OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

RESTRICTED

20695

DP/ID/SER.A/1704
25 July 1994
ORIGINAL: ENGLISH

STRENGTHENING OF THE COLLEGE OF TEXTILE TECHNOLOGY, DHAKA

DP/BGD/85/162

BANGLADESH

Technical report: Work at the College of Textile Technology*

Prepared for the Government of Bangladesh
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Volker Rossbach, textile chemist (wet processing)
in collaboration with Frank Eckersley, textile technologist (yarn manufacturing)
El Syed El Helw, textile technologist (fabric manufacture)

Backstopping officer: J. P. Moll
Agro-based Industries Branch

United Nations Industrial Development Organization
Vienna

---

* This document has not been edited.

V.94 25203

CONTENTS

	Page
Abbreviations	iv
Annexes	v
Abstract	1
Introduction	2
Part 1 Common activities and outputs	4
I Teaching programme	4
A. Academic year	4
B. Interruptions of teaching programme	5
C. College students	6
D. National teaching staff	8
E. Teaching effort of experts	11
II Adjusting and refining curriculum	12
A. Modular curriculum	12
B. Preparation of syllabi	16
III Supporting of teaching staff	16
IV College/industry contacts	17
V Assessment of short/medium/long term manpower requirements	18
A. Short-term Planning	18
B. Medium-/Long-term Planning	19
VI Library	20
VII Machines and equipment	20
VIII Project design	22

Page

Part 2. Special activities and outputs in yarn manufacturing (see report of Frank Eckersley)

Part 3. Special activities and outputs in fabric manufacturing (see report of El Sayed El Helw)

Part 4. Special activities and outputs in wet processing (Volker Rossbach)

I. Workshops and laboratories 24

A. Workshops 24
B. Textile chemistry laboratory 30
C. Science laboratory 30

II. Teaching programme 31

A. College staff 31
B. Teaching 32
C. Support to local staff 36

III. Adjusting and refining curriculum 38

IV. College/industry contacts 39

V. Short/medium/long term manpower planning 41

VI. Library 42

General recommendations 43

Backstopping Officer's Comments 46

Abbreviations

AGM	Assistant General Manager
BCTT	Bangladesh College of Textile Technology
BGTTC	Bangladesh-German Technical Training Centre
BJGA	Bangladesh Jute Goods Association
BJMC	Bangladesh Jute Mills Corporation
BSTI	Bangladesh Standards and Testing Institution
BTI	Bangladesh Textile Industry
BTMA	Bangladesh Textile Mills Association
BTMC	Bangladesh Textile Mills Corporation
BUET	Bangladesh University of Engineering and Technology
CTA	Chief Technical Advisor
GM	General Manager
h/wk	hours per week
L	Lecture
P	Practical training
R & D	Research and development
Taka =	Bangladeshi currency; 40 Taka = US$ 1
TIDC	Textile Industry Development Centre
UCEP	Underprivileged Children's Education Programme
UNIDO	United Nations Industrial Development Organization

Annexes*

I	Job description	47
II	UNIDO activities in BTI	48
III	Session jam	49
IV	Interruptions of teaching programme	50
V	List of technical teachers	51
VI	Training programmes of staff	52
VII	Present running curriculum and syllabus	53
VIII	UNIDO proposed curriculum plan (March 1993)	92
IX	Latest proposed curriculum and syllabus (Jan. 1994)	98
X	Industrial visits	152
XI	Programmes of seminars held	155
XII	List of materials given to library	158
XIII	List of textile books ordered by British Council	166
XIV	Machine list	167
XV	Further necessary equipment required for BCTT (Technological Sections)	173
XVI	Further necessary equipment required for BCTT (Science Section)	177
XVII	Industrialists met	179
XVIII	Video films given to the College	181
XVIX	SUBSTANTIVE OFFICER'S COMMENTS	187

Abstract

DP/BGD/85/162 - Strengthening of the College of Textile Technology, Dhaka, Bangladesh. The objectives of the project are to help in the teaching of 3rd and 4th year of the B.Sc. courses, adjusting and refining new curricula developed in the preparatory phase of this project, assisting existing teaching staff, making industrial visits with students, improving college/industry relations and assisting the College Principal in the planning of short/medium/long-term manpower requirements in industry.

Improvements at the College included completing installation of new machines and equipment in all workshops and testing laboratory; also re-wiring of workshops. The current problems of voltage fluctuation in the wet processing department will be solved with the procurement of voltage stabilizers. The purchase has been agreed upon by UNDP in March 1994.

Classrooms are in need of upgrading, reproduction facilities are inadequate and maintenance of equipment and buildings is poor.

It was modified by the consultants taking into account the views expressed by industry representatives on issues such as the level of practical skills of the College graduates and additional knowledge required in engineering and computer applications. A further modification in January incorporated Clothing Technology.

There are mixed comments from industry regarding future employment of graduates; only a modest increase is thought necessary. With the inclusion of clothing technology, the Ministry of Education envisaged a doubling of student intake.

Some recommendations from previous reports have not been adopted; the College has no autonomy and the so-called 'session jam' continues. Two new teachers were employed, one has retired, but more are required due especially to the increase in student numbers and the inclusion of garment technology.

It will also be important to find ways and means of motivating the staff if future projects to assist the BCTT are to succeed.

Introduction

This report is written by Volker Rossbach, Textile Technologist (Wet Processing) in collaboration with Frank Eckersley, Textile Technologist (Yarn Manufacture) and El Sayed El Helw, Textile Technologist (Fabric Manufacture). The brief was to strengthen the Bangladesh College of Textile Technology, Dhaka, Bangladesh, project reference DP/BGD/85/162. This included: adjusting and refining the new curriculum, participating in the teaching of third and fourth years of the B.Sc. course, assisting existing teaching staff to improve their teaching skills and technical knowledge, making industrial visits with students, improving college/industry relations and assisting the College Principal in short, medium and long-term planning (see job description Annex I)[1]

Problems related to College staff shortages, protest actions and extended student strikes seriously disrupted the project activities and led to only partial achievement of project objectives.

The Principal of the College and National Project Director was prevented from carrying out his duties because of the students strike. He has since been appointed to another College and a Principal-in-Charge was appointed from the College staff. Members of staff were promoted and two new members of staff appointed at the end of July 1993. Only after these problems had been solved, the core part of this project (curriculum development and implementation) could be addressed.

Part 2 and 3 of this report concern the specialist activities in yarn manufacturing (Frank Eckersley) and fabric manufacturing (El Sayed El Helw) reported in September and November 1993, and Part 4 refers to Volker Rossbach (wet processing).

This technical report covers the entire period during which consultants were present, although for each individual consultant these periods differed considerably:

El Sayed El Helw:	23rd Oct. 1992 -	24th Sept. 1993
Frank Eckersley:	17th Oct. 1992 -	5th April. 1993
	17th May 1993 -	11th Nov. 1993
Volker Rossbach:	31st Jan. 1993 -	22th Jan. 1994

[1] All the annexes are contained in a separate volume

The duration of assignment for each consultant was 12 months although in Frank Eckersley's case it was divided into two periods of six months each.

To avoid repetition in the technical reports of all three consultants, Part 1 of this report involves common areas of work from October 1992, when Messrs. Frank Eckersley and El Sayed El