8		
25.	- angle/digital convertor			1	L	4		
26.	- digital recording device			1	L	1		
27.	- direct conversion digital voltmeter			1	L	2		
28.	- direct conversion digital frequency/time meter			1	L	2		
29.	- digital chronometer			1	L	2		
30.	- digital tacheometer			1	L	2		
31.	- digital phase meter			1	L	2		
32.	- digital voltmeter with voltage/frequency or voltage/time conversion			1	L	2		
33.	- AC digital voltmeter (average and instructions values)			1	L	2		
34.	- digital R L C meier			1	L	2	Estimated Cost	$75,000
	END							
	COMPUTATION AND ELECTRONIC MEASUREMENT LAB							92

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPARTMENT

Persons Contacted:

1. The Dean of the Faculty
2. Dr. Kamal Nagi, Vice Dean
3. Head of the Department

General Findings:

Laboratories are presently old, small, and poorly equipped with outdated equipment. The new laboratories are excellent environments , but only partially equipped. Equipment is already installed in some of the new laboratories and is ready for use anytime. Additional space is empty and waiting for all new equipment. Due to the fact that the department recently acquired (from European sources) some equipment, they reduced the original request to exclude what they already had obtained while added new items which they need but had not described on the original list.

Findings and Recommendations:

The equipment requests fall into one of two categories:

A. Needed to complete already existing , but partially equipped laboratories.

B. Needed for future laboratories for which space , but no previous equipment has been allocated at this time.

In the first category, the requested equipment has to match specifications of equipment already existing. In the second, the request consists of complete new laboratories, including secondary equipment such as benches, switchboards, etc.

The power system and machinery department requests are similar to those made by the Electronics Department in that they have varied in the degree of details given to the study team. While some laboratory equipment was explicity specified item by item, others were described only by the purpose and experiments to be carried out in the laboratory, In the latter case, the faculty is expecting the team to act as consultant and help identify the needed equipment.

Equipment Recommendations:

Following is a generic list of equipment recommended for the various laboratories, including those labs described in general terms by the faculty. The costs shown are the average estimates that a procurement office can expect to pay for current model items manufactured principally in the U.S.A.

Estimated cost for the entire department is $1,425,000.

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPT./HYBRID COMPUTER LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Hybrid Computer							
1.	A mini-computer with minimal configuration 48-64K memory and standard FORTRAN compiler			1	H	1		
2.	Parallel data communications interface to support up to 8 analog/digital inputs through interrrupts			1	H	1		
3.	Analog-to-digital data conversion expansion For 16 channels (14 bits each) of multiplexed data with 85 KHZ rate.			1	H	1		
4.	EAI 2000 Analog computer system (or equivalent)							
5.	Serial data communications interface			1	H	1		
6.	Integrator and summation tray			1	M	12		
7.	Track-store summation and summation tray			1	M	4		
8.	Multiplier/Divider and Summation Tray			1	M	4		
9.	Digitally-set function generator			1	M	4		
10.	Dual digitally-set coefficient group			1	M	16		
11.	Octal manually-set coefficient group			1	M	1		
12.	Dual digital-to-analogue multiplier group (DAM)			1	M	2		
13.	General purpose logic tray			1	M	2		
14.	General purpose register tray			1	M	1		

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPT./HYBRID COMPUTER LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
15.	Six Pack comparator tray			1	M	1		
16.	Variable limiter (for summer)			1	M	2		
17.	Variable limiter (for integration)			1	M	4		
18.	Program Panel			1	M	1		
19.	Patch cord kit			1	M	1		
	Computer Terminals							
20.	180 cps printing terminal			1	H	2		
21.	Visual display terminal			1	H	2		
22.	Graphics terminal			1	H	2		
	Analogue/Hybrid Computer Trainers							
23.	Vidac 169 hybrid trainers			1	M	8		
24.	Quarter square multiplier			1	M	2		
25.	Mark space multiplier			1	M	2		
26.	Function generator			1	M	4		
27.	Potentiometer triple			1	M	4		
28.	Lamp display unit			1	M	4		

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPT./HYBRID COMPUTER LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
29.	Digital Timer			1	M	4		
30.	Crystal decade divider			1	M	2		
31.	Dual integrator Type 1			1	M	2		
32.	Dual integrator Type 2			1	M	2		
33.	Dual inverter Type 1			1	M	4		
34.	Dual inverter Type 2			1	M	2		
35.	Track hold pair and comparator			1	M	4		
36.	Switched gain unit			1	M	2		
	Display Devices							
37.	Oscilloscope			1	M	6		
38.	X-Y Recorder			1	M	8		
	Test Equipment							
39.	Alpha II Digital MM			1	M	20		
40.	Oscilloscope			1	M	15		
41.	Sine square wave generator			1	M	15		
42.	Resistance boxes Type 1			1	L	25		
43.	Resistance boxes Type 2			1	L	15		
44.	Analogue Voltmeters			1	M	20		97

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPT./HYBRID COMPUTER LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
45.	Analogue milliammeters 1-1000 mA			1	M	10		
46.	Variable power supply Microreg 300-1			1	M	10		
47.	Digital frequency meter			1	M	10		
48.	Variable double-ended power supply			1	M	15		
	Components and Sundries							
49.	Capacitors and $\frac{1}{2}$ watt carson film resistors			1	L	15		
	Technician Equipment							
50.	Dual beam oscilloscope			1	L	2		
51.	Digital multimeters			1	L	4		
52.	Avometers			1	L	4		
53.	Longnosed pliers			1	L	4		
54.	Side cutters			3	L	4		
55.	Wire strippers			1	M	4		
56.	Tweezers			1	M	4		
57.	Spanners			1	M	4		
58.	Soldering irons			3	L	4		

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPT./HYBRID COMPUTER LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
59.	Power irons			3	L	4		
60.	Supplies:			3	L			
	Main plugs							
	Fuses							
	Crocodile clips							
	Connecting wire							
	Cored solder							
	PTFE Sleeving							
							Estimated Cost	$200,000
	END							
	HYBRID COMPUTER							

A

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPT/DIGITAL COMPUTER LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Large main frame processer with floating point arthimetic hardware			1	H	1		
2.	512 K or 1 M Byte Memory			1	H	1		
3.	Console keyboard, stand and display			1	H	1		
4.	Card Reader			1	H	1		
5.	High speed printer			1	H	1		
6.	Low speed printer			1	H	1		
7.	Disk controller			1	H	1		
8.	200 MB Disk			1	H	4		
9.	Magnetic top controller			1	H	1		
10.	Magnetic top unit			1	H	4		
11.	Preheral devices controller (Quantity depends on specific system)			1	H			
12.	Data channels			1	H	2		
13.	CRT Terminals (some with Arabic/English languages)			1	H	10		
14.	Hard copy terminals			1	H	6		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
15.	Card punch			1	H	4		
16.	Modems			1	H	10		
17.	Basic software such as Basic, Fortan Compilers, assembler, macro-assembler, operating system			1	H	1		
18.	Special software packages for university administration use and other special packages for Interactive Power System Analysis			1	H	1		
							Estimated Cost	$900,000
	END DIGITAL COMPUTER LAB							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY/ELEC. MACHINES LAB. A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Synchronous generator set cyclindrical type complete with control, switchboard and measuring instruments			1	M	1		
2.	Same as Item 1 but Salient type			1	M	1		
3.	Three-phase asynchronous motor DC generator set slip-ring type. Complete with switch-board, control, and measuring instruments.			1	M	3		
4.	As Item 3, but squirrel-cage motor type			1	M	2		
5.	D-C motor/generator complete set Type G			1	M	2		
6.	As Item 5, but Type M			1	M	2		
	Amplidyne/three-phase squirrel-cage induction motor complete set.							
7.	Amplidyne			1	M	1		
8.	Motor			1	M	1		
	Metadyne/Three-phase Squirrel-cage induction motor/D-C shunt-motor sets (complete)							
9.	Metadyne			1	M	1		
10.	Three-phase squirrel-cage induction motor			1	M	1		
11.	D-C Shunt-Motor			1	M	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Three-phase voltage regulators							
12.	Induction Type			1	M	2		
13.	Sliding Brush Type			1	M	5		
14.	Three-phase shifter			1	M	2		
	Three-phase Motor/Three-phase Alternator Complete Set							
15.	Motors			1	M	2		
16.	Generators			1	M	2		
	Repulsion Motor/D-C Shunt Generator Complete Set							
17.	Motor			1	M	1		
18.	Generator			1	M	1		
	Induction Repulsion Motor/D-C Generator Complete Set							
19.	Induction Motor			1	M	1		
20.	D-C Generator			1	M	1		
	Ward-Leonard Complete Set							
21.	D-C Motor			1	M	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
22.	D-C Generator			1	M	1		
23.	Motor			1	M	1		
24.	Exciter			1	M	1		
25.	A-C/D-C Converter Complete Set			1	M	1		
26.	Three-phase transformers			1	M	4		
27.	Single-phase transformers			1	M	4		
28.	Cascade set consisting of two wound-rotor induction motors of different poles			1	M	1		
	Special Machines							
29.	Single-phase sylsen set (complete)			1	M	2		
30.	Three-phase sylsen set (complete)			1	M	2		
31.	Single-phase induction motor (complete)			1	M	3		
32.	Linear-induction motor (complete)			1	M	1		
33.	Step motor (complete)			1	M	2		
34.	A-C servo motors (complete)			1	M	2		
35.	D-C servo motors (complete)			1	M	2		
36.	Tachogenerator A-C type (complete)			1	M	2		104

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY/ELEC. MACHINES LAB D

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
37.	Tachogenerator D-C type (complete)			1	M	2		
38.	A-C Micromachines (complete)			1	M	2		
39.	Demonstration model for automatic drive of three-phase magnetic amplifier			1	M	1		
40.	Demonstration model for thyristor and rectifier circuits			1	M	1		
41.	Static frequency converter			1	M	1		
42.	Demonstration model for automatic drive control system (Werd-Leonard)			1	M	1		
	Resistances and Loads							
43.	Rheostat with fuses			1	M	40		
44.	Variable loads with fuses			1	M	8		
45.	Variable inductance with fuses			1	M	4		
46.	Variable capacitances with fuses			1	M	4		
47.	D-C Motor starter with fuses			1	M	6		
48.	Three-phase motor starters			1	M	5		
49.	Motor analysis dynameter (hyrolic type)			1	M	1		
50.	Main and sub-main distribution panel			1	M			
	Measuring Instruments							
51.	Moving iron V-meters (different ranges)			1	L	25		
52.	Moving Coil V-meters			1	L	15		105

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
53.	Moving iron A-meters			1	L	25		
54.	Moving coil A-meters (different range)			1	L	20		
55.	MA meters D-C and A-C			1	L	15		
56.	Cos-meters			1	L	2		
57.	V.A.R. meters			1	L	3		
58.	Flux meters			1	L	2		
59.	Phase sequence indicator			1	L	2		
60.	Non-instrument requests a. spare parts for five years b. benches for all equipment and cabinets c. training of two technicians or more d. preparation of equipment layout in lab			1	L	1		
61.	A demonstration unit for the effect of changing winding pitch, distribution factor, etc.			3	M	1		
62.	A demonstration unit for pole-changing in various types of motors			3	M	1		
63.	Memory scope for storage and playback of transient signals			3	M	1		
64.	A demonstration unit for the starting performance of induction motors			3	M	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
65.	An electric braking system for induction motors			3	M	1		
66.	Three-phase micro-synchronous generator			3	M	1		
67.	Instrumentation for measurements of dynamic characteristics of various machine sets			3	M	1		
68.	Instrumentation for comparison of commutation quality of D-C machines			3	M	1		
69.	A demonstration unit for relative contribution of torques			3	M	1	Estimated Cost	$100,000

END

ELECTRIC MACHINES LAB

Item Description

The requests for this laboratory were given in the form of a list of experiments only. No specific equipment request was available. A list will be generated by the Study Team when the scope of work has been revised. The experiments shown also depend on other equipment which is already in Damascus, previously obtained from Euopean manufacturers. Initial impressions are that it would be difficult and/or possible to get some of the requested equipment from American Vendors.

Power Systems Experiments

C6.1.2.2	Transistor phase-comparator
C6.1.2.3	Rectifier-bridge comparator, and rectifer bridge used as a phase-comparator
C6.1.2.6	Measurement of zero sequence current
C6.1.2.8	CVT model (response of a cvt under steady-state and transient conditions)
C6.1.2.12	Boucherot 'Constant Current' Supply Circuit
C6.1.2.13	Amplitude Comparators
C6.1.2.14	Phase Comparators
C6.1.2.15	Over current relays for time grading
C6.1.2.16	Segretating networks for positive and negative phase sequence components
C6.1.2.17	Current Differential Relay
C6.1.2.18	Relays with bias signals: circle diagram and polar plots
C6.1.3.8	Magnetic characteristics of c wound transformer core
C6.1.3.11	Capacitor voltage-transformer model

Estimated Cost $200,000

END PROTECTIVE GEAR CIRCUITS LAB

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPARTMENT

FACULTY

NETWORK ANALYSIS LABORATORY

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	The equipment requested for this laboratory must be compatible with already existing equipment. Only Siemens, Robinson's or Dukes & Briggs can supply this equipment at the present time without necessary additional circuitry for interfacing.							
1.	Transient Network Analysis			1	M	1		
2.	A.C. Network Analyser for load flow, fault and stability study. This consists of: a. 4 generator units b. 4 load units c. 12 line units d. 4 autotransformer units e. 8 susceptance units f. power supplies and metering units			1	M	1		
3.	D.C. Network Analyser			1	M	1		
4.	Transformer-analogue network analyser			1	M	1	Estimated Cost is included in Protective Gear Circuits Lab	
	END NETWORK ANALYSIS LAB							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPARTMENT/TELEMETRY & COMMUNICATIONS LABORATORY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	The laboratory requests submitted to the Study Team were in the form of oral descriptions, outlining the objectives of the laboratory. A rough estimate of the necessary equipment is given in this list. Exact equipment requirements can be generated by the Study Team subsequent to submission of this report.							
	Digital Processes							
1.	Logic training boxes			1	M	4		
2.	A/D converters			1	M	10		
3.	D/A converters			1	M	10		
4.	Digital voltmeters			1	M	4		
5.	Digital transmission systems			1	M	2		
	Telemetry							
6.	Transducers			1	M	4		
7.	Time division multiplexer			1	M	1		
8.	Frequency division multiplexer			1	M	1		
9.	Miscellaneous auxillary instruments			1	M			
	Communication							
10.	Sequence generators			1	M	1		
11.	Time domain reflectometer			1	M	2		
12.	Oscilliscope			1	M	2		

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY DEPARTMENT/TELEMETRY & COMMUNICATIONS LABORATORY

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
13.	Power line carrier simulater			1	M	1		
14.	Signal analysers			1	M	2		
15.	Pulse modulator			1	M			
16.	Microwave parabolic link			1	M			
17.	Frequency shift keyboard, generator, modulator, transmitter set			1	M	1		
							This is very specialized equipment, however, not exceptionally expensive. Cost has not been included.	
	END TELEMETRY AND COMMUNICATIONS LAB.							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ELECTRICAL POWER AND MACHINERY/ COMPUTER CONTROL LAB A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Microcomputer System with small memory, simple keyboard and CRT Display. Both serial and parallel I/O interfaces. Hardware and software interface to connect the microprocessers to the mini-computer specified in Hybrid Computer Lab.			1	H	4		
2.	A/D and D/A converters to attach the microprocessors in Item 1.			1	L	16	Estimated Cost	$25,000
	END COMPUTER CONTROL LAB							

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/ MECHANICAL AND PRODUCTION ENGINEERING DEPARTMENTS

Persons Contacted:

1. Dr. Fuad Azer, Dean of Mech. and Elec. Engineering
2. Dr. Kamal Naji, Vice Dean
3. Dr. Simon Obeid, Head of Mechanical Engineering
4. Dr. Abul Saleh Nazeh, Mechanical Engineering Dept.
5. Dr. Jalal Youzbashi, Production Engineering

General Findings:

There are approximately 3500 students in the School of Mechanical and Electrical Engineering. They are equally divided between the two main branches of the school. The school is housed in a new complex located on the edge of the City of Damascus about 10 kilometers from the main campus. (This school is located on the opposite side of town from the School of Agriculture.)

The mechanical and production engineering laboratories and classrooms are well-equipped for students. The mechanical engineering request is for energy related laboratories. It is estimated that about 50% of the mechanical engineering requests are for research related equipment.

Production engineering requests are for teaching aids such as charts, posters, films and projection equipment. The request also includes several complete laboratories. The nature of materials for these laboratories has been left to the discretion of the study team.

The requests from the production engineering department are reasonable and will complement existing equipment. Requests for teaching aids are needed and will be used principally to teach undergraduate students. In general, the mechanical engineering department wishes to receive aid for complex installations that will require considerable on-site assembly.

Equipment Recommendations:

It is recommended that the requests for production engineering be accepted. Requests for complete laboratories in both mechanical and production will take considerable time to develop. The central heating technology lab, solar energy labs, the vibration laboratory, and the automotive laboratory are indicated as justifiable, but requests for the engine test bed and experimental steam plant for mechanical engineering are not part of the study team's recommendations.

Following is a generic list of equipment that is available at this time for the various laboratories. Where equipment lists have not been delineated, lab descriptions are shown. The costs are average estimates that a procurement office can expect to pay for current model items manufactured principally in the U.S.A. Estimated Cost for the two departments is $300,000.

FACULTY OF MECHANICAL AND ELECTRICAL ENGINEERING/MECHANICAL AND PRODUCTION ENGINEERING A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Projector (volostoscope) to project books on wall.			1	L	5		
2.	Overhead Projector			1	L	5		
3.	Slide Projector			1	L	5		
4.	Movie Projector 16 mm. for scientific films.			1	L	3		
5.	Movie films; production engineering metallurgy, heat treatment, machine tools, metal working, casting, 25 films or more.			1	L	1		
6.	Movie screens, various sizes, some portable and some fixed			1	L	12		
7.	Horizontal Milling Machine complete with accessories for teaching students			1	L	2		
8.	Vertical Milling Machine complete with accessories for teaching students.			1	L	2		
A.	Laboratory for Machine Design							
	1. Gears, an assortment for demonstrations and for experiments, critical speeds, friction.							

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	2. Jigs and fixtures design laboratory demonstration and experiments. Turning, grinding, welding, drilling, borings, drill bushing, etc., hydraulic, pneumatic, hydroplastic, electro penumatic.			1	L			
B.	Laboratory for Automation of Machine Tools 1. Automatic screw machine 2. Taped controlled milling machine 3. Boring Machine			1	L			
C.	A Library References, books, slides, textbooks, Films: The Way Machine Tools Work, with pictures of machines, tools, nomenclature showing the names of parts and construction.			1	L			
D.	Small Scale Central Heating Teaching System To include hot water boiler, piping and connections, radiator, expansion tank and other necessary accessories to enable demonstration and experimentation of hot water central heating systems.			1	L			

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
E.	Solar Distillation Apparatus - 4th Year Students. To carry on the following experiments: . solar energy input . measuring base insulation . brine depth . effect of different absorbent surfaces, inclination of surfaces, effect of ambient temp. and wind velocity. Fitted with necessary instrumentation (solar meter, anemoneter, recorder....)			1	L			
F.	Elementary Experimental Solar Energy Laboratory - 3rd year students To be suggested by supplier to suit teaching and elementary research purposes.			1	L			
G.	Complete Experimental Vibration Apparatus 3rd or 4th year students To test free and forced vibrations with viscous damping in the range of experiments, Mass-spring system, lateral vibrations, Torsional vibrations and vibration absorber. Variable range of external force frequency. Natural frequency around 1Hz. Variable range of damping up to (2) approx. Fitted with necessary controls and instrumentation and a facility of recording results.			1	L			

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
H.	Automotive Laboratory Models To include demonstration and working models for agricultural machinery and building construction machinery.			2	M			

C. Faculty of Agriculture

Soils Department
Food Science Department
- Organic Chemistry Lab
- Analytical Chemistry Lab
- Biochemistry Lab (including Microbiological Media)
- Dairy Technology Lab
- Cereals Technology Lab

Plant Production Department
- Horticulture Lab

Plant Protection Department
- Insecticides Lab

Animal Production Department
- Physiology of Reproduction Lab

FACULTY OF AGRICULTURE

Persons Contacted:

1. Dr. Hamad Muzubar, Dean
2. Dr. Abdul Kassem, Vice Dean
3. Dr. Sudeman Massri, Food Science
4. Dr. Haddad, Dairy Technology
5. Dr. Massu, Dairy Technology
6. Dr Ghiath Sumainah, Biochemistry
7. Dr. Abdulhamid Hassan, Professor of Farm Machinery
8. Dr. Sharabi Najmeddin, Soils Department
9. Dr. Habil Mouner, Soils Department
10. Dr. Dieb Badie, Soils Department
11. Dr. Fuad Kurdi, Soils Department
12. Dr. Issa Hassan, Head of Animal Production
13. Dr M. Fouad Al-Rabbat, Animal Production
14. Dr. Adman Kotob, Plant Production Department
15. Dr. Faddoul, Plant Protection Department
16. Dr. Fouzi Samarah, Head of Plant Protection Department
17. Dr. Mohammed Habbooby, Analytical Chemistry
18. Dr. Lamise Yousfy, Organic Chemistry
19. Dr George Shahla, Genetics
20. Dr. Fouad El Kurdi, Soils Department

General Findings:

The Faculty of Agriculture is located approximately ten kilometers from the main university campus. New space has been provided in a six-story building. These facilities appear adequate to house the requested equipment.

There are approximately 3000 students enrolled in the undergraduate program. There are no advanced degree studies at the present time. A two-year program was instituted for diplomas in Food Science and Horticulture, but the program was unable to attract and hold sufficient students. Part of the reason is that Syrian law requires students to attend school full time. Many students who attempt enrollment in agriculture courses are too poor to attend without part-time employment. In addition, six students must be enrolled in a course for it to be offered. The officials at the School of Agriculture are hopeful these problems will be rectified soon.

The Faculty of Agriculture has some equipment for students. Some of this equipment is new and half is old and worn out. Some equipment is currently available for research, but additional apparatus is needed to aid in improving the quantity and quality of Agricultural products produced in Syria and to aid in controlling the quality of imported products.

Detailed reviews of the requests with staff members revealed that a definite need exists for student laboratories, and for research equipment. Many programs planned or currently underway, are aimed at improving sanitation and the quality of agricultural products produced and sold in Syria. For example, one program is proposed to set standards for milk. The basis for this program is that ninety percent of the milk sold in Syria is neither pasteurized nor refrigerated.

There is at present, no equipment in the pesticides laboratory. A new course has been prepared and equipment is needed for 25 students and some research.

The following departments were studied: (each department is further sub-divided into various specialties :

- o Soils
- o Food Science
- o Plant Production
- o Animal Production
- o Plant Protection

Equipment Recommendations:

It is the study team's recommendation that requested items are justified and they should be supplied excepting several of the sophisticated equipment pieces such as the Amino Acid Analyzer. The following is a generic list of the equipment for this department. The costs shown are the average estimates of what a procurement office can expect to pay for current model items manufactured in the U.S.A. Estimated cost for the entire faculty is $1,500,000.

FACULTY OF AGRICULTURE/SOILS DEPARTMENT

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Rotating Shaft Evaporator with Water Container Stand - complete with the following flasks: Qty. Value 5 2000 ml 5 1000 ml 5 500 ml 5 250 ml 10 100 ml 10 50 ml			1	M	2		
2.	Glass Cylinder 15 cm. Diam. X 20 cm. Height with 2 openings glass chambers, double wall pyrex (isothermic cells) cover for 4 holes with tubes which could be tightly closed.			1	L	2		
3.	pH Meter, with expanded scale facilities to record output. Special electrode to measure certain ions 240 V 50/60 HZ.			1	L	2		
4.	Flash Evaporator, 5000 W immersion heater with the following accessories: replacement condensing/evaporating flasks case of 12 of the following capacity; 250, 500, 1000 ml			1	M	1		
5.	Polarimeter with accessories: Extra sodium lamp Measuring Tube			1	L	1		

FACULTY OF AGRICULTURE/SOILS DEPARTMENT

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
6.	Pipette Stand			1	L	10		
7.	Thermo-stirrer, 220-240V with cooling coil and pump			1	L	5		
8.	Adjustable Lab Stand, 170X160 mm Base Dimensions			1	L	20		
9.	Wood Funnel Support, 4 holes, adjustable 38X11x43 cm			1	L	20		
10.	Stop Watch, 30 min., 1/5 sec.			1	L	10		
11.	Micro-Kjeldahl distillation unit			1	L	15		
12.	Kjeldal; digestion stand for item 11, Micro, electrically heated for 6 samples, 220 V. Temp. regulated with 10 flasks, 50-100 ml			1	L	8		
13.	High Speed Centrifuge with accessories 17000 r.p.m. timer, speed regulator, 220 V. 50 Hz single phase, with 2 heads 8x50 ml approx. 16x30 ml and 24 plastic tubes			1	M	2		

FACULTY OF AGRICULTURE/SOILS DEPT. C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
14.	Water distillation apparatus. Capacity 20 L/H 220V. 50/Hz 1 phase			1	L	1		
15.	Distilled water storage unit for item 14			1	L	1		
16.	30 h.p. tractor with double brake-pedal for driver-training and large seat.			1	M	2		
17.	Take apart car with structural intersections for teaching purposes.			1	L	1		
18.	Take apart small combine-harvester (15-30 h.p.) for teaching purposes.			1	L	1		
19.	Small mold board plough, 2-3 bodies, for teaching purposes.			1	L	1		
20.	Teaching aid disk plough with 2-3 disks (diameter about 25 cm)			1	L	1		
21.	Teaching aid chisel plough with 3-5 shears (width 50 cm)			1	L	1		
22.	Teaching aid furrow plough 2-3 small furrow			1	L	1		
23.	Teaching aid sugar beet drill			1	L	1		
24.	Teaching aid sugar beet digger 1-2 row			1	L	1		

FACULTY OF AGRICULTURE/SOILS DEPT.

D

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
25.	Laboratory type driver training machine with control mechanism, 6 for space 10 m x 12 m.			1	L	6		
26.	Sets of selected mineral specimens with degrees of hardness of 1-9 Mohs, supplied with streak plate in boxes.			1	L	10		
27.	Collection of 80 minerals			1	L	1		
28.	Collection of 50 natural crystals.			1	L	1		
29.	Magnetic Compass			1	L	5		
30.	Collection of natural rocks.			1	L	1		
31.	15X hand held lens			1	L	7		
32.	Soil hydrometer for mechanical soil analysis			1	L	20		
33.	Window fan to remove gases, 220V, 50Hz			1	L	1		
34.	Electric grinding machine with adjustable speeds.			1	L	2		
35.	Collection of microscopic slides 150 different slides of rocks to show their structure to be used on polarizing microscope			1	L	1 set		

FACULTY OF AGRICULTURE/SOILS DEPT. E

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
36.	Multipurpose pH Meter with accessories: Glass electrode, reference electrode, silver chloride electrode, ammonia electrode sulphur dioxide electrode, burette attachable unit, recorder with extra charts. Flouride electrode.							
37.	Fermentation tube, vertical (140 h x 15 mm) with plastic foot, meets APHA standard			1	L	48		
38.	(not used)			1	L	2		
39.	Atom Model-Kit to construct Amino Acids macro-molecules; 1420 atom centers and 3000 pre-cut bonds with 35 page booklet			1	L	2		
40.	Soxhlet extraction apparatus for determination of fats Complete three-price assembly with Allihn condensers. Soxhlet extraction tube with 24/40 joints at bottom and 34/45 joints at the top of the tube, flask capacity 125 ml			1	L	6		
41.	Accessories: for item 40: Heating mantle electrothermal control, to accommodate 6 soxhlet extraction units.			1	L			

FACULTY OF AGRICULTURE/SOILS DEPT.

F

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
42.	Current regulator 110-240V. 20 A			1	L	8		
43.	U.V. Spectrophotometer with recorder and paper for recording			1	M	1		
44.	Freezer: Cap 250-350 Liters Temp. -50° to +50°			1	M	2		
45.	Refrigerator Cap. 13-14 cubic feet			1	M	2		
46.	Acid Pump, Polyethylene plastic			1	L	4		
47.	Bottles, weighing capacity #45 50 x 40 mm			1	L	36		
48.	Platinum Crucibles			1	L	10		
49.	Pencil, tungsten carbide point for writing on glass			1	L	40		
50.	Pencil, wax paper wrapped glass marking color blue			1	L	12		
51.	pH meter				M	3		
52.	Spectrophotometer Accessories: Wide range photolube with Filter Tungsten Lamp 6-5V,(Pack of 10) Water Technology Manual Spectrokit Reagent System Test Tubes 12.7 m (2 boxes of 12) Test Tube Pack (6)							

FACULTY OF AGRICULTURE/SOILS DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
53.	Barnstead Rectangular Sterilizer			1	M	1		
54.	Gravity Convection Oven			1	M	1		
55.	Incubator			1	M	1		
56.	Mettler Analytical Balance			1	L	1		
57.	Extra Large Hot Plate			1	L	1		
58.	Water Shaker Bath with Tray Accessories:		1					
59.	Test Tube Mixer			1	L	3		
	Physics Instruments							
	Balances							
60.	Balance, sensitivity 10 mg, 2-5 kg (with set of weights)			1	L	2		
61.	Single beam top pan balance. Range 0-12 kg x 0.5 kg, 0-500 g x 10 g			1	L	2		

FACULTY OF AGRICULTURE/SOILS DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
62.	Lever Balance, Range 0-25 kg x 1kg 0-100g x 10 g			1	L	2		
63.	Triple beam balance, ranges capacity 1000 - 2000 g (set of weights)			1	L	2		
64.	Electric top pan balance, capacity 1000-2000 g x 0.01 g			1	L	2		
65.	Electric balance, capacity 150-300 g x (0.05 - 0.10) mg			1	L	2		
66.	Spring balance, capacity 2-5 kg x 20g			1	L	2		
67.	Spring balance, capacity 5-10 kg x 50 g			1	L	2		
	Other Measuring Apparatus							
68.	Calipers, sliding vernier (with leg) 10-12 cm x 0.1 mm			1	L	20		
69.	Calipers, sliding vernier (with leg) 15 cm x 0.1 mm			1	L	6		
70.	Micrometer, screw gauge 20-30 x 0.01 mm			1	L	4		
71.	Spherimeter, range-5 to +10 0.01 mm			1	L	4		
72.	Tape measure, mm, 2- 5 meters			1	L	4		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
73.	Ruler, steel, 100 cm, graduated in mm (3 cm width)			1	L	1		
74.	Ruler, wooden, 100 cm, graduated in mm			1	L	11		
75.	Stopwatch, fifth second			1	L	5		
76.	Stopwatch, tenth second			1	L	5		
77.	Wheel and axle, a wooden double wheel, 150 and 50 mm diameter (6 mm ramp + 500 - 200 - 100 - 50 - 25 weights)			1	L	4		
78.	Tensile Test apparatus with set of wires (6 wires, diameter 0.5 - 0.9 mm. 6 m long)			1	L	2		
79.	Young's Modulus aparatus, Searle's pattern with accessories and spare wires			1	L	2		
	Other Apparatus							
80.	Two stroke engine representing internal structure and operating system			1	L	1		
81.	Four stroke engine representing internal structure and operating system			1	L	1		
82.	Four stroke diesel engine representing internal structure and operating system.			1	L	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
83.	Wankel rotary engine representing internal structure and operating system			1	L	1		
84.	Specific gravity bottle, capacity 50 cm^3			1	L	10		
85.	Hydrometer, 250 mm long x 40 mm diameter			1	L	2		
86.	Hydrometer, universal, range 60°F 0.700 to 2.000 x 0.010			1	L	4		
87.	Hydrometer, extra wide range at 60°F 1.000 to 1.500 x 0.010			1	L	2		
88.	Hydrometer, extra wide range at 60°F 1.500 to 2.000 x 0.1010			1	L	2		
89.	Hydrometer, wide range, at 60°F 0.800 to .000 x 0.002			1	L			
90.	Calorimeter, joules, with thermometer range -5 +50 x 0.1 C (350 mm long)			1	L	2		
91.	Calorimeter, Harris, complete (12V, 6W)			1	L	1		
92.	Thermometer, range - 10 to +105 x 0.2 C, length 350 mm			1	L	4		
93.	Thermometer, range - 10 to +110 x o.5°C, length, 300 mm			1	L	4		
94.	Thermometer, range - 10 to 250 x 1° C			1	L	4		
95.	Thermometer, range - 10 to 60 x 2°C			1	L	4		

FACULTY OF AGRICULTURE/SOILS DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
96.	Mechanical equivalent of heat apparatus, simple form (120 x 53 x 33 mm) with accessories: thermometer -5 to 50°C . 1°C, black calorimeter AC 76 x 86 mm heat capacity 878 JKg-1K immersion heater 12V 50W , diameter 12 mm, 60 mm long + loading mass 1000 g + mass 2000 g ±100 mg.			1	L			
				1	L	2		
97.	Lenses: double concave, spherical							
	25 mm diameter, 50 mm focus			1	L	2		
	25 mm, diameter, 100 mm focus			1	L	2		
	25 mm, diameter 150 mm focus			1	L	2		
	25 mm, diameter 200 mm focus			1	L	2		
	50 mm, diameter50 mm focus			1	L	2		
	50 mm, diameter 100 mm focus			1	L	2		
	50 mm, diameter 150 mm focus			1	L	2		
	50 mm, diameter 200 mm focus			1	L	2		
98.	Lens, plano-convex diameter 87 mm, focus 150 mm			1	L	2		
99.	Lens holder (to take lens up to 76 mm dia.)			1	L	4		
100.	Prisms: 60° x 60° x 60° refractive index 1.52 length 25 mm, face 25 mm			1	L	2		
101.	Prisms: 60° x 60° x 60° refractive index 1.52 length 38 mm, face 38 mm					2		

FACULTY OF AGRICULTURE/SOILS DEPT.

L

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Prisms: 90°x 45° x 45° refractive index 1.52 length 35 mm face 35 mm.			1	L	2		
	Prisms: 90°x 60 x 30° refractive index 1.52 length 33 hypotenuse 28 mm			1	L	2		
101.	Parallel beam projector 12 V 2 milli watt lamp (to produce spectrum) with spares and accessories (spare lamp, prisms, diffraction grating, color filter)			1	L	1		
102.	Intermediate spectrometer with spares and accessories			2	M	2		
103.	Absorption spectrometer 12V, 2 milliwatts 1.5 V d.c.			2	M	2		
104.	Electrometer amplifier (d.c. amplifier) input resistance 10-15 ohms, two 9V batteries type pp 9 with set of accessories: disc electrodes, extension rod, ionization chamber, and further accessories (power supply unit; radio-active sources: Thoron generator; pair of brass plates and U.V. lamp)			2	M	1		
105.	Dual purpose gold leaf elecroscope (complete)			1	L	2		
106.	Daniell cell (battery) capacity 0.5 litre			1	L	2		
107.	Galvanometer, moving coil (35-0-35 x 1) resistance 10 ohms (35-0-35 mA)					2		

FACULTY OF AGRICULTURE/SOILS DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
108.	Galvanometer, Crampton Parkinson 4-0-4mA			1	L	2		
109.	Wheatstone bridge, ½ m (22 s.w. g) with suitable jockey			1	L	2		
	Wheatstone bridge, 1 m (22 s.w.g) with suitable jockey			1	L	2		
	Wheatstone bridge, 1 m (26 s.w.g) with suitable jockey			1	L	2		
110.	Potentiometer wheatstone bridge with spare parts and accessories			1	L	2		
111.	Rheostat , single tube, open (920 ohm, 0.1A)			1	L	2		
112.	Rheostat , single tube, protected (330 ohms, 1.2A)			1	L	4		
113.	Resistance set (6 dif. wires at 200 mm 400 mm, 600 mm, 21 s.w.g. 200 mm, 28 s.w.g. 200 mm, 32 s.w.g.)			1	L			
114.	Resistance coil unknown value (transparent cover) A, 0.6; B 1.4.C, 1.5; E, 17; G, 93; J, 510 ohms.			1	L			

FACULTY OF AGRICULTURE/SOILS DEPARTMENT

N

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
115.	Large air cooled inductance (d.c. resistance 50 ohms, 50 Hz) - with accessories. Wheatstone bridge and multiammeter (100 mV to 2000V in 9 range, modes) resistance 1 ohm to 50 m. ohms							
116.	Rheostat, protected pattern with interscale meter, a.c. ammeter scales milliammeter range (0-250 mA)			1	L	2		
117.	Ammeter moving iron range, (0-10A)			1	L	1		
118.	Voltmeter moving iron range (0-10V)			1	L	1		
119.	Voltmeter moving coil double range (0-5 and 0-15V)			1	L	1		
120.	Universal indicator with shunt ranges (0-20, 0-50, 0-100, 0-200, 0-500 mA) + multiplier range (0-500 mA 0-20V)			1	L	1		
121.	Multimeter (d.c. 250 V to 5000 in 8 ranges: 50 mA to 100mA: a.c. 2.5V - 5000V. 10 mA to 10A) with scale batteries			1	L	1		

FACULTY OF AGRICULTURE/SOILS DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
122	Universal Volt-ampere - ohmmeter			1	L	1		
123	Nuffield A level physics teacher's guide			1	L	2		
124	Spectroscope			2	M	2		
125	Oscilloscope			1	M	2		
126	Overhead Projector			1	L	2		
127	Teaching Model Spectrophotometer	Coleman Junior II	6/20	2	M	1		
128	Spectrophotometer	Perkins - Elmer	295	2	M	1		
	Microscopes							
129	Vickers polarizing microscope (objective X4, x 10, x 40x)			1	L	2		
130	Swift Microscope (objectives 4X 10 X x 40X			1	L	2		
131	Intermediate Microscope (objectives 4X x 10X x 40X)			1	L	2		
132	Stereomicroscope			1	L	2		

FACULTY OF AGRICULTURE/SOILS DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Technical Instruments							
133.	Burette with rubber pinch valve and glass jet, cap 50 x 0.1.			1	L	100		
134.	Burette pinch valve to fit item 133, package of 5			1	L	20		
135.	Mettler Analytical Balance, electric max capacity about 1 kg, precision 0.1 mg, 220V, 50 Hz, one phase, , direct reading			1	L	1		
136.	Ultracentrifuge, max speed 40,000 rpm, 220V, 50 Hz, automatic photoelectric overspeed protection system, variable speed control.	Beckman	L5-40	1	M	1		
137.	Munsell color chart for soil surveys			1	L	10		
138.	Stop Watch, reading to 30 min. in ½ sec.			1	L	6		
139.	Tensiometer for measuring soil tension capacity			1	M	5		
140.	Squeeze bulb (rubber with single inlet/ outlet for use with pipettes for liquids dispensing)			1	L	10		
141.	Orbit shaker with platform flask, capacity 250 ml			1	L	2		
142.	Spectrophotometer 200-1000 mm, 220V, 50Hz 1 phase digital readout	Fisher Spectsonic 21	UV-D	2	M	1		137

FACULTY OF AGRICULTURE/SOILS DEPT.

Q

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
143.	Vermiculite, Max particle size 3mm, pack of about 0.11 cubic inches	Fisher		1	L	10 packs		
144.	Rexyn 101 cation exchange resin, mesh 16-50, ionic form H+	"		1	L	5 lbs.		
145.	Rexyn 206 (OH) ion exchange resin, mesh 16-50	"		1	L	5 lbs.		
146.	Pure Wyoming Bentonite Clay			1	L	5 kg.		
147.	Pure Kaolin Clay			1	L	5 kg.		
148.	Hollow cathode lamps for atomic absorption. Spectrophotometer model 1272, Beckman for the following elements: Sn, Pb, Ni, Se, Cr with work sheets			1	L	1 each		
149.	Y-shaped connectors, prolyethylene to fit tubing 4.8 to 9.5 mm, pack of 12			1	L	2 packs		
150.	Flame photometer, with propane regulator and dilutor, electronic, 220V 50Hz			2	H	1		
151.	Display cabinet with fluorescent lamps			1	L	1		
152.	Minet lattice structures			1	L	1		
153.	Universal planetarium			1	L	1		

FACULTY OF AGRICULTURE/SOILS DEPT.

R

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
154.	Dispersion cup for high speed stirrer S38 - 010, Griffin, for determination of particle size distribution.			1	L	4		
155.	Ingram ward section cut off			1	L	1		
156.	Microtome thin section cutting of minerals 220V, 50Hz, 1 phase			1	L	1		
157.	Altitude barometer, to 6000 feet, 158			1	L	1		
158.	Altitude barometer to 16,000 feet.			1	L	1		
159.	Gas analyser, three vessal for determination of CO_2, O_2 and CO,			3	H	1		
160.	pH meter			1	L	1		
161.	pH meter soil electrode for item 160			1	L	1		
162.	Soil penetrometer, portable			1	L	1		
163.	Titration potentiometer, battery operated with accessories			1	L	1		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Tube 9380	Corning		1	L	12		
	Tube 9400	"		1	L	8		
	Tube 2420	"		1	L	6		
	Tube 9530	"		1	L	42		
	Tube 9601 -	"		1	L	100		
	Beaker 1003 150 ml	"		1	L	12		
	250 ml	"		1	L	12		
	1000 ml	"		1	L	4		
	Beaker 1010 3000 ml	"		1	L	2		
	Bottle 1000 ml 1220	"		1	L	20		
	Bottle 3700 ml 1230	"		1	L	12		
	Bottle 125 ml 1541 T	"		1	L	24		
	250 ml	"		1	L	10		
	Bottle 1000 ml 1500	"		1	L	18		
	Bottle 1000 ml 51500	"		1	L	5		
	Tube 8800-24	"		1	L	20		
	8800-29	"		1	L	20		
	8800-34	"		1	L	20		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Tube 8820-1019 thru 8820-2955	"		1	L	6		
	Tube 8840	"		1	L	12		
	Tube 8920	"		1	L	12		
	Tube 8930	"		1	L	12		
	Tube 8940	"		1	L	12		
	Tube 8825-24 thru 8825-34	"		1	L	20 each		
	Cylinder 3200 10 ml	"		1	L	5		
	25 ml	"		1	L	5		
	50 ml	"		1	L	5		
	100 ml	"		1	L	3		
	250 ml	"		1	L	3		
	500 ml	"		1	L	3		
	1000 ml	"		1	L	3		
	Cylinder IL-1000	"		1	L	3		
	Cylinder 3120-250	"		1	L	2		
	3118-160	"		1	L	2		
	Distilling head 3560	"		1	L	6		
	Distilling receiver 3642	"		1	L	6		
	33680	"		1	L	2		

C

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY

Item No.	Item Description		Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Drying apparatus	3690	"		1	L	4		
		3525	"		1	L	8		
	Tissue Grinder	7726	"		1	L	4		
	Tissue Grinder	7727	"		1	L	4		
	Tube	7728	"		1	L	6		
		7729	"		1	L	8		
	Tube	7800	"		1	L	12		
		7805	"		1	L	12		
		7268-50	"		1	L	3		
	Stopcock	7542	"		1	L	6		
	Stopcock	7544	"		1	L	6		
	Stopcock	7548	"		1	L	6		
	Stopcock	7558	"		1	L	12		
	Stopcock	7684	"		1	L	8		
	Spot Plate	7220	"		1	L	10		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY D

Item No.	Item Description		Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Stopper	7570-10	Corning		1	L	24		
		7570-19	"		1	L	12		
		7570-24	"		1	L	12		
		7570-34	"		1	L	12		
	Stopper	7571-14	"		1	L	10		
		7571-19	"		1	L	10		
	Stopper	7580	"		1	L	12		
	Tissue	7725	"		1	L	12		
		7680-1	"		1	L	2		
		7680-2	"		1	L	2		
		7680-3	"		1	L	2		
		7680-4	"		1	L	2		
		7680-5	"		1	L	2		
		7680-6	"		1	L	2		
		7680-7	"		1	L	2		
		7680-8	"		1	L	2		
	Tube	9020	"		1	L	10		
		9021	"		1	L	10		
		9040	"		1	L	10		
		9050	"		1	L	10		
		9060	"		1	L	10		
		9120	"		1	L	10		
		9185	"		1	L	4		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY E

Item No.	Item Description			Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Tube	8947		Corning		1	L	8		
		8950		"		1	L	12		
		8959		"		1	L	12		
		8960		"		1	L	6		
		8980		"		1	L	12		
		9000		"		1	L	12		
	Extractor Soxhlet	3740	S	"		1	L	2		
			M	"		1	L	2		
			L	"		1	L	2		
			XL	"		1	L	2		
	Extraction apparatus	3840 - S	24/40	"		1	L	2		
	Allihn, condenser	M		"		1	L	2		
		L		"		1	L	2		
		XL	29/42	"		1	L	2		
	Stirrer	7270		"		1	L	1		
		7272		"		1	L	2		
		7273		"		1	L	2		
		7278		"		1	L	2		
	Stopcock	7280		"		1	L	8		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY

Item No.	Item Description		Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Stopcock	7287	Corning		1	L	8		
		7300	"		1	L	8		
		7302	"		1	L	6		
		7400	"		1	L	6		
		7422	"		1	L	8		
		7440	"		1	L	8		
		7450	"		1	L	24		
		7451	"		1	L	12		
		7474	"		1	L	2		
	Funnel	36060 10	"		1	L	27		
		36210 - 50 c 20	"		1	L	18		
	Cylindrical	6383A 14/20 50ML	"		1	L	12		
		24/40 100 ML	"		1	L	12		
		6382A - 100 24/40	"		1	L	12		
		56400-125 3	"		1	L	2		
		250 2	"		1	L	2		
		500 4	"		1	L	2		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY G

Item No.	Item Description		Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Cylindrical	6388-125 22	Corning		1	L	4		
		250 22	"		1	L	4		
		600 27	"		1	L	4		
	Condenser	2401 - 14	"		1	L	12		
		24	"		1	L	12		
		2400 -19	"		1	L	12		
		24	"		1	L	12		
		2400-300 24	"		1	L	6		
		2480-200 19	"		1	L	6		
		2540-200 19	"		1	L	6		
		300 24	"		1	L	6		
		2640 24	"		1	L	2		
	Cylinder	3002-10 9	"		1	L	3		
		25 9	"		1	L	3		
		50 9	"		1	L	3		
		100 9	"		1	L	3		
	Components	6949 E I 19/22	"		1	L	6		
		6949 G-2 I 14/20	"		1	L	6		
		6949 K I 14/20	"		1	L	6		
	Extraction apparatus	3880 S 24/40	"		1	L	2		
		M	"		1	L	2		
		L	"		1	L	2		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Flask - three necks 4965 B 250 ml 19/22	Corning		1	L	12		
	500ml	"		1	L	12		
	Flask - two necks 4967 24/40 500 ml	"		1	L	12		
	1000 ml	"		1	L	6		
	Flask 4960B - 500ml 29/42	"		1	L	8		
	4965 - 100 ml	"		1	L	4		
	200	"		1	L	4		
	300	"		1	L	4		
	500	"		1	L	4		
	IL	"		1	L	4		
	5341 - 250 ml	"		1	L	9		
	500	"		1	L	9		
	IL	"		1	L	9		
	2L	"		1	L	9		
	Funnel 6060 - 42x	"		1	L	6		
	Tube 9021	"		1	L	12		
	9040	"		1	L	12		
	9050	"		1	L	12		
	9060	"		1	L	12		
	9120	"		1	L	12		
	9185	"		1	L	8		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ORGANIC CHEMISTRY LABORATORY I

Item No.	Item Description		Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Gas Washing	31760 - 250 29/42 250m	Corning		1	L	20		
	Buib - Absorption	1900-165	"		1	L	12		
	Bulb Kjeldahl	1982-24 I 24	"		1	L	2		
	Heater	16790 250 ml	"		1	L	1		
		500	"		1	L	1		
		1L	"		1	L	1		
		2L	"		1	L	1		
	Impinger apparatus	6800 500ML	"		1	L	2		
		6880 45150	"		1	L	4		
	Companents	6949 A I 24/40	"		1	L	8		
	Watch Glass	9985-65	"		1	L	28		
		9985-75	"		1	L	28		
		9985-90	"		1	L	28		
		9985-100	"		1	L	28		
		9985-150	"		1	L	28		
	Bottle	31770			1	L	4		
	Filter apparatus	33990			1	L	100		
	Plastic Atom Kits				1	L	1kit		
					1	L	1kit		
	END ORGANIC CHEMISTRY LAB								

FACULTY OF AGRICULTURE/ANALYTICAL CHEMISTRY/FOOD SCIENCE DEPARTMENT A.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Centrifuge			1	L	5		
2.	Balance, Analytical			1	L	3		
3.	Balance, Mettler			1	L	1		
4.	Balance, Mettler, Top Loading 2000 g			1	L	1		
	END ANALYTICAL CHEMISTRY							

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LABORATORY

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Hydrogen Generator, High Purity H_2 220V 50Hz			1	M	1		
2.	Hot Plate, top plate dimensions 23c x 23c, battle-vented stainless steel case operating temp. 493°C 220V A.C. 50/60 Hz			1	L	1		
3.	Warburg Manonieter, Manometric Respiratory device for Micro gas reactions. Double walled s/s insulated bath for 18 units. Range 25-60°C, 360degree rotation, 220V 50/60 Hz accessories.			1	L	1		
	a. table rack			1	L	1		
	b.1 reaction vessel: Pyrex with center well.			1	L	1		
	2. reaction vessel: Pyrex with center well and one side arm with stopper.			1	L	1		
	3. reaction vessel: Pyrex with center well. Two side arms one side arm has vented plug			1	L	1		
	c. thermometer			1	L			
	d. glassware springs			1	L	36		
4	Centrifuge, high speed refrigerated for biochemical separations, for temps down to 150°C, 220V A.C. 50/60 Hz Max spd. 25000rpm			1	L	1		
	Accessories:							
	Rotor 8 x 50 ml			1	L	1		
	Rotor 6 x 500 ml			1	L	1		
	Swing Bucket 4 x 250ml (all rotors to be provided with plastic tubes)			1	L	1		150

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPT/BIOCHEMISTRY LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
5.	Universal pipet dispensers. Dispense 20 times per minute. Accuracy 1%.			1	L			
	Capacity: 5 ml					3		
	Capacity: 1.0ml					3		
6.	UV Spectrophotometer, double bean filter grating four digit readout, wavelength range 190-900 mm. Provide cell holders for micro and macro analysis, 220V AC 50/60Hz			1	M	1		
	Accessories:							
	a. flourescence unit			1	L	1		
	b. washing kit for UV cell			1	L	1		
	c. pins, disposable, red			1	L	30		
	d. UV cell holder and drying rack			1	L	1		
	e. booklet "An introduction to UV Spectro Spectrophotometry"			1	L	1		
7.	Wiley cutting mill (intermediate) interchangeable sieve-top, delivery top V-belt, brush switch, allen wrenches, ¼ hp motor, 220V 50Hz.			1	M	1		
8.	Micro-Kjeldahl digestion unit hot plate with six elec. heaters with individual rheostat control and pilot light provided with a gas manifold for water ejection of fumes, holds 100ml flasks, 220V, 50Hz			1	L	1 set up		
	Accessories: Micro-Kjeldahl flasks			1	L	24		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPT/BIOCHEMISTRY LAB

C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
9.	Steam distillation unit for Micro-Kjeldahl system. Compact one-piece borosilicate glass unit with teflon stopcocks (chemically inert) 220V 50/60 Hz			1	L	1		
10.	Heating Mantle for round bottom flasks, quartz, fabric skin and lining 220V 50/60 H			1	L	1		
	Accessories: Temperature regulator (A.C.)			1	L	1		
11.	Water Shaker Bath, shaker only bath only, or combination for interchangeable trays for Erlenmyer flasks, beakers and test tubes dim. 71x35x28 220V AC 50/60 Hz			1	L	1		
	Accessories:							
	Trays to hold one each 250ml flasks			1	L	1		
	Trays to hold one each 500 ml flasks			1	L	1		
	Trays to hold one each 1000 ml flasks			1	L	1		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPT/BIOCHEMISTRY LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
12.	Flash or rotary evaporator for distillation, drying, extraction, consisting of coiled condenser fitted to two flasks and temperature controlled water bath, 500 watt immersion heater. (220V, 50/60 Hz.)			1	M	1		
13.	Accessories: (for Item 12) Replacement condensing and evaporating flasks: Case of 12 of the following capacity 250, 500, 1000 ml.			1	L			
14.	Polarimeter light beam measurement of optically active materials. Instrument employs sodium lamp in combination with a 589 nm filter.			1	L	1		
15.	Accessories: (for Item 14) Extra sodium lamp, and measuring tube (one of each)			1	L			
16.	PH meter, with expanded scale facilities, recorder output provided facilitating relective ions measurements complete set with spare parts. 220V, 50/60 Hz Kit of Accessories: 1. Glass electrode 2. Reference electrode 3. Silver chloride electrode 4. Ammonia electrode 5. Sulphus dioxide electrode			1	L	1		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPT/BIOCHEMISTRY LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	(Accessories con t'd) 6. Automatic Burette attachable to set. 7. Recorder with extra charts 8. Flouride electrode							
17.	Fermentation Tube. (140H x 15mm) with plastic feet,meets, APHA standard..			1	L	48		
18.	Atomic Model Kit to construct amino acids, macro-molecules, kit includes a minimum of 1420 atom centers and 3000 pre-cut bonds with instruction manual.			1	L	2		
19.	Soxhlet extraction apparatus three-piece assembly with condensers. Soxhlet extraction tube with 24/40 joints at the bottom and 34/45 joints at the top of the tube, flask capacity 125 ml			1	L	6		
20.	Accessories to Item No. 19 Electrothermal Heating Mantle controlable to accommodate 6 soxhlet extraction units.			1	L	1		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPT/BIOCHEMISTRY LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
21.	Remote Control Hot Plate, Type 1900, Manuel No. RC-2625			1	L	2		
22.	Stir Hot Plate for typical laboratory uses.			1	L	1		
23.	A muffle furnace for ashing organic and inorganic samples , Type 1400, Model F-B 141017			1	L	1		
24.	Melting point apparatus for determining M.P. up to 350°C.			1	L	1		
25.	Test tube mixer, used in lab for vortex mixing - it is able to mix four test tubes simultaneously.			1	L	2		
26.	Amino Acid Antoanalyzer. A device for complete analysis of protein hydrolysate, working on single column analysis system, with fully automatic loading and operation. It takes 140 minutes for single and complete A.A. analysis.			3	H	1		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPT/BIOCHEMISTRY LAB

G

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
27.	Gas-chromatograph instrument for investigation in all areas of Biochemical research, including steroid carbohydrate, fatty acids, pesticides, etc., using GC Technique.			2	H	1		
28.	Thin-layer kit for quantitative analysis containing densitometer and spotter. The densitometer should be a double beam scanning TLC - standard plates should be provided.			1	L	1		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Microbiological Media							
	Nutrient Broth			1	L	5kg		
	Lactose Broth			1	L	2kg		
	Nutrient Gelatin			1	L	1kg		
	Nutrient Agar			1	L	5kg		
	Endo Agar			1	L	1kg		
	Levine EMB Agar			1	L	2kg		
	Tryptone Glucose Extract Agar			1	L	1kg		
	Potato Dextrose Agar Potatoe			1	L	2kg		
	Proteose Tryptone Agar			1	L	1kg		
	Tomato Juice Agar			1	L	1kg		
	Skim Milk			1	L	1kg		
	Brain Heart Infusion Agar			1	L	1kg		
	PPLO Agar			1	L	1kg		
	MacConkey Agar			1	L	2kg		
	EMB Agar			1	L	2kg		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	S.S. Agar			1	L	2kg		
	Urea Agar			1	L	1kg		
	Micro Assay Culture Agar			1	L	1 kg		
	Neurospora Culture Agar			1	L	1kg		
	Niacin Assay Medium			1	L	1 kg		
	Thiamine Assay Medium			1	L	1kg		
	C.S. Vitamin B 12 Agar			1	L	1kg		
	Folic Acid Assay Medium			1	L	1kg		
	Leucine Assay Medium			1	L	1kg		
	Lysine Assay Medium			1	L	1kg		
	Sabouand Dextrose Agar			1	L	2kg		
	Sabouand Maltose Agar			1	L	2kg		
	Mycological Agar			1	L	1kg		
	Bacto-Beef Extract			1	L	1kg		
	Bacto-Peptone			1	L	1kg		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Bacto-Agar			1	L	1kg		
	Bacto-Oxgall			1	L	1kg		
	Bacto-Tryptos			1	L	1kg		
	Bacto-Tryptone			1	L	1kg		
	Bacto-Yeast Extract			1	L	2kg		
	Malt Extract	" "		1	L	1kg		
	Bacto Peptonized Milk	" "		1	L	1kg		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

D

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Microbiology Slides			1	L	1 each		
	Bacteo Agars			1	L	1 each		
	Filamentous Fungi and Yeasts Various Fungi and yeasts (36 types) for stude work and comparison studies specimen catalysts.			1	L			

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

E

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Instruments							
1.	Precision Porta-Temp Constant Temperature Circulator			1	L	1		
2.	Lab Wagon			1	L	3		
3.	Three Prong Clamps			1	L	4 4 4		
4.	Regular Holder			1	L	12		
5.	Contort Holder			1	L	4		
6.	Student Grade Holder			1	L	72		
7.	Thermometer Clamps			1	L	12		
8.	Three Prong Water Bath Clamp			1	L	4		
9.	Twin Cylinder Compressor.			1	L			
10.	One Piece Howard Counting Chamber Cover Glasses Cover Glasses			1 1 1	L L L	10 pack of 6 pack of 6		
11.	Micrometer Disc			1	L	10		
12.	Anaerobic Culture Dish Cover			1	L	12		
13.	Petri Dish Turntable			1	L	2		161

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

F

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
14.	GN-6 Metrical Filters			1 1	L L	3 pk. 3 pk.		
15.	Acrodisc Syringe Filter (box of 50)			1	L	1		
16.	Gelman Glass Fiber Filters (box of 100)			1 1 1	L L L	1 1 1		
17.	Bacterial Air Vent, (pkg. of 24)			1	L	1		
18.	Magnetic Filter Funnel			1	L	4		
19.	Seitz Filter Cap 100 ml Seitz Asbestos Discs (box of 100)			1	L	2		
20.	Fiberglass Bacteriological Glove Box			1	L	1		
21.	Micro-liquid Syringe 1.0 ml Pressure-lok series 5.0 ml			1 1	L L	2 2		
22.	Nuova 7 Stirrer			1	L	2		
23.	Soil Hydrometers			1 1	L L	5 5		
24.	Anaerobic Incubator with vacuum pump			1	L	1		
25.	Dyno Label Maker Kit with Tape: Type 1 2 3 4			1	L	2		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

G

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
26.	Long Wave Lamp			1	L	1		
27.	Lens Paper (pk. of 12)			1	L	20		
28.	Removable Horizontal Tray (case of 12)			1	L	1		
29.	Holder with Adjustable Chuck for Innoculating Loops, pk. of 12			1	L	2		
30.	Wire for Making Loops (pk. of 12)			1	L	2		
				1	L	2		
				1	L	2		
31.	AO Micro Star Series 10 Dual Viewing Microscopes.			1	L	3		
	Accessories			1	L	3		
32.	Kirk. Micro Pipet (pk. of 12 each)							
	Type 1							
	2							
	3							
	4							
	5							
	6							
33.	Explosion - Proof Refrigerator			1	L	2		
34.	Asbestos Gloves			1	L	5		
35.	Beaker Tongs			1	L	3		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
36.	Flask Tongs Type 1			1	L	3		
37.	Flask Tongs Type 2			1	L	5		
38.	Dish Tongs							
39.	Multi-purpose Thermoplastic Parafilm			1	L	1		
40.	Portable Non-Refrigerated Centrifuge			1	L	1		
41.	Refrigerated Centrifuge			1	L	1		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/BIOCHEMISTRY LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Torsion Balance			1	L	1		
2.	Direct Reading Balance			1	L	1		
3.	Class C Weight Sets			1	L	2		
4.	International Clinical Centerfuge with horizontal heads accessory			1	L	3		
5.	Chromatographic jar kits			1	L	2		
6.	Tissue Culture Rotator			1	L	1		
7.	Photoelectric Colorimeter with color filters 5 Mu: 500 - 550 - 600- 640 - 690			1	L	1		
8.	pH Meter			1	L	1		
9.	Recording Hygrograph with 7-day charts			1	L	4		
10.	Micromanipulator			1	L	1		
11.	Kimamatic Viscosity Bath							
12.	Viscosimeters , Size No. 200-300			1	L	10		
13.	Two Stage Vacuum pump			1	L	1		
14.	Shaker pourer unit Shaker platforms with flask capacity 250-500n			1 1	L L	1 2		
15	Stopwatch /END BIOCHEMISTRY LAB			1	L	10		165

FACULTY OF AGRICULTURE/ANIMAL PRODUCTION DEPT/MICROBIOLOGY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Genetics Slides							
	Chromosomes and Genes in Action			1	L	3		
	Human Chromosomes (male)			1	L	5		
	Human Chromosomes (female)			1	L	5		
	Down's Syndrome			1	L	5		
	Turner's Syndrome			1	L	5		
	Kline Filter's Syndrome			1	L	5		
	Any Chromosome Slides Available for Animals Sheep, Goats, Cows.							
	Zoology Slides							
	Entamoeta hitolytica			1	L	5		
	Entamoeta Coli			1	L	5		
	Trypamosoma Gambiens			1	L	5		

FACULTYOF AGRICULTURE/ANIMAL PRODUCTION DEPT./MICROBIOLOGY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Giardia Intestinales			1	L	3		
	Giardia Intestinales Cysts			1	L	3		
	Balantidium Coli			1	L	3		
	Eimeria Tenella			1	L	3		
	Plasmodium Vivax			1	L	3		
	Schistosoma Heamatobium (male)			1	L	2		
	Schistosoma Heamatobium (female)			1	L	2		
	Schistosoma Heamatobium (in copula)			1	L	2		
	Schistosoma Heamatobium (eggs)			1	L	2		
	Schistosoma Mansoni (eggs)			1	L	2		
	Fasciola Hepatica			1	L	5		
	Hymenolepis nana			1	L	3		
	Hymenolepis nana			1	L	3		
	Diphyllobothrium latum			1	L	3		
	Trichuris Trichiura			1	L	3		
	Trichinella spiralis			1	L	5		

FACULTY OF AGRICULTURE/ANIMAL PRODUCTION DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Ankylostoma doudenale			1	L	5		
	Ankylostoma doudenale (male)			1	L			
	Ankylostoma doudenale (female)			1	L	5		
	END ANIMAL PRODUCTION DEPARTMENT							

A

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/DAIRY TECHNOLOGY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1	Kjeldahl Digestion unit, 2 each units with infrared heaters 50 to 250ML			1	L	2		
2	Tube extraction relon Roese-Gottlieb model S.L.B.			1	L	10		
3	Centrifuge nouneau, multiple place MOA-F2a			1	L	2		
4	Measuring device			1	L	2		
5	Acidimeter salut			1	L	3		
6	Acidmeter neurex			1	L	3		
7	Stopwatch, 30 min. 1/5 sec.			1	L	10		
8	Balance mittler griffin			1	L	2		
9	Balance mittler griffin			1	L	2		
10	Milking machine, 5 cows			1	L	1		
11	Petre dish sterilizer s/s with removable rotor to hold 10 dishes			1	L	10		
12	Sterilizer for pipettes type N 010			1	L	20		
13	Amino Acid Analyzer			1	L	1		
14	Microscope, 2 binoculars, 5 objectives 4x, 10x, 20x, 40x and 100x oil immersion			1	L	50		

FACULTY OF AGRICULTURE /FOOD SCIENCE DEPT/DAIRY TECHNOLOGY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
15	Micro projector			1	L	1		
16	Magnetic stirrer and spare parts			1	L	5		
17	Hot plates for magnetic stirrer			1	L	5		
18	PH Meter			1	L	2		
19	Homogenizer, 50 - 100 liter			1	L	4		
20	Churner s/s 220V AC 50/60 HZ 50-100 liters			1	L	1		
21	Cheese making VAT 50-100 liters			1	L	2		
22	Cheese butyrometer			1	L	25		
23	Dry milk butyrometer			1	L	25		
24	Balance , rapid Oe-2			1	L	3		
	END DAIRY TECHNOLOGY LAB							

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPARTMENT/CEREAL TECHNOLOGY AND PROCESSING

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Magnifocuser			1	L	1		
2.	Seed Blowers			1	L	1		
3.	Laboratory aspirator			1	L	1		
4.	Seed dosage sieves, set of 12 sieves and pan			1	L	1		
5.	Wide Chief grader, double deck "20" wide			1	L	1		
6.	Spiral grain cleaner			1	L	1		
7.	Seed, grain cleaner and grader, stand screens, elevator and hopper			1	L	1		
8.	Color-grader determinater			1	L	1		
9.	Hardness-tester			1	L	1		
10.	Falling number system 1600 for alpha-amylose determination, falling number AB			1	L			
11.	Glutamic system for glutein determination			1	L	1		

FACULTY OF AGRICULTURE/FOOD SCIENCE DEPT/CEREAL TECHN. AND PROCESSING B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
12.	Parinograph,			1	L	1		
13.	Extensograph			1	L	1		
14.	Fermentograph			1	L	1		
15.	Laboratory Bakery,20kg-h			1	L	1		
16.	Laboratory plainsifter with ten sieves ,			1	L	1		
17.	Laboratory mill 20kg/h			1	L	1		
18.	Flour color grader			1	L	1		
19.	Grain Sampler 1 kg capacity			1	L	1		
20.	Weight per bushel 1 kg			1	L	1		
21.	Glutin divider ten samples			1	L	1		
22.	Washing and brush plant			1	L	1		
23.	Vertical square sifter			1	L	1		
24.	Digital moisture computer			1	L	1		
25.	Universal moisture tester			1	L	1		
26.	Moisture determination balance			1	L	1		

FACULTY OF AGRICULTURE /FOOD SCIENCE DEPT/ CEREAL TECHN. AND PROCESSING

C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
27.	Rapid moisture tester complete			1	L	1		
28.	Stainless steel oven 150°C			1	L			
29.	Triple-purpose heat-cabinet			1	L	1		
30.	Official sample cans for grains , qt. size			1	L	100		
31.	Grain sample bags, Polyethyne, govt. std.			1	L	100		
32.	Thermometer set			1	L	1		
33.	Official sample pans			1	L	12		
34.	Hygrometer , Mason type			1	L	1		
35.	Pneumatic grain sampler , complete			1	L	1		
36.	Grain collector			1	L	1		
37.	Weight per bushel and Hecto-liter apparatus			1	L	1		
38.	Torsion balance scale			1	L	1		
39.	Zoom stereo-microscope					1		
	END							
	CEREAL TECHNOLOGY AND PROCESSIN							

FACULTY OF AGRICULTURE/PLANT PRODUCTION DEPARTMENT/HORTICULTURE LABORATORY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1	Automatic propagator for seeds and cuttings. Dimension 92 x 51 x 30 cm. Heated by means of low voltage warning wire embedded in sand and controlled by rod type thermostate adjustable over the range 0 to 70c. For soil treatment and hot bed propagation.					6		
2.	5-50 ml (Scale, ml) with interchangeable tips fine syringes for gas/chromatography (2) syringes with 50 needles for G.C. work					2		
3.	To control vacuum 0.5 to 5 x 10 - 3 torr vacuum electronic vacuum control unit for an existing vacuum pump.					1		
4.	Vacuum leak detector to test vacuum of high vacuum pump to insure maximum efficiency in connections.					1		
5.	Mineral insulated heating cables, each unit consisting of 9.75 meters of mineral insulated single core copper sheathed heating cable HDP sheathed overall black. Each end to be fitted with a complete seal assembly (20 mm thread)					20		
6.	Rototherm mercury - steel temperature recorders single pen, range 10/120F, 7 day rotation electric clock, 200/250 V A.C. 50 HZ, wall mounting with 10 ft. copper (continued)							

FACULTY OF AGRICULTURE/PLANT PRODUCTION DEPT./HORTICULTURE LAB

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
6. cont'd	sheathed capillary reinforced at head an bulb, mild steel type. Complete with charts and supply of ink and spring wound clock.					2		
7.	Metal thermostat, weather proof rod having rod length of 23 inches and temperature range of 20 - 110 F with power cord.					3		
8.	Electric hot plate with energy regulator, maximum temp. : 450c dimensions: 45 cm x 30 cm of hot plate with power cord and all accessories. Voltage 220 A.C.					8		
9.	Forceps, length 10 cm					120		
10.	Mohr type clamps, nickel plated brass for burretes length 8 cm.					120		
11.	Hoffman type clamps, with screw and hinged bottom plate, distance between bars 32 mm.					120		
12.	Warburg apparatus (circular) with tank capacity 10 to 15 litres complete with flask and manometers which can oscillate independently with an adjustable variable shaking speed. The apparatus contains 16 flasks, manometers and stands respectively with power and all accessories 220 volts.					1		

FACULTY OF AGRICULTURE/PLANT PRODUCTION DEPARTMENT/HORTICULTURE LABORATORY

C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
13.	Clamps for rubber pressure tubing extra strang with large screw and head.					120		
14.	Paper chromatographic two dimensional tank. The tank is cast in clear glass and is closed by means of a plate glass lid which fits closely to the ground edge, the tank contains two upper glass solvent tank, is supported on glass cross breaklets and the lower solvent tank is fabricated polypropylene. Ten glass rods should be provided to support whatman chromatographic paper with 1470 mm length. Tank dimensions (2.5 x 22 x 51)					3		
15.	Air velocity indicator monitors operation of heating and ventilating installations. Readings are in feet per minute, maximum scale reading is 1000 feet per minute. Scale divisions are numbered from zero to 10 each number representing 100 ft/min.					2		
16.	Sliding weight balances with double bar, the top reads 0-10 g in 0.1 g the lower 0-200 g. Total capacity 2000 grams with set of weights from 0.1 gram to 2000 grams.					5		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ HORTICULTURE LABORATORY

D

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
17.	Electrothermal Soxhlet extraction unit flasks 300 ml. 500 ml. 600 ml. and 1000 ml. Temperature control is by built-in individual flask control. Process for extracting fats and organic acids by solvents.					2		
18.	Pressure gauge for connecting tubes, safety type dial calibrated 0-60 atmosphere with red line at 25 atmosphere, pipe threaded.							
19.	Vacuum gauge for connecting tubes safety type - dial calibrated from 0.5 to 5 x 10 -3 torr, pipe threaded.					2		
20.	Growth chamber cabinet fully automatic for temperature, humidity, and light control, with all accessories, voltage 220 volt. AC temperature -10c to 50 c 13-20 cubic ft. capacity.					2		
21.	35 mm slide projector					2		
22.	Muffle furnace. Automatic control temperature range up to 1000 - 1100 c with a swing up door and solid state scale combined controller calibrated in C showing continuous indication of furnace temperature. Internal dimensions 25 cm height, 50 cm depth, 28 cm width, maximum power required, 5000 watts 220 V. A.C. with all accessories.					3		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/ HORTICULTURE LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
23.	Electrical Analytical Balance capacity 200 g minimum weight 0.1 mg. with all accessories voltage 220 volts A.C.					5		
24.	Water bath for general laboratory applications Temperature accuracy of ± 0.25 C. dimension 17 x 12 x 19½ inches inside the bath. Thermostatically controlled between 25 c to 85 c stainless steel construction with metal lid, heater rated at 1500 watts A.C. and 220 volts thermostat covering range of 5 c for any temperature from 25 c to 85 c with power cord and all accessories.					2		
25.	Stereo microscope complete with standard equipment (binocular) with accessories. Voltage 220 volts.					6		
26.	Drying oven, mechanical convection, large capacity range to 200 C all stainless steel construction inside dimensions 100 cm width 50 cm depth 100 cm height three replaceable shelves 220 volts A.C. with fan and accessories.					2		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/HORTICULTURE LABORATORY

F

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
27.	½ h.p. electric blower and motor A.C. mounted on heavy box and iron base. Output 0.75 cu. feet perminute up to 16/sq. inche in pressure and /20/ inches to 28 inches vacuum, with power cord and accessories. Voltage 220 volts.					2		
28.	Magnues pressure tester for testing fruit maturity in field and laboratory conditions.					3		
29.	Fruit Juicer with cutter of hard stainless steel. Automatic brake stop and convenient lemon squeezer. 220 volt. 50-60 Hz with power cord and accessories.					2		
30.	Water still 10 liters per hour					1		
31.	Hand-held 8x magnifier with plastic cover.					35		
32.	Alcoholometer with thermometer. Total length 450 mm 0-100% scale reading . 1% to measure alcohol content of liquids					5		
33.	Cardboard boxes for storing plant specimens dimensions 40 x 30 x 5 cn with filler and clear tops.					500		

FACULTY OF AGRICULTURE/PLANT PRODUCTION DEPT./HORTICULTURE LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
34.	Hand refractometer 0-70 scale reading to determine total soluble solids in juice.					2		
35.	Research greenhouse for vegetable production. Height: 4.2 meters, length 55 meters width 12 meters with automatic air cooling ventilation and heating for Syrian climate maximum temperature in summer 42-45 C in winter minimum temperature 10 to 15 C outside Hot water heating system. Storm guards for glazing 3 year warrantee guarantee for equipment and construction. Personnel training required. 5000 liter diesel tank and 10,000 liter water tank with all connections for diesel, electricity, water, air, and gas connections to greenhouse.					1		
36.	Penetrometer pressure tester					2		
37.	Refractometer to measure fruit					2		
38.	Polarimeter - sucros meter to determine sugar content by light					1		
39.	Sling psychrometer					1		
40.	Leaf transpiration instrument					1		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/HORTICULTURE LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
41.	Thermograph					1		
42.	Hygrograph					1		
43.	Thermo-Hygrograph					1		
44.	Recording Hygrometer					1		
45.	Evapograph					1		
46.	Rain gauge					1		
47.	Rain gauge recorder					1		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/HORTICULTURE LABORATORY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
48.	Barometer					1		
49.	Sunrise recorder					1		
50.	Hand-held anemometer					1		
51.	Electronic Calculators for Statistical Analysis					100		
52.	Refractometer					2		
53.	Electric Chain Saw					1		
54.	Automatic Seeder for small quantity attachment. Nursey push type					1		
55.	Cultivater					1		
56.	Pruning Shears					1		
57.	Illuminator					2		
58.	Mini Computer					1		
59.	Analysis of Sugar Apparatus by use of Alpha Analysis : Enzymes					1		

FACULTY OF AGRICULTURE/PLANT PRODUCTION/HORTICULTURE LAB

J

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
60.	Electric Grafting Machine					1		
61.	KiHo					7		
62.	Tractor, with the following grade blade attachments: Dozen blade, Tiller, Disc, Spike Tooth Harrow Cultivator, Rear Discharge Mower, Lawn Sweepers, Lawn Roller Aerator, 4-wheel Utility Wagon, Cement Mixer, 2-wheel Dump Cart.					1		
63.	Air Blower (for aeration)					7		
64.	Plastic Heat Sealer Unit - width 2 m					2		
65.	Stump Remover - type 1					3		
	Stump Remover - type 2					2		
	Stump Remover - type 3					1		
66.	Bush Remover					1		
67.	Coldfogger					1		
68.	Bio-degradable Containers, Size 34							
69.	Water Pump for Filteration in Chromatography Apparatus							
70.	Specific Gravity Apparatus for Determination Starch in Potatoes							

END HORTICULTURE LAB

A

FACULTY OF AGRICULTURE/PLANT PROTECTION DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Slide Projector			1	L	1		
2.	Incubator for Paraffin Bath			1	L	1		
3.	Freezing Microtome			1	L	1		
4.	Isolation chamber (microbiology) for special environments			2	H	2		
5.	Small isolation chamber for students			1	L	2		
6.	Autoclave 50 liters 30" x 33" x 39" 200°C			1	L	2		
7.	Sample size, Lyophilizer, freeze dryer			1	L			
8.	Deep freezer, chest type , 12 - 14 cu. ft.			1	L	3		
9.	pH Meter, type 1			1	L	1		
10.	Magnetic stirrer and hot plate with spare parts			1	L	2		
11.	Vacuum pump 1 - 10^4 torr Hg			1	L	1		
12.	Centrifuge			1	L	2		
13.	Magnetic filter funnel			1	L	1		
14.	Little giant			1	L	1		
15.	Membrane type 1 type 2 type 3			1 1 1	L L L	2		184

FACULTY OF AGRICULTURE/PLANT PROTECTION DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
16.	Laminar flow bench			1	L	1		
17.	Falle toy useful dimensions 375x 724x 600 in stainless steel			1	L	1		
18.	Slide cabinet			1	L	3		
19.	Vacuum chamber heater to 105°C to determine weight of fungus, moisture			1	L	1		
20.	Pressure steam sterilizer			1	L	2		
21.	Student Microscope			1	L	50		
22.	Research Stereomicroscope with microphotograph adapter			1	L	1		
23.	Research microscope			1	L	1		
24.	Student Stereomicroscope			1	L	50		
25.	Flame Photometer			1	L	1		
26.	Muffle Furnace			1	L	2		
27.	Water Bath			1	L	2		
28.	Water Bath Hotplate - energy regulator 400 C			1	L	8		
29.	Oven max. 100°C			1	L	1		

FACULTY OF AGRICULTURE/PLANT PROTECTION DEPT.

C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
30.	Balance - 1 g to 1000g			1	L	2		
31.	Balance - 1g to 0.000 1g			1	L	11		
32.	pH Meter type 2			1	L	6		
33.	Sterilizing box for petri dishes Stainless steel with removable rack to hold 10 dishes			1	L	20		
34.	Continuous pipette syringe			1	L	1		
35.	Stainless steel pipette container with close fitting lid			1	L	10		
36.	Stirrer, stainless steel			1	L	1		
37.	Slide drying plates			1	L	5		
38.	Stainless Steel test-tube stands			1	L	25		
39.	Dissecting set			1	L	60		
40.	Dissecting needle			1	L	60		
41.	Disposable scalpels			1	L	60		
42.	Specimen forceps			1	L	60		
43.	Slide Box (rack form)			1	L	25		

FACULTY OF AGRICULTURE/PLANT PROTECTION DEPT.

D

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
44.	Knapsack sprayer, stainless steel or hard brass capacity 3.5 gal. working pressure 15-12 psi nozzle 1-2-3 dia. (mm)			1	L	2		
45.	Back sprayer, stainless steel or hard brass cap. 2.3 gal. max. press. 58 psi			1	L	2		
46.	Back sprayer, plastic, battery operated cap. 1.4 gal.			1	L	10		
47.	Hand sprayer (diff. types) plastic or metal total cap. 1-2-1 (pistol type sprayer etc.)			1	L	2		
48.	Thermo fogger output 15 gal./HR stainless steel tank and parts			1	L	10		
49.	Scare-away for birds. Heavy duty unit, operate on carbide and water or acetylene.			1	L	1		
50.	Black light contamination detection kit for rodents			1	L	1		
51.	Electra fogger			1	L	2		
52.	Hand tank sprayer			1	L	2		
53.	Electric insect trap U.V. light 220V/ 50 cyl or batteries			1	L	5		

FACULTY OF AGRICULTURE/PLANT PROTECTION DEPT.

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
54.	Gas masks with face shields (several types) masks for protection from insecticides. plus cartridge-filter pack.			1	L	15		
55.	Gas masks for use with methyl bromide			1	L	10		
56.	Plastic or rubber protective clothing + face shields for insecticides			1	L	20		
57.	Rubber gloves for handling chemicals and pesticides medium size			1	L	20 pair		
58.	Flumiscope reads from 0-10002 of methylbromide per 1000 cu. ft. 220V 50 cyl. or batt. operated.			1	L	1		
59.	Bee Smoker, heavy metal			1	L	2		
60.	Hot knife for honey removal, auto thermostat polished steel, 220V /50 cycl. or batt. operated.			1	L	2		
61.	Frame grip for handling bee frames 8" grip			1	L	5		
62.	Beeveil, wire mesh screen porous khaki, elastic hat band long bottom drawstrings with hat.			1	L	5		
63,	Bee keeper gloves, sting resistant high quality medium size			1	L	10		

FACULTY OF AGRICULTURE/PLANT PROTECTION DEPT/INSECTICIDES LAB

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Water Bath, rectangular, elec. heated 220V, 50Hz, 6 compartments, 1500 watt, 100 mm dia. holes, stainless steel integral constant level water feed			1	L	2 2 2		
2.	Pipette Filler, rubber bulb			1	L	10		
3.	Bunsen Burner, portable			1	L	25		
4.	Thin layer absorption chromatography and spare parts			1	L	1		
5.	Burette Holder			1	L	20		
6.	Beaker Clamp			1	L	20		
7.	Respirator, face, for non-toxic mists and spare filters			1	L	30 20 bxs		
8.	Portable colorimeter, EEL and spare parts			1	L	2		
9.	Vacuum Desiccators			1	L	2		
10.	Funnels, separating 50ML to 100ML heart-shaped			1	L	10 each		
11.	Funnels, separating 50ML to 1000ML conical shaped.			1	L	10 each		
12.	Rain guage			1	L	20		

FACULTY OF AGRICULTURE/PLANT PROTECTION DEPT/INSECTICIDES LAB

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
13	Stirrers, electric			1	L	1		
14	Automatic dispensers capacity:							
	CM^3 1			1	L	5		
	CM^3 2					5		
	CM^3 5					5		
	CM^3 10					5		
	CM^3 20					5		
15	Micro Applicator for dosing insects 1ML per press			1	L	12		
16	Spectrophotometer for pesticide analysis/ with spare parts.			1	M	1		
17	Gas/liquid chromatograph for pesticide analysis with spare parts and supplies			1	L	1		
18	Balance, electric, front loading down to 0.00001 grams			1	L	1		
19	Balance table for above item No. 18			1	L	1		

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FACULTY OF AGRICULTURE/PLANT PROTECTION/INSECTICIDE LABORATORY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Tube - 9380	Corning		1	L	8		
	Tube - 9400	Corning		1	L	4		
	Tube - 2420	"		1	L	4		
	Beaker 150 ml 1003	"		1	L	20		
	250 ml	"		1	L	20		
	1000 ml	"		1	L	20		
	Beaker 3000 ml 1010	"		1	L	2		
	Bottle - 1000 ml, 1220	"		1	L	10		
	Bottle - 3700 ml, 1230	"		1	L	12		
	Bottle - 125 ml 1541 T	"		1	L	10		
	250 ml	"		1	L	10		
	Bottle - 1000 ml, 1500 IL	"		1	L	10		
	Bottle - 1000 ml, 51500	"		1	L	5		
	Tube - 8800-24	"		1	L	20		
	8800-29	"		1	L	20		
	8800-34	"		1	L	20		
	Tube - 8820-1019 thru 8820-2955	"		1	L	6 each		

FACULTY OF AGRICULTURE/PLANT PROTECTION/INSECTICIDE LAB

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Tube - 8920	Corning		1	L	12		
	Tube - 8940	"		1	L	12		
	Tube - 8825-24 thru 8825-34	"		1	L	20 each		
	Cylinder- 3002 - 10 ml	"		1	L	5		
	25	"		1	L	5		
	50	"		1	L	5		
	100	"		1	L	5		
	250	"		1	L	5		
	500	"		1	L	5		
	1000	"		1	L	5		
	Distilling head - 3560	"		1	L	6		
	Distilling receiver - 3642	"		1	L	3		
	33680	"		1	L	2		
	Drying apparatus - 3690	"		1	L	2		
	3525	"		1	L	5		
	Tube - 7728	"		1	L	6		
	Tube - 7800	"		1	L	6		
	Tube - 7268 - 50	"		1	L	3		
	Stopcock - 7542	"		1	L	6		
	Stopcock - 7544	"		1	L	6		
	Stopcock - 7548	"		1	L	6		
	Stopcock - 7558	"		1	L	6		
	Stopcock - 7684	"		1	L	6		192

FACULTY OF AGRICULTURE/PLANT PROTECTION/INSECTICIDE LAB

C

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Stop Plate - 7220	Corning		1	L	5		
	Stopper - 7570 - 10	"		1	L	12		
	Stopper - 7570- 19	"		1	L	6		
	Stopper - 7570 - 24	"		1	L	6		
	Stopper - 7570 - 34	"		1	L	6		
	Stopper - 7571 - 14	"		1	L	10		
	Stopper - 7571 - 19	"		1	L	10		
	Stopper - 7580	"		1	L			
	Tissue - 7725	"		1	L	6		
	7680 - 1	"		1	L	1		
	7680 - 2	"		1	L	1		
	7680 - 3	"		1	L	1		
	7680 - 4	"		1	L	1		
	7680 - 5	"		1	L	1		
	7680 - 6	"		1	L	1		
	7680 - 7	"		1	L	1		
	7680 - 8	"		1	L	1		

FACULTY OF AGRICULTURE/PLANT PROTECTION/INSECTICIDE LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Tube - 9020	Corning		1	L	6		
	Tube - 9021	"		1	L	18		
	Tube - 9040	"		1	L	18		
	Tube - 9050	"		1	L	18		
	Tube - 9060	"		1	L	18		
	Tube - 9120	"		1	L	14		
	Tube - 9185	"		1	L	2		
	Extractor Soxhlet- 3740 S 50 ml 24/40	"		1	L	2		
	M	"		1	L	2		
	L	"		1	L	2		
	XL 21/42	"		1	L	2		
	Extraction apparatus 3840 - S 24/40	"		1	L	2		
	Allihn, condenser M	"		1	L	2		
	L	"		1	L	3		
	XL 29/42	"		1	L	2		
	Stirrer - 7270	"		1	L	1		
	Stirrer - 7272	"		1	L	2		
	Stirrer - 7273	"		1	L	2		
	Stirrer - 7278	"		1	L	2		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Stopcock - 7280	Corning		1	L	8		
	Stopcock - 7287	"		1	L	8		
	Stopcock - 7300	"		1	L	8		
	Stopcock - 7302	"		1	L	6		
	Stopcock - 7400	"		1	L	6		
	Stopcock - 7422	"		1	L	8		
	Stopcock - 7440	"		1	L	8		
	Stopcock - 7450	"		1	L	12		
	Stopcock - 7451	"		1	L	12		
	Stopcock - 7474	"		1	L	2		
	Funnel - 36060 - 10	"		1	L	12		
	Funnel - 36210 - 50c 20	"		1	L	12		
	Cylindrical 6383A 14/20 50 ml	"		1	L	12		
	24/40 100 ml	"		1	L	12		
	Cylindrical 6382A - 100ml 24/40	"		1	L	12		
	Cylindrical - 56400 - 125 3	"		1	L	2		
	250 2	"		1	L	2		
	500 4	"		1	L	2		
	Cylindrical - 6388 - 125 22	"		1	L	4		
	250 22	"		1	L	4		
	600 27	"		1	L	4		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Condenser 2401 - 14	Corning		1	L	12		
	24	"		1	L	12		
	Condenser 2400 - 19	"		1	L	12		
	24	"		1	L	12		
	Condenser 2440 - 300 24	"		1	L	6		
	2480 - 200 19	"		1	L	6		
	Condenser 2540 - 200 19	"		1	L	6		
	300 21	"		1	L	6		
	Condenser 2640 - 24	"		1	L	2		
	Cylinder - 3002 - 10 ml 7	"		1	L	3		
	25 9	"		1	L	3		
	50 9	"		1	L	3		
	100 9	"		1	L	3		
	Components - 6949 E I 19/22	"		1	L	6		
	6949 G-2 I 14/20	"		1	L	6		
	6949 K I 14/20	"		1	L	6		
	Extraction apparatus 3880 - S 24/40	"		1	L	2		
	M	"		1	L	2		
	L	"		1	L	2		

FACULTY OF AGRICULTURE/PLANT PROTECTION/INSECTICIDE LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Flask - three necks 4965 B 250 19/22	Corning		1	L	12		
	500	"		1	L	12		
	Flask - two necks 4967 24/40 500 ML	"		1	L	12		
	1000 ML			1	L	6		
	Flask - 4960B - 500 29/42	"		1	L	8		
	Flask - 4965 - 100 ml	"		1	L	4		
	200	"		1	L	4		
	300	"		1	L	4		
	500	"		1	L	4		
	1000	"		1	L	4		
	Flask - 5341 - 250 ml	"		1	L	9		
	500	"		1	L	9		
	1L	"		1	L	9		
	2L	"		1	L	9		
	Funnel - 6060 - 42x	"		1	L	6		

FACULTY OF AGRICULTURE/PLANT PROTECTION/INSECTICIDE LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Gas Washing - 31760- 250 29/42 250	Corning		1	L	4		
	Bulb Absorption 1900 - 165	"		1	L	4		
	Bulb Kjeldahl 1982 - 24 I 24	"		1	L	2		
	Heater - 16790 250 ml	"		1	L	1		
	500	"		1	L	1		
	1L	"		1	L	1		
	2L	"		1	L	1		
	Impinger apparatus - 6800 500 ml 45150	"		1	L	2		
	6880	"		1	L	4		
	Components - 6949 A I 24:40	"		1	L	4		
	Watch Glass - 9985 - 65	"		1	L	24		
	-75	"		1	L	24		
	-90	"		1	L	24		
	-100	"		1	L	24		
	-150	"		1	L	24		
	Bottle - 31770	"		1	L	4		
	Filter apparatus 33990	"		1	L			
	END							
	INSECTICIDES LAB							

FACULTY OF AGRICULTURE/ANIMAL PRODUCTION DEPARTMENT/PHYSIOLOGY OF REPRODUCTION LAB A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Electric water heater (20-30 lites capacity) 220V, 50Hz			1	L	1		
2.	Electroejaculate: for bulls (complete unit)			1	L	1		
3.	Electroejaculator for rams (complete unit)			1	L	1		
4.	Research microscope			1	L	1		
5.	Quantitative Grade Filter paper, Ashless Grade			1	L			
	Whatman (41)							
	9 cm Dia.			1	L	3 boxes		
	11 cm Dia.			1	L	3 boxes		
	12.5 cm Dia.			1	L	3 boxes		
6.	Quantitative Grade Filter paper, Ashless Grade Ashless Grade			1	L			
	Whatman (40)							
	9 cm Dia.			1	L	3 boxes		
	11 cm Dia			1	L	"		
	12.5 cm Dia			1	L	"		
7.	Quantitative Grade Filter Paper			1	L			
	Hardened Grade with 0.025% max. ash			1	L			

FACULTY OF AGRICULTURE/ANIMAL PRODUCTION DEPT/PHYSIOLOGY OF REPRODUCTION LAB B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
	Whatman (54)							
	9 cm Dia			1	L	3 boxes		
	11 cm Dia.			1	L	3 boxes		
	12.5 cm Dia.			1	L	3 boxes		
8.	Atomic Absortion Spectrometer			2	H	1		
9.	Microtome			1	M	1		
10.	Student Microscope			1	L	30		
11.	A complete unit for freezing and storing semen in straws			1	L	1		
12.	Microscope TV complete set for testing semen			1	L	1		
13.	Model sets for male and female reproductive systems (cattle, sheep, swine, chicken, and human)			1	L	1		
14.	Microscope Slide Set of various subjects; zoology, cytology, histology, endocrinolog reproductive system genetics			1	L	5		

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FACULTY OF AGRICULTURE/ANIMAL PRODUCTION DEPT/PHYSIOLOGY OF REPRODUCTION LAB

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
15.	Overhead Transparencies							
	75W0110 The Cell					1		
	75W0130 Genetics					1		
	71W0150 DNA					1		
	75W4000 The Skeletal System					1		
	75W4020 The Muscular System					1		
	75W4040 The Nervous System					1		
	75W4080 The Circulatory System					1		
	75W4100 The Respiratory System					1		
	75W4120 The Digestive System					1		
	75W4140 The Excretory System					1		
	75W4150 The Endocrine System					1		
	75W4170 The Reproductive System					1		
16.	Filmstrip Sets							
	70W 3400 Introducing Genetics					1		
	70W 3900 The Living Cell					1		
	70W 3300 DVA and Cell Chemistry	"				1		
17.	Animal Cages							
	21W1212 Jewel cages, model no. 315					20		
	21W9213 Jewel cages, model no. 316					20		
	END PHYSIOLOGY OF REPROD. LAB							
	Selected From:							
	Ward's 1974-75 catalog Ward's Natural Science Establishment, Inc. P.O. Box 1712 Rochester, NY 14603							

FACULTY OF AGRICULTURE/ANIMAL PRODUCTION DEPARTMENT/ANIMAL NUTRITION LABORATORY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Muffel Furnace, max. temp. 1000oc Furnace 220-240V			1	M			
2.	Distillation apparatus, 220/380 three phase 50/HZ 20 liters/hr, 4800 watts: switch output 15 amp.			1	L			
3.	Almeter: hydraulic/electric apparatus to measure wool strength			1	L			
4.	Projectine Lanometer apparatus to determine diameter of wool fiber. Micrometer lens for microscope			1	L			
5.	Microner.			1	L			
6.	Strength meter to measure wool length calescopic calibration with lead balls in reservior.			1	L			
7.	Washing or Dispensing Bottles. Wicker-covered neck ideal for hot solutions, borosilicate glass with rubber stopper and tubing. 100 ml. capacity			1	L			
8.	Nalgene Bottles. Type one/conventional polyethylene with screw cap and spigot at the bottom/5 gal. capacity			1	L			
9.	Nalgene Bottles. Type two.			1	L			
	END ANIMAL NUTRITION LAB							

FACULTY OF DENTAL MEDICINE

Persons Contacted:

1. Dr. M.A. Massassati, Dean of Faculty
2. Dr. Emile Azar, Assistant Dean

General Findings:

The Dental School has approximately 1000 students in its five year program. There are also about 180 students in the Dental Assistant Program and 180 in the Dental Lab Technician Program. Twenty-one students are studying in the Dental Hygiene Program. The Dean of the school indicated that 40 students are attending the university to study post-graduate specialties such as Ortho-Dontistry, surgery, etc.

The faculty has one sparsely equipped operating room available for their use, 160 dental operatory set-ups, and approximately 28 Prophylaxis units. Radiographic capability, according to the Assistant Dean, consists of seven, Lo-cap, general purpose units (only six were counted during the tour of facilities) two Panographic units, and one Cephalography unit.

Approximately 60% (team estimate) of the dental operatory assemblies are in need of some form of maintenance or repair.

During two visits to the Dental School, the number of persons waiting for examinations and/or treatment in various waiting spaces, including corridors was high (approximately 40-50 in each space.)

The Casting Facility/Dental Lab area was very small, though adjacent space is available in the school to expand this capability.

Conclusions and Recommendations:

The majority of the equipment requirements for the Dental School involves replacement of obsolete operatory units and expansion of the Dental Laboratory.

Presently, the lab has a single casting unit, two old and small furnaces, one grinding and polishing unit, and one model trimmer. It is recommended that the final procurement package include sufficient dental casting equipment to increase the lab's productivity capability by 100%.

The Dental School also requested the replacement of 40 dental units. An inventory showed that there are 48 operatories that could justifiably be replaced. These are all units manufactured by Seimens in the 1948-1953 period.

Equipment Recommendations:

Following is a generic list of equipment recommended for this department. The unit price is the average cost that a procurement office can expect to pay for a current model manufactured in the U.S.A.

FACULTY DENTAL MEDICINE

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Dental Operating Unit, complete with chair and operating light.			1	M	48		
2.	Binocular Microscope			3	L	1		
3.	Rotary Microtome			1	L	1		
4.	Microtome/Cryostat			1	L	1		
5.	Tissue Processor			1	L	1		
6.	Grinding and Polishing Machine			1	L	1		
7.	Almalgamator			1	L	48		
8.	Binocular Microscope, Dual Viewing			2	L	1		
9.	Dental Laboratory Furnace			1	L	1		
10.	Casting Machine			1	L	1		
11.	Prophylaxis Unit			1	M	30		
							Estimated Total	$478,230.
	END							
	FACULTY OF DENTAL MEDICINE							

E. Faculty of Pharmacy

Pharmacological Department

- Chemistry and Bromatology
- Toxicology and Pharmacology
- Pharmaceutical Chemistry
- Drug Manufacturing and Pharmaceutical Technology
- Biochemistry, Microbiology, and Immunology
- Pharmacognosis

FACULTY OF PHARMACY

Persons Contacted:

1. Dr. Dakak Moustafa, Dean of Faculty
2. Dr. Lahham George, Vice Dean
3. Dr. Nazir Azmeh, Pharmacology
4. Dr. Laila Massouh - Rizk, Toxicology
5. Dr. Riyhad Hindawi
6. Dr. Abdulghani Maa Bared

General Findings:

The Faculty of Pharmacy has approximately 2500 students in its five year program. The six departments consist of the following:

1. Analytical Chemistry and Bromatology
2. Toxicology and Pharmacology
3. Pharmaceutical Chemistry (to include an organic chemistry lab and a drug control lab)
4. Drug manufacturing and Pharmaceutical Technology
5. Biochemistry, Microbiology, and Immunology
6. Pharmacognosis

The Faculty of Pharmacy has a staff of 35 in addition to 20 assistants. The Dean expressed a desire to implement graduate-level training programs at the college and to expand its current capabilities, particularly in the areas of radioimmunassay (RIA) procedures and "Lymphotomy" Studies.

At the present time, work is in process to complete three new lab areas (150-200 sq. meters each) for the College of Pharmacy.

The only equipment requested by the Faculty of Pharmacy was that for the Pharmaceutical Technology Laboratory. A United Nations loan has been requested to procure equipment for the other departments in the Faculty of Pharmacy.

Conclusions and Recommendations:

The Faculty of Pharmacy has submitted an equipment list mainly designed to modernize and increase the capability of the college to prepare and examine the numerous ointments, tablets, emulsions, and pastes prepared in its Pharmaceutical Technology Laboratory, which is presently equipped with some old, semi-manually operated equipment manufactured in Germany.

The recommended equipment list is designed to demonstrate or instruct students in electrophoresis, pharmaceutical manufacturing, and quality control procedures. Providing new and more automated equipment to this faculty will enable, both students and professors to utilize their time in a more economic and productive fashion in addition to demonstrating the modern techniques used in the drug and pharmaceutical industry.

Equipment Recommendations:

The following is a generic list of equipment recommended for the Faculty of Pharmacy. The unit price is the average cost that a procurement office can expect to pay for a current model manufactured in the U.S.A.

FACULTY OF PHARMACY

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Compacting Press, Laboratory			1	M	4		
2.	Compacting Press			3	M	1		
3.	Rotary Press			1	M	2		
4.	Tablet Hardness Tester, 60kg			1	L	3		
5.	Oscillating Granulator			2	M	1		
6.	Reduction Granulator with Screens and Motor			2	M	1		
7.	Tablet Disintegration Testing Unit			1	L	1		
8.	Tablet Counter			2	H	1		
9.	Freeze-Dry Unit			3	H	1		
10.	Coating and Polishing Sytem with Pan			1	L	1		
11.	Blender, 3.8 Liters			1	L	1		
12.	Homogenizer			1	L	2		
13.	Hygrometer			1	L	2		
14.	High Torque Stirrer with Stand			1	L	1		
15.	Autoclave/Dryer			1	L	1		
16.	Magnifier, Fixed, Focus, 5x			1	L	3		
17.	Microprojector with Graduated Mechanical Stage			1	L	1		
18.	Pressure/Vacuum Pump			1	L	3		
19.	Heat Sealer			1	L	1		
20.	Roller Mill with Jar			1	L	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
21.	pH Meter			1	L	2		
22.	Melting Point Analyzer			1	L	1		
23.	Double-Beam Spectrophotometer			3	M	1		
24.	Pressure Filter, Holder, 142 mm			1	L	1		
25.	Small Batch Filtration System			1	L	1		
26.	Bacterial Air Vent			1	L	1		
27.	Filtration Funnel, 300 ml			1	L	1		
							Estimated Total	$118,725.

END

FACULTY OF PHARMACY

F. Faculty of Medicine

Medicine Department

- Biochemistry
- Physical Medicine
- Medical Pharmacology
- Histocytology and Anatomy

FACULTY OF MEDICINE

Persons Contacted:

1. Dr. Mounir Bitar, Dean
2. Dr. Kanan Jabi, Dept. Head; Histology, Anatomy and Embryology
3. Dr. Mustafa Misrabi; Asst. Head; Histology, Anatomy and Embryology
4. Dr. Nassouh Kotob; Dept. Head; Biochemistry
5. Dr. Abdulhab Maamoun; Asst. Head; Biochemistry
6. Dr. Akram Mahayni; Dept. Head, Medical Pharmacology
7. Dr. H. Tayan, Dept. Head; Physical Medicine

General Findings:

The School of Medicine has approximately 3000 students with an average of 575-615 in each class of its five-year program.

The school is headquartered in a new faciltiy approximately two kilometers from the University Administration Building on the main campus.

Dr. Bitar and Dr. Tayan indicated that the school staff, 4th and 5th year students are associated with three hospitals; The Medical Faculty Hospital (150-175 beds) The Mouassat Hospital (1300 beds) and The Children's Hospital (300 beds.)

All of the departments have requested numerous items of medical-oriented visual patient simulaton training aids. Visits to all the lab areas and observation of a number of classes in session revealed that there is a limited amount of audio-visual training equipment available. Most of the lab slides that were being discussed while projected to classes apparently are prepared by the school staff.

Items such as spectrophotometers, flamephotometers, and Ph meters, were either non-existent or extremely limited in quantity. The only centrifuges available in the school were a few old low-speed general purpose models.

In one lab room being used by the Biochemistry Dept., 21 students, of the 65-odd students in the class, were standing around a single photometer waiting their turn to use it. In general, equipment available for demonstrations, or for student use in experimentation to show the following common physiological parameters was extremely limited, or non-existent: Blood flow rate and volume EMG (electromyography) and EEG (electroencephalogram), biosignals, cardiac output, nerve potentials, and galvanic skin responses.

Conclusions and Recommendations:

During the numerous discussions on equipment lists submitted by the Faculty of Medicine, many revisions occurred. Some of the items on the original lists were deleted because of their inappropriateness to the curriculum or misunderstanding on the part of the requestor about what an item actually accomplished. In one department, two high-cost blood chemistry analyzers were listed under their manufacturer's trade names (which are different) even though both provide equal results in accuracy and in types of tests capable of being performed.

At least 250 microscopes were deleted after a discussion with the head of the Biochemistry Department about their use.

A total of 97 items were eliminated from the physical medicine list after explaining to the department head that the items were better suited for patient treatment in hospitals than for student instructional purposes. It was also explained during this discussion that an appropriate physical parameter simulator could be obtained that would be better for demonstrating to students the physiological changes occuring in a human than would actual diagnostic or therapeutic hospital equipment.

A number of the more advanced research-caliber microscopes have also been deleted from the final recommended equipment list. Procurement of a small number of additional accessory objectives and lenses, specimen holders, and adapters will allow the sharing of the basic microsope instruments between departments in the Medical School.

The final recommended list also includes the addition of basic lab instruments for use by the students. These are mainly paraffin dispensers, timers, cytology study filter assemblies, incubators, centrifuges, and tissue processors.

Equipment Recommendations:

The following generic list of equipment recommended for The School of Medicine is arranged by department. The unit costs are the average that a procurement office can expect to pay for a current model manufactured in the U.S.A.

FACULTY OF MEDICINE/BIOCHEMISTRY

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Spectrophotometer, 340-950 NM			1	M	20		
2.	Spectrophotometer, uninterrupted 200-1000NM			2	M	1		
3.	Advanced optic microscope			1	L	50		
4.	Phase contrast microscope			3	L	3		
5.	Fluorescence microscope			3	L	1		
6.	Nicholas illuminator			1	L	1		
7.	Stereo microscope with zoom lens			3	L	1		
8.	Automatic chemistry analyzer			3	H	1		
9.	Thermal analysis system			3	H	1		
10.	Liquid Chromatograph			3	H	1		
11.	Gas chromatograph			2	H	1		
12.	Rotary microtome			1	L	3		
13.	Fluorometer			1	L	1		
14.	Flame photometer			1	M	1		
15.	pH/Ion meter			1	L	3		
16.	pH meter			1	L	7		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
17.	Electronic balance			1	L	10		
18.	Distilling apparatus			1	L	1		
19.	Centrifuge, table model			1	L	10		
20.	Centrifuge, micro-hematocrit			1	L	2		
							TOTAL COST	$546,142.
	END BIOCHEMISTRY LAB							

FACULTY OF MEDICINE/PHYSICAL MEDICINE

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Physiological monitor system with accessories			1	L	35		
2.	Physiological monitor training system with projector			1	L	2		
3.	Autoclave/Dryer			1	L	1		
4.	Life-size training model body			1	L	1		
5.	Anatomical model brain with arteries			1	L	1		
6.	Body structure training set			1	L	1		
7.	Film loop projector with zoom lens			1	L	1		
8.	Systems of The Human Body Training Set			1	L	1		
							TOTAL COST	$178,882.
	END PHYSICAL MEDICINE							

FACULTY OF MEDICINE/MEDICAL PHARMACOLOGY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Enzyme analysis system			1	M	1		
2.	Spectrophotometer, uninterrupted 200-1000NM			2	M	1		
3.	Electrophoresis unit with bath, power supply and reagent kit			1	L	1		
4.	Flame photometer			1	M	1		
5.	Gas chromatograph			2	H	1		
6.	Physiological Monitor with accessories			1	M	4		
7.	Slide projector			1	L	2		
8.	Movie projector, 16mm			1	L	1		
9.	Centrifuge, table model			1	L	2		
10.	Centrifuge, micro-hematocrit			1	L	2		
11.	Autoclave/dryer			1	L	1		
12.	Distilling apparatus			1	L	1		
13.	Incubator, bacteriological			1	L	2		
14.	Gravity convection oven			1	L	2		
15.	Spectrophotometer with digital readout			2	M	1		
16.	Immunology Kit			1	L	120		
17.	Drug education module			1	L	120		
18.	Enzyme module			1	L	120		
19.	Enzymatic hydrolysis kit			1	L	120		

FACULTY OF MEDICINE/MEDICAL PHARMACOLOGY

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
20.	Basic chromatography kit			1	L	4		
21.	Qualitative analysis chromatography kit			1	L	4		
22.	Analysis of Amino Acids Kit			1	L	120		
							TOTAL COST	$85,091.
	END MEDICAL PHARMACOLOGY							

FACULTY OF .MEDICINE/HISTOCYTOLOGY AND ANATOMY

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Rotary microtome			1	L	4		
2.	Centrifuge, micro-hematocrit			1	L	1		
3.	Microtome/cryostat			1	L	1		
4.	Slide projector			1	L	2		
5.	Fluorescence microscope			3	L	1		
6.	Scanning electron microscope			3	H	1		
7.	Electronic balance			1	L	1		
8.	Pipet shaker			1	L	2		
9.	Advance optic microscope			1	L	25		
10.	Paraffin dispenser			1	L	2		
11.	Air flow incubator			1	L	1		
12.	Frosted micro slides			1	L	10		
13.	Darkroom equipment set			1	L	1		
14.	Plain glass micro slides			1	L	15		
15.	Microtome knives			1	L	15		
16.	Gravity convection oven			1	L	2		
17.	Slide warmer			1	L	4		
18.	Tissue embedding apparatus			1	L	15		
19.	Water bath for tissue flotation			1	L	4		

FACULTY OF MEDICINE/HISTOCYTOLOGY AND ANATOMY

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
20.	Slide stainer			1	L	5		
21.	Anatomical Model Set			1	L	1		
22.	Human Pathology Slide Set			1	L	1		
							TOTAL COST	$251,863.
	END HISTOCYTOLOGY AND ANATOMY							

G. Faculty of Science

- Mathematics
- Botany
- Zoology
- Physics
- Geology
- Chemistry

FACULTY OF SCIENCE/MATHEMATICS DEPARTMENT

Persons Contacted:

1. Dr. Said, Vice Dean for Academic Affairs
2. Dr. Salah, Department Head
3. and one other staff member

General Findings:

The department has no equipment whatsoever for student use.

The department has no equipment for research use.

The number of students in the department is about 1000 distributed over a four-year program. The department staff consists mainly of young professors which are not trained to U.S.A. standards.

The department apparently has most personnel doing their graduate study abroad at this same time. Some staff will return to initiate curricula and enter into teaching relatively soon.

The department has decided to introduce the subject of numerical methods into the curriculum. This will be one of the specialized for fourth year (senior) students.

The number of students to take numerical methods specialization will be limited to 50. The department, therefore, will need some computer-aided capabilities in order to implement this new program.

Equipment Requests:

The department requested computational equipment to be used for teaching, programming languages and numerical methods. Their request is modest and appears very justifiable. Programming languages and numerical methods will probably be taught to most engineers and scientists at the University. It is a valuable tool for solving

numerical problems which are either difficult or impossible to solve through purely mathematical approaches. Programming languages, like basic or ALP could be taught using a small mini computer or microprocessor system. The knowledge of programming languages enables the student to solve numerical problems that are either tedious to do by hand or do not have mathematical solutions in closed form.

Numerical methods are also usually taught using the same hardware as programming augmented by sophisticated hand-held calculators. When compared to using tables or long hand figuring, the use of calculators to solve purely numerical problems could save much valuable time for both students and staff.

Conclusions and Recommendations:

A computing capability is needed and justified for the math department. The Study Team, therefore, recommends the equipment as shown on the following sheet. The unit price is the cost that a procurement office can expect to pay for current models manufactured items in the U.S.A.

FACULTY OF SCIENCE/MATHEMATICS DEPT.

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Microprocessor System			1	H	2		
2.	Hand Calculator			1	M	25		
							Estimated Cost	$40,000
	END MATHEMATICS DEPARTMENT							

FACULTY OF SCIENCES/BOTANY DEPARTMENT

Persons Contacted:

1. Dr. Abou Kharma, Dept. Head
2. Dr. Dahhak, Sub-Dean; Faculty of Science
3. Dr. Nazzi, Plant Physiology

Findings:

The Botany Department averages between 2000 and 2500 students. Approximately 1,000 of these are majoring in another branch or are first-year students in the School of Medicine.

There are six rooms established for laboratory experiments and/or lectures. Two of the areas (approximately 120 square meters each) have been designated for first-year students. Four of the rooms, ranging from 60-70 square meters each, are utilized for work in the advanced courses.

The amount of laboratory equipment currently available for student use in experiments, or for accomplishing research projects, is very limited. For example, in one of the first-year laboratories, 47 students were performing experiments and had only two very old laboratory stirrers and miscellaneous glassware available for their use. Many of the students were visually estimating the weights and volumes of the mixtures being prepared in addition to utilizing open flames to raise temperatures to the desired level.

In the advanced course laboratory areas, there was no evidence that equipment was available, for student or faculty use, to perform experiments or practical work in such areas as enzymes, soil conditioning, etc.

Conclusions and Recommendations:

A review of the equipment requested by this department did not indicate any

quantity excessiveness or technical sophistication beyond its capabilities or needs. More than half (cost) of the items are basic to laboratory experiments; magnetic stirrers, controlled humidity/temperature apparata, vacuum pumps, etc.

It is recommended that the equipment listed in the final report be approved for procurement.

Equipment Recommendations:

The following is a generic list of the equipment recommended for this department.

The unit prices are the average cost a procurement office can expect to pay for a current model, manufactured in the U.S.A.

FACULTY OF SCIENCES/BOTANY DEPARTMENT

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Fraction Collection with Base Unit			1	L	1		
2.	Freezer, Low-Temperature, Chest Model			1	L	1		
3.	Spectrophotometer, 200-1000 NM			1	M	1		
4.	Freeze-Dryer, 3-Liter			1	L	1		
5.	Electrophoresis Unit with Bath, Power Supply and Reagent Kit			1	L	1		
6.	Chromatography Oven			1	L	1		
7.	High Torque Stirrer			1	L	5		
8.	Magnetic Stirrer with Fluorescent Light			1	L	5		
9.	Chromatography Kit			1	L	3		
10.	Mineralight Ultraviolet Lamp			1	L	5		
11.	Distilling Apparatus			1	L	1		
12.	Oxygen Meter			1	L	1		
13.	Cryoscope Thermometer			1	L	5		
14.	Rotary Microtome			1	L	1		
15.	Vacuum Pump, 35-Liter			1	L	1		
16.	Instrumentation Vacuum Pump			1	L	5		
17.	Salinity/Conductivity/Temperature Meter			1	L	1		
18.	Analytical Balance			2	L	2		
19.	Shaker Bath			1	L	1		
20.	Freezing Point Depression Apparatus with Cooling Thermometer			1	L	5		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
21.	Muffle Furnance with Automatic Temperature Control			1	L	1		
22.	Controlled Environment Chamber			1	L	2		
23.	Fluorescence Microscope			1	M	1		
							Estimated Total	$29,979.
	END							
	BOTANY DEPARTMENT							

FACULTY OF SCIENCE/ZOOLOGY DEPARTMENT

Persons Contacted:

1. Dr. M. Issa, Department Head
2. Dr. Ziad Qutob, Head Professor of Animal Physiology

General Findings:

The Zoology Department students are basically the same students studying botany. There are 5 laboratory rooms, one (approximately 25 square meters) for experiments and research in Embryology, and 4 (125 square meters each) for student teaching and experiments. The equipment in use at this time is very limited. There are no modern instruments available to students for demonstrating or observing animal physiological parameters. Sterilization of lab items after use appears to be non-existent.

Conclusions and Recommendations:

The equipment requested by this department is needed. It is also recommended that the quantity of oscilloscopes be increased from one to two and that a Physiology Recorder, with projection capabilities, be included in the procurement package. This will provide a better method for student observation of parameters than the actual screen of the scope and a permanent record of actual wave forms instead of individual student sketches and notes.

Equipment Recommendations:

The following is the generic list of equipment recommended for this department. The unit prices are the average cost a procurement office can expect to pay for a current model, manufactured in the U.S.A.

FACULTY OF SCIENCES/ZOOLOGY DEPARTMENT

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Triggered Dual-Trace Oscilloscope			1	M	2		
2.	Square Wave Generator			1	L	2		
3.	Biofeedback Transducer Coupler			1	L	2		
4.	Research Microscope, Fluorescent			1	M	1		
5.	Advanced Optic Microscope			1	L	40		
6.	Rotary Microtome			1	L	2		
7.	Gravity Convection Oven			1	L	1		
8.	Microtome/Cryostat			1	L	1		
9.	Autoclave/Dryer			1	L	1		
	END							
	ZOOLOGY DEPARTMENT							

FACULTY OF SCIENCE/DEPARTMENT OF PHYSICS

Persons Contacted:

1. Dr. A. H. Said, Dean
2. Dr. Hassan Kuneish, Professor
3. Mr. Mohamal Skaiker, Technician

General Findings:

Laboratory equipment presently available for student use is old and in short supply, but it is in fair condition. The several laboratories visited are well equipped with work stations and power sources. These laboratories are located in a relatively new and spacious building. Adequate space will be available in a new fourth floor addition currently under construction.

Research programs are not performed by staff members due to a lack of equipment. Part of this request is aimed at providing materials for proposed projects in laser technology, solar energy and nuclear physics.

There are approximately 5000 students enrolled in the Department of Physics. Full time physics majors number about 2500 and the remainder are from other schools (i.e., geology, chemistry and medicine.) The bachelor degree is the only program offered at this time. Advance degree studies will be proposed, when the school obtains adequate laboratory equipment.

The present facilities and these currently under construction will be adequate to house the items requested on this project.

Materials and equipment included in the request are principally for student laboratories and include items for studies in electricity, measurement, light and optics.

Some few items will replace existing, obsolete laboratory apparatus, The USAID office in Dan ascus advised the study team that requests for items such as radioactive isotypes cannot be accepted.

Equipment Recommendations:

It is recommended that all items requested be supplied except the Dye Laser and those associated with radioactive isotopes. Following is a generic list of equipment recommended for the department. The costs show the average estimates that a procurement office can expect to pay for current model items manufactured principally in the U.S.A.

FACULTY OF SCIENCE/PHYSICS DEPARTMENT

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Capacitor Assortment type 1			1	L	20		
2.	Capacitor Assortment type 2			1	L	20		
3.	Capacitance Subbox			1	L	40		
4.	Resistance Subbox			1	L	40		
5.	"Last Word" indicator			1	L	10		
6.	Universal surface gage			1	L	10		
7.	Dial. Caliper			1	L	40		
8.	5 lb. spool 40/60 3/32"			1	L	2		
9.	3 wire soldering iron 220V			1	L	10		
10.	3 wire soldering iron 220V			1	L	10		
11.	3 wire soldering iron 220V			1	L	10		
12.	HC 4 Iron holder/tip cleaner			1	L	40		
13.	Replacement Soldering Tip			1	L	40		
14.	Soldering attachment			1	L	40		
15.	Stripper clip			1	L	40		
16.	Thread-on tips			1	L	20		

FACULTY OF SCIENCE/DEPT. OF PHYSICS

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
17.	Thread micro-spade			1	L	20		
18.	Coil winding machine			1	L	1		
19.	Coil winder			1	L	5		
20.	Wire unreeling and tensioning device			1	L	5		
21.	10 amp, variable transformer			1	L	10		
22.	Galvanometer 50-0-50 milli amps			1	L	20		
23.	Electronic volt-ohmmeter			1	L	20		
24.	Multifunction counter			1	L	20		
25.	Multiple power source			1	L	20		
26.	DC volts and ammeter			1	L	20		
27.	DC regulated power supply kit			1	L	40		
28.	2-station transistor intercom kit			1	L	40		
29.	Deluxe signal tracer			1	L	20		
30.	Multimeter			1	L	20		
31.	Peak-to-peak VTVM			1	L	20		
32.	RCL Bridge			1	L	5		

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Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
33.	Micro-Vu optical comparators - 8" screen			1	L	1		
34.	Accessory screen for Model 300, Radius and Grid lines			1	L	1		
35.	Solar Energy Trainer			1	L	2		
36.	Temperature Recorder			1	L	2		
37.	Temperature Differential Control			1	L	2		
38.	Battery Charger			1	L	2		
39.	Modern semiconductor electronics "add-on"			1	L	20		
40.	Superhetrodyne AM receiver/Transmitter/ FM Circuit			1	L	5		
41.	Microwave Trainer			1	L	5		
42.	Introductory Modern Electricity Learning Unit			1	L	20		
43.	Book 10 Lab Manual			1	L	10		
44.	Lab Manual for AM-FM			1	L	2		
45.	Computer logic trainer with lab manual			1	L	10		

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D

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
46.	Recorder, type 1			1	L	5		
47.	Recorder type 2			1	L	5		
48.	Chart paper for above			1	L	20		
49.	Adapter			1	L	10		
50.	Pens			1	L	40		
51,	Recorder type 3			1	L	5		
52.	Chart paper for above			1	L	40		
53.	Eyepiece micrometer			1	L	20		
54.	Micrometer Discs type 1			1	L	20		
55.	Micrometer Discs type 2			1	L	20		
56.	B&L polarizing attachment,			1	L	20		
57.	Portable pyrometer			1	L	2		
58.	Indicating pyrometer			1	L	2		
59.	Replacement thermocouple			1	L	10		
60.	YSI Thermistemp controller			1	L	2		
61.	YSI Series 600 prober			1	L	2		
62.	YSI Series 600 probes			1	L			234

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E

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
63.	YSI Series 400 probes			1	L	10		
64.	Portable constant temperature circulators type 1			1	L	2		
65.	Portable constant temperature circulators type 2			1	L	2		
66.	Chain balance for liquid densities			1	L	6		
67.	Thermometer - plummet			1	L	20		
68.	Accessory for solids			1	L	20		
69.	G EDAC D100A with parts as specified			1	L	6		
70.	EIA Basic Kit, M-12			1	L	10		
71.	AC-DC power source M			1	L	10		
72.	Function Generator			1	L	10		
73.	Oscilloscope			1	M	10		
74.	FET Multimeter			1	M	10		
75.	Fundamentals 2nd edition M-12P			1	L	10		
76.	Assemblers power source kit			1	L	20		
77.	Cabling and wiring kit			1	L	20		

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Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
78.	EIA Radio and Television			1	L	20		
79.	DC Milliammeter Mod			1	L	40		
80.	DC Milliammeter - Ammeter			1	L	40		
81.	DC Voltmeter			1	L	40		
82.	AC Milliammeter			1	L	40		
83.	AC Ammeter			1	L	40		
84.	AC Voltmeter			1	L	40		
85.	Galvanometer			1	L			
86.	AC-DC Wattmeter type 1			1	L	20		
87.	AC-DC Wattmeter type 2			1	L	10		
88.	3 Phase Wattmeter			1	L	5		
89.	AC-DC Wattmeter type 3			1	L	20		
90.	Digital measuring system			1	L	10		
91.	AC Millivoltmeter			1	L	10		
92.	100 ____ counter			1	L	5		
93.	Milli-to-Megohm Bridge			1	L	10		
94.	Time Interval Meter			1	L	10		

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Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
95.	Counter type 1			1	L	10		
96.	Counter type 2			1	L	10		
97.	M-17 Internal Beam 1.5 m Air Track with photocell gate 10-162			1	L	6		
98.	Air source			1	L	6		
99.	AF-30 Acoustics and Fluids Kit with instruments required			1	L	6		
100.	Current balance with coulomb attachment			1	L	6		
101.	Memory trainer			1	L	4		
102.	N.M.R. Spectrometer			1	L	4		
103.	Laser optics with all parts			1	L	20		
104.	Precision decade capacitor			1	L	5		
105.	Decade capacitors 1419-A			1	L	20		
106.	Decade Capacitor			1	L	10		
107	Precision Capacitor			1	L	10		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
108.	10PF Reference standard capacitor			1	L	2		
109.	100 PF Reference standard capacitor			1	L	2		
110.	Decade Inductor			1	L	10		
111.	Preamplifier			1	L	5		
112.	Precision capacitance bridge			1	L	1		
113.	Oscilloscope			1	M	7		
114.	Pulser			1	M	8		
115.	Bin and power supply			1	L	8		
116.	Scintillation preamplifier			1	L	5		
117.	Amplifier			1	L	10		
118.	Timing single - channel analyzer			1	L	5		
119.	Counter			1	L	5		
120.	Source kit			1	L	1		
121.	Surface - barrier detector			1	L	2		
122.	Preamplifier, charge - sensitive			1	L	4		
123.	Vacuum chamber			1	L	4		
124.	Detector Bias supply			1	L	5		238

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
125.	Biased amplifier			1	L	2		
126.	Multichannel analyzer			1	L	5		
127.	Mechanical vacuum pump			1	L	10		
128.	Gold foil type 1			1	L	5		
129.	Nickel foil			1	L	5		
130.	Radioactive source			1	L	2		
131.	Surface - barrier detector			1	L	2		
132.	Photomultiplier tube base			1	L	6		
133.	Nanosecond delay			1	L	2		
134.	Time to pulse height convector and SCA			1	L	3		
135.	High voltage power supply			1	L	4		
136.	Universal coincidence			1	L	3		
137.	Timer			1	L	3		
138.	Na1 (Ti) detector and photomultiplier			1	L	3		
139.	Source			1	L	1		
140.	Thin-window Na1 (Ti) detector with Pm tube			1	L			
141.	Ge (Li) detector system			1	L	2		239

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Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
142.	Series S_1 (L_1) X-ray detector system			1	L	2		
143.	Fast Plastic detector and PM tube			1	L	2		
144.	Preamplifier			1	L	2		
145.	Surface - barrier detector			1	L	2		
146.	1-mu C_1 source			1	L	1		
147.	Gold Foil type 2			1	L	4		
148.	Rutherford scattering chamber			1	L	2		
149.	Gamma source, 5mu C_1 $\pm$ 5%			1	L	1		
150.	Lead plates			1	L	8		
151.	Connecting cables			1	L	10		
152.	Delay amplifier			1	L	3		
153.	Linear Gate			1	L	3		
154.	2 by 2 in. Na 1 (Ti) Crystal and Phototube			1	L	2		
155.	End-window Geiger Tube			1	L	2		
156.	GM Inverter			1	L	3		
157.	25 mu C_1 Source			1	L	1		
								240

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
158.	20 sheets each: Pb P1-2, Cd PI-1, SIP.1-1, Pn P1-2 - 8 each AIF1-1, AHF1-2, AIFI-3, AIFI-4, AIFI-5, 1 of each PbP1-3			1	L			
159.	Detector			1	L	2		
160.	Impedance comparator			1	L	2		
161.	Radio-frequency bridge			1	L	2		
162.	Precision coaxial adapter kit			1	L	2		
163.	Advanced Optics System			1	L	1		
164	Intermediate Optics System			1	L	1		
165.	Diffraction System			1	L	1		
166.	Complete Interferometer System			1	L	1		
167.	Education Research Laboratory			1	L	1		
168.	Advanced optics education laboratory			1	L	1		
169.	Laser optics system			1	L	1		
170.	Advanced holography laboratory			1	L	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
171.	Universal monochromatic source			1	L	1		
172.	Grating - 1 Micron			1	L	1		
173.	Grating - 2 Micron			1	L	1		
174.	Grating - 4 Micron			1	L	1		
175	Grating - 8 Micron			1	L	1		
176	Grating - 280 nm			1	L	1		
177	Grating - 500 nm			1	L	1		
178	Infrared Globar and quartz-halogen sources			1	L	1		
179.	1 inch filter holder			1	L	1		
180.	Filter type 1			1	L	1		
181.	Filter type 2			1	L	1		
182.	Filter type 3			1	L	1		
183.	Monochromator Telescope			1	L	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
184.	He - Ne Laser (spectra-physics)			1	L	10		
185.	60 Lens kit			1	L	10		
186.	Solar cells			1	L	10		
187.	Solar panel			1	L	10		
188.	Solar energy cube			1	L	5		
189.	Transmission Hologram type 1			1	L	1		
190.	Transmission Hologram type 2			1	L	1		
191.	Transmission Hologram type 3			1	L	1		
192.	Polorizing discs			1	L	5		
193.	Diffraction grating type 1			1	L	2		
194.	Diffraction grating type 2			1	L	2		
195.	Prism set			1	L	10		
							Estimated Cost	$600,000
	END PHYSICS DEPARTMENT							

FACULTY OF SCIENCE /DEPARTMENT OF GEOLOGY

Persons Contacted:

1. Dr. Fuad Ejel, Dean
2. Dr. M.B. Attaie
3. Dr. Mustafa Otaki
4. Dr. Faris Chouker
5. Dr. Jamal Aboudeeb

General Findings:

Approximately 1000 students are enrolled in the School of Geology. There are 300 students in the freshman class and 400 students in the sophomore class. Junior and senior classes contain approximately 150 students each.

The existing student laboratory and classroom areas are quite old and crowded. New facilities are being designated at this time .Their sophisticated research equipment, however, is currently located in new facilities, having a higher degree of environmental controls.

Some laboratory equipment presently is available for student use. The requirement for curriculum laboratory equipment during the first two years is not great. Sample preparation microtomes are, however, required for advance studies. The existing equipment is quite old and several generally unnecessary steps are required for sample preparation. The requested equipment will make this task easier and faster.

The majority of the items that were listed are for field work and research. Currently, many pieces of sophisticated research equipment are under-utilized because of the lack of certain backup hardware. Several requested items fit into this category.

This equipment recommended by the study team is compatible with the current needs of the students and faculty for field research. Some items in fact will be used by students and faculty to determine mineral and petroleum reserves in Syria.

Equipment Recommendations:

Almost all equipment requested by the Geology department has been determined reasonably justifiable and should be provided. The major exception, however, is the high cost scanning electron miscroscope which has been deleted.

Following is a generic list of equipment recommended for this department The costs are an average estimate a procurement office can expect to pay for current models manufactured in the U.S.A.

FACULTY OF GEOLOGY

A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	X-Ray Diffractometer			1	M	1		
2.	Electromagnetic Separator			1	M	1		
3.	Crucible, Platinium - ml			1	L	6		
4.	Basins, Platinium - ml			1	L	6		
5.	Assortment of heavy liquids, for mineral separation			1	L			
6.	Microtome, complete lab			1	M	1		
7.	Microscope with platinum filter			1	L	1		
8.	Complexometer or calcimeter (for Carbonate)			1	L	1		
9.	Porosimeter			1	M	1		
10.	Sample compressor for mass spectrometer			1	M	1		
11.	Permeability meter			1	M	1		
12.	Altimeter (for Geological Survey)			1	M	3		
13.	Scanning electron microscope with energy dispersing scanning microscope			3	H	1		
14.	Portable well logging system			1	M	1		
15.	Refraction seismograph, multi-channel			1	M	1		

FACULTY OF SCIENCE/DEPT. OF GEOLOGY

B

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
16.	RF drivers squid super conducting magnotometer			3	H	1		
							Estimated Cost	$450,000
	END GEOLOGY DEPARTMENT							

FACULTY OF SCIENCE/CHEMISTRY DEPARTMENT

Persons Contacted:

1. Dr. H. Kellaur, Department Head
2. Dr. A.H. Said, Sub-Dean for Scientific Affairs

General Findings:

The Chemistry Department has approximately 9-10,000 students and consists of seven laboratory/experiment areas in addition to the lecture rooms.

The seven laboratory areas are utilized as follows:

Elementary Chemistry (2)
Organic Chemistry
Inorganic and Analytical Chemistry
Physical Chemistry
Biochemistry
Applied Chemistry

The laboratory areas are approximately 120 sq. meters each, and will seat 50-55 students comfortably. The laboratory sessions in progress during the visits averaged 65-70 students per group. Three new laboratories, under construction, are being added to this department.

The equipment in the Physical Chemistry Lab consisted of two very old water baths and one Mettler Balance. The Inorganic and Analytical Chemistry Lab was equipped with drying ovens about 25 years old and a few Mettlers that were 18-20 years old. The Physical Chemistry Lab had one very old spectrophotometer manufactured in Germany.

The Elementary Chemistry Laboratory areas had, for the processing of glassware, a pan of water and a very old German air compressor. Only two balances were visible for student use in the Elementary Laboratories.

The incubators/ovens and water baths being used in the Applied Chemistry Laboratory are on the losing side of the rust prevention battle: The distilling apparatus is approximately 25 years old and there was no indication that the water being produced was laboratory grade or pyrogen-free.

There was practically no equipment available in the Biochemistry Laboratory except a number of simple colorimeters (that may have been fabricated locally) for use in basic experiments.

The Chemistry Department is not equipped to perform any extensive experiments or student research involving glass, porcelain, petrology products, or instrumentation analysis.

Many of the equipment items were unusable due to a lack of either the correct accessories, solvents, reagents, etc., or the provision of corrective maintenance.

Conclusions and Recommendations:

The Chemistry Department is in need of extensive equipment and supply items to perform its function of graduating qualified chemists effectively and economically. There are also many items required to conduct the research necessary to develop an academic base to support the technological expansion of the nation's industrial activities. Following is a generic listing of equipment/supplies recommended for this department.

The estimated costs are an average that a procurement office can expect to pay for new model equipment manufactured in the U.S.A.

FACULTY OF SCIENCE/DEPARTMENT OF CHEMISTRY A

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
1.	Alkacid pH Kit			1	L	10		
2.	Alkacid Pocket Tester			1	L	100		
3.	CO_2 Weight Model Alkalimeter			1	L	4		
4.	Penetrometer			2	L	2		
5.	Balance, Top-Loading			1	L	20		
6.	Balance, 170 gram			2	L	2		
7.	Balance, 160 gram			1	L	20		
8.	Balance, 20 gram			3	L	1		
9.	Harvard Trip Balance			1	L	10		
10.	Moisture Balance			2	L	2		
11.	Solution Balance			2	L	4		
12.	Circular Water Bath			1	L	10		
13.	Barometer			2	L	4		
14.	Shaker Bath			2	L	2		
15.	Refrigerated Bath			2	L	2		
16.	Conductivity Bridge			1	L	5		
17.	Semi-Micro Safety Centrifuge			1	L	10		
18.	Gas Chromatograph			2	L	1		
19.	Air Compressor			1	L	2		
20.	Conductivity Meter			1	L	10		
								250

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
21.	Fraction Collector with Base Unit			1	L	4		
22.	Calorimeter			3	M	1		
23.	Oxygen Calorimeter			3	M	1		
24.	Calorimeter Ignition Unit			3	M	2		
25.	Temperature Controller			2	M	4		
26.	High Cloud/Pour Test App.			1	L	3		
27.	Low Cloud/Pour Test App.			1	L	3		
28.	Dry Ice Maker			3	M	1		
29.	DC Power Supply			2	M	2		
30.	Petroleum Distillation Unit			2	M	3		
31.	Organic Atom Model Kit			1	L	4		
32.	LP Burner			1	L	100		
33.	Laboratory Lift Support Unit			1	L	100		
34.	Laboratory Mini-Lift Support Unit			1	L	100		
35.	Flash Point Tester			2	L	3		
36.	Gasoline Corrosion Test Bomb			2	L	3		
37.	Gravity Convection Oven			1	L	3		
38.	Forced Convection Oven			2	L	2		
39.	Vacuum Oven			2	L	1		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
40.	Oxy-Hydrogen Burner with Absorber Unit, Combustion Tube and Spray Trap			1	L	3		
41.	Potentiometer			1	L	6		
42.	Accumet pH Meter			2	M	1		
43.	Analog pH Meter			2	M	1		
44.	Stirring Hot Plate			1	L	10		
45.	General Duty Hot Plate			1	L	10		
46.	Heavy Duty Heater			2	L	1		
47.	Polarimeter with Measuring Tubes			2	M	1		
48.	Vacuum Pump			2	L	4		
49.	Circulating Pump			1	L	5		
50.	Penetrometer			2	L	3		
51.	Closed Tester with Electric Stirrer, Cups, and Thermometers			2	L	3		
52.	Single-Pen Recorder			2	M	3		
53.	Rotary Evaporator			2	M	3		
54.	Refractometer			3	M	1		
55.	Refractive Index Liquids Set			2	L	1		
56.	Spectrophotometer, 200-1000 NM			2	M	2		
57.	Spectroscope			3	M	1		
58.	Mixer/Stirrer			1	L	10		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
59.	Vacuum Stirrer			1	L	14		
60.	Turbidimeter			2	M	2		
61.	Tensiometer			2	L	1		
62.	Variable Transformer			1	L	50		
63.	Tag Closed Tester			2	L	3		
64.	Gas Open Tester			2	L	3		
65.	Viscosity Bath			2	L	3		
66.	Water Determination App.			1	L	18		
67.	Glass Blowing Kit with Electric Cutter			1	L	1		
68.	Molecular Weight Determination Unit			1	L	5		
69.	Bennert-Type Vacuum Manometer			1	L	10		
70.	Osmometer			3	H	1		
71.	Bath Controller			1	M	30		
72.	Temperature Circulator			1	M	30		
73.	General Purpose Mill			2	M	3		
74.	Jar Mill			2	M	3		
75.	Distilling Apparatus, H_2O			1	L	1		
76.	Variable Transformer, Heavy Duty			1	L	10		
77.	Extractor			2	L	3		
78.	Melting Point Apparatus with Capillary Accessory			2	L	3		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
79.	Micro Kjeldahl Distillation Unit			2	L	5		
80.	Nitrogen Steam Distillation Unit			2	L	5		
81.	Self-Stirring Mini-Reactor			2	L	5		
82.	Peristaltic Pump			2	L	4		
83.	Dispenser Pump			2	L	2		
84.	Syringe Pump, 3-Channel			2	L	2		
85.	Recorder, Dissolved O_2 Analyzer			2	M	2		
86.	UV Monitor			2	M	2		
87.	Portable Recorder			2	M	2		
88.	Electrophoresis App.			2	M	2		
89.	Petroleum Colorimeter			2	M	2		
90.	Freezing Point Depression App.			1	M	5		
91.	Immunoelectrophoresis System			1	L	2		
92.	Lab. Safety Chart			1	L	3		
93.	Metal Coordination Model Kit			1	L	2		
94.	Hand Truck					10		
95.	Caddy					10		
96.	Warm/Cool Air Dryer			1	L	30		
97.	Abderhalden Drying Apparatus			1	L	30		
98.	Voltage Monitor			1	L	10		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
99.	Freezer Voltage/Temperature Monitor			1	L	10		
100.	Mounting Press with 2.5 cm Mold			1	L	1		
101.	Dreiding Stereomodel Kit			1	L	2		
102.	Explosion-proof Refrigerator			2	L	3		
103.	Chromatographic Column System			1	L	20		
104.	Automatic Fraction Collector			2	M	2		
105.	Top-Loading Electronic Balance			1	L	10		
106.	Trip Balance			1	L	20		
107.	Gas Flowmeter, Liter Model			1	L	10		
108.	Air/Water Flowmeter			1	L	10		
109.	Centrifugal Freeze Dryer			2	M	2		
110.	Tube Furnace with Control Console			1	L	10		
111.	Combustion Furnace			1	L	10		
112.	Split Tube Furnace			1	L	10		
113.	Closed-End Manometer			1	L	10		
114.	Stirring Hot Plate			1	L	10		
115.	Spherical Mantle, 250 ml			1	L	10		
116.	Spherical Mantle, 500 ml			1	L	10		
117.	Spherical Mantle, 1000 ml			1	L	10		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
118.	Hemispherical Mantle, 50 ml			1	L	50		
119.	Hemispherical Mantle, 100 ml			1	L	50		
120.	Hemispherical Mantle, 250 ml			1	L	50		
121.	Hemispherical Mantle, 1000 ml			1	L	50		
122.	Vessel Heater			1	L	6		
123.	Hydrogenator with Reaction Bottle and Heater			1	L	5		
124.	Flame Photometer			2	M	1		
125.	Slide Projector			1	L	2		
126.	Overhead Transparency Projector			1	L	1		
127.	Autoclave/Dryer			1	L	4		
128.	High Torque Stirrer			1	L	4		
129.	Evaporator			1	L	10		
130.	Spectrophotometer			1	M	30		
131.	Viscosimeter			2	M	2		
132.	Automatic Distillation Apparatus			3	L	1		
133.	Paper Copier			1	L	1		
134.	Carbon Residue Apparatus			2	M	2		
135	Aniline Point App. with Thermometer			2	M	2		
136.	Sulfur Analysis System			3	H	1		
137.	Conductivity Cell, Dip-Type			1	L	12		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
138.	Calorimeter Thermometer			1	L	2		
139.	Cathetometer			2	L	5		
140.	Dangerous Materials' Chart			1	L	3		
141.	Thermometer for High Distillation			1	L	36		
142.	Thermometer for Low Distillation			1	L	36		
143.	Orbit Model Building System			1	L	2		
144.	Periodic Chart			1	L	4		
145.	Indicating Pyrometer			1	L	1		
146.	Vapor Pressure Constant Temperature Bath with Bomb and Guages			2	L	3		
147.	Ubbelohde Viscometer Set			1	L	3		
148.	Calibrated Viscometer Set			1	L	3		
149.	Combustion Furnace			3	L	1		
150.	Marker Kit			1	L	2		
151.	Reaction Kettle Set with Accessory Mantles			2	L	2		
152.	Chromatography Hanger Rod, 14-25 cm			1	L	10		
153.	Chromatography Hanger Rod 23-38 cm			1	L	10		
154.	Chromatographic Separation Tube, 10x300 mm			1	L	10		
155.	Chromatographic Separation Tube, 20x400 mm			1	L	10		
156.	Forced Air Dryer			1	L	4		
157.	Chemical Glove Box with Mobile Bench			2	L	3		
158.	Mortar Grinder with Alumina Mortar and Pestle			2	L	2		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
159.	Multimeter			1	L	5		
160.	Automatic Furnace			3	M	1		
161.	Portable Furnace			1	L	20		
162.	Semi-Micro Evaporator			1	L	1		
163.	Soxhlet Extraction Apparatus with Allihn Condenser			1	L	10		
164.	Magnetic Spinbar Kit			1	L	50		
165.	Hand-operated Vacuum Pump			1	L	5		
166.	Shortwave Lamp			3	L	1		
167.	Laboratory Stopwatch			1	L	100		
168.	Combination Paper Copier and Transparency Production Unit			1	H	1		
169.	Aniline Point Thermometer Set			2	L	2		
170.	Laboratory Funnel Set			1	L	60		
171.	Filter Paper Set			1	L	500		
172.	Mortar and Pestle Tool Steel Set			2	L	5		
173.	Mortar and Pestle Iron Set			2	L	1		
174.	Aluminum Oxide Mortar Set			2	L	1		
175.	Tubing Connector Set			1	L	40		
176.	Beaker Set			1	L	15		

Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
177.	Laboratory Flask Set			1	L	30		
178.	Glass Joint Adapter Set			1	L	11		
179.	Crucible with Holder and Adapter Sets			1	L	10		
180.	Condenser Assemblies with Adapters			1	L	10		
181.	Filtering Flasks for Pumps			1	L	10		
182.	Laboratory Bottleware Set			1	L	10		
183.	Laboratory Graduated Cylinder Set			1	L	20		
184.	Buret Support Stand with Buret and Clamp			1	L	100		
185.	Laboratory Glove Set			1	L	30		
186.	Safety Shield Set			1	L	100		
187.	Tong Set			1	L	100		
188.	Rectangular Chromatography Jars			1	L	6		
189.	Desiccator with Plates			1	L	5		
190.	Dewar Flasks			1	L	10		
191.	Minit Lattice Structure Model			1	L	2		
192.	Polycarbonate Vacuum Chamber Set			1	L	1		
193.	pH Indicator Chart with Solutions			1	L	2		
194.	Laboratory Headgear with Visor			1	L	10		

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Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
195.	Fire Blanket			1	L	35		
196.	Laboratory Pipet Set			1	L	10		
197.	Pipet Rack Support			1	L	100		
198.	Ring Support Set			1	L	10		
199.	Laboratory Spatula Set			1	L	10		
200.	Pipet Rubber Bulbs			1	L	10		
201.	Fractional Degree Scale Thermometer			1	L	100		
202.	Differential Thermometer			1	L	10		
203.	General Purpose Mercurial Thermometer			1	L	100		
204.	Gas Drying Jar			1	L	7		
205.	Drying Jar with Stopper and Hose Connection			1	L	10		
206.	Drying Tube Set			1	L	20		
207.	Filter Membrane Holder			1	L	50		
208.	Fritted Disc Filter			1	L	50		
209.	Reductor Tube			1	L	10		
210.	Medium Resolution Mass Spectrometer			3	H	1		
211.	High Resolution Proton Spectrometer			3	H	1		

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Item No.	Item Description	Recommended Manufacturer/ Vendor	Catalog No.	Need Priority	Service Priority	Quantity	Unit Cost	Total Cost
212.	Organic Micro Glassware Kit			1	L	20		
213.	Organic Chemistry Kit with 19/22 Components			1	L	20		
214.	Organic Chemistry Kit with 24/40 Components			1	L	20		
215.	Voltage Converter, 1000 W			1	L	10		
216.	Voltage Converter, 2000W			1	L	10		
							Estimated Cost	$841,442.
	END CHEMISTRY DEPARTMENT							

APPENDIX A

TRIP CHRONOLOGY

3 March - Saturday

Initiated talks with Mr. Wolf Von Spiegelfeld, procurement officers at AID/Damascus office and was briefed on background material about the University of Damascus and SAR Ministry of Planning roles. Stopped briefly at the Ministry of Planning Office around the corner from Hotel Vendome and met with Mr. Imad Al-Bakjaji. From there, all persons, including Mr. Al-Bakjaji traveled by official car to the University Administration Building and were introduced to the Vice President of Administrative Affairs, Mr. Ahshamad Faroulk and Vice President of Academic Affairs, Dr. Lotfy. Dr. Lotfy was very helpful in arranging our initial series of meetings with Department Heads and Faculty.

Messrs. Smith, Sheehan, and Dr. Abdalla met with Faculty of Dentistry at noon while Mr. Ordway went back to the Ministry of Planning with Mr. Al-Bakjaji and borrowed copies of the equipment request lists written by the University departments.

4 March - Sunday

9:00 a.m. meeting with Dr. A.H. Said, Head of the Faculty of Science, and two colleagues each from the respective departments; Zoology, Botany, Geology, Physics, Chemistry and Mathematics. After a brief meeting together, the team members broke up to meet departments individually. Mr. Sheehan, Biology, Zoology and Chemistry; Messrs. Ordway and Smith, Geology and Physics; and Dr. Abdalla, Mathematics. Equipment lists were reviewed, new lists introduced and changes made; survey of existing facilities equipment.

5 March - Monday

8:00 a.m. meeting at AID/Mission Office with Mr. Von Speigelfeld, his assistant Farouk Isakh, and Mr. Dennis Chandler, then acting Mission Director. Discussed U. of Nebraska, Title 12 work at Faculty of Agriculture for animal husbandry; computer availability/hardware costs/ software via NCR; other equipment availability/vendors. Talked with AID person Sai Yemen on computer needs.

11:00 a.m. Messrs. Sheehan, Smith and Ordway met with Pharmacy Faculty. Dr. Abdalla arranged to meet with NCR agent.

6 March - Tuesday

9:00 a.m. Mr. Sheehan met with the Faculty of Medicine.
9:00 a.m. Mr. Ordway and Dr. Abdalla met with the Faculty of Architecture and Civil Engineering.
10:00 a.m. Mr. Smith met with the Faculty of Agriculture.

7 March - Wednesday

8:45 a.m. Messrs. Smith and Ordway and Dr. Abdalla met with the Faculty of Electrical and Mechanical Engineering.
12:00 noon, Mr. Smith met with Dr. Kunaish heads of the Department of Physics.
10:00 a.m., Mr. Sheehan met with the Department of Pharmacology in the Faculty of Medicine.

8 March - Thursday

National Holiday in Syria. The project team studies notes and planned remaining series of meetings, Made arrangements through U.S. Embassy travel bureau for revised itineraries.

9 March - Friday

Religious Holiday. Made contact with the NCR agent, Mr. Khaled H. Habel and Fisher agent George Rahad to learn about services/item availability.

10 March - Saturday

7:00 a.m., journeyed by car from Damascus to Amman, Jordan (Messrs. Ordway, Sheehan, and Dr. Abdalla) to inspect two NCR computer installations and the Amman field office. NCR's Mr. Habal accompanied us to Amman where we were met by another agent. Visited the Royal Jordanian Computer Center which is officially a private organization that provides scientific services, including computer capabilities to public and private concerns. They presently have a Centurion 251 NCR Computer which is a top-of-the-line item. Dr. Yusif, Vice President of the Center told the team that they have a contract with NCR for technical support including parts, renewed on an annual basis. They pay something less than 7-8% of the hardware value each year for this service. Dr. Yusif indicated they have had a good experience with NCR.

NCR and CDC computer companies created a company called C.P.I. to produce periferals compatible with both company's record.

Dr. Yusif also felt it is necessary for the University of Damascus to create a formal orientation program in order to build a knowledge base for both research and teaching prior to installation of hardware.

The project team also toured the older NCR computers at the Arab Bank downtown, which

is presently being upgraded to Criterion System. The team returned to Damascus in the evening.

11 March - Sunday

9:00 a.m., Mr. Smith and Dr. Abdalla met again with Mechanical and Electrical Engineering for discussions with Electronics and Production Engineering Departments.
10:00 a.m., Messrs. Sheehan and Ordway met with Faculty of Medicine again in the departments of Pharmacology, Toxicology and Histology.

Met with Dr. Romanos from the Department of Physics who is interested in isotoper research.

12 March - Monday

8:15 a.m., Messrs. Ordway, Smith and Dr. Abdalla met briefly with University President Dr. Hasad. He was especially concerned about the computer's availability for administrative work.

9:30 a.m., Messrs. Smith and Ordway met with the Faculty of Agriculture for another meeting to sort out equipment requests.

12:00 noon, Mr. Sheehan met with Varian instruments sales representatives.

13 March - Tuesday

9:00 a.m., the entire project team met with Dr. A.H. Said for review of equipment requests by Faculty of Science.

Dropped off excess sheets of equipment lists to the Ministry of Planning Offices.

6:00 p.m., the project team met with Dr. Lotfy and the University wide Coordination Committee, which included most of the faculty heads that the team had met before. Mr. Al-Bakjaji, office director br the vice minister of planning, was also present. The faculty indicated a need to reassess priorities on the finalized lists, if the SAR or AID did not allocate sufficient monies for all equipment. It was agreed that the list, when finalized, should be sent by AID again to the University for this proofing of items.

Mr. Al-Bakjaji stressed that the government was interested in an economic as well as technical justification of equipment and that the validity of the equipment survey would hinge on those two arguments.

Method of procurement was discussed to some extent. The University faculty stressed the need for a method with the fastest delivery dates, in some cases Charter Plane deliveries, possibly an independent contractor to effect procurement in the U.S.A. coordination of

deliveries to one point of departure, transport overseas, distribution at University and set up.

The meeting was then adjourned and a farewell dinner was held at the Orient Club for the Project Team by the University, with faculty and AID personnel present. This was the first time the team was introduced to Miles Wedeman, Director of the AID Mission.

14 March - Wednesday

8:45 a.m. and 3:00 p.m., taken by AID truck to the Mission for presentation of Draft Report to Mr. Wedeman and discussion of revised scope of project. Mr. Wedeman was made aware of the upward revised estimates of equipment costs. Also, the implications of this revised scope of work with respect to VVKR's contract were touched upon. Mr. Morris of the Accounting Department at AID said he would start procedures for approval of renegotiated terms of project costs and estimated time of completion with SARG.

The project team left with AID/Damascus five copies of the draft report and a cover letter describing, among other things, the points of concern that have influenced the scope of project work.

15 March - Thursday

Departed from Damascus and arrived in Cairo same morning.
We were met at the airport by Captain Youssef, agent for NCR. He expedited our movement through customs and made hotel arrangements. The project team arranged meetings for the next work day.

16 March - Friday
Religious Holiday
6:45 a.m., Mr. Sheehan departed via TWA for the United States. Mr. Ordway made courtesy calls on Mr. Rich Aiken of the AID/Cairo Mission and Mr. Phil Lewis of their C.I.P. offices.

17 March - Saturday

6:45 a.m., Mr. Smith departed via TWA for the United States.

Mr. Ordway and Dr. Abdalla met with NCR representative Mr. Nabil Seraphim of the Cairo office at the American University of Cairo Computer Center. Toured their Centurion System (a Criterion is on order.)

Dr. Salah Hamid, head of the Computer Center, and the American University at Cairo met with them at some length describing the Center's relationship with NCR over the years and the software and technical preparation curricula that the center offers. (See literature.)

He stressed the need for University of Damascus to initiate curriculum changes and create a department of computer sciences well before hardware is in place and functioning. He also indicated his Center's willingness to offer their services, both in writing programs, and computer training of personnel.

18 March - Sunday

6:45 a.m., Mr. Ordway and Dr. Abdalla departed via TWA for the United States.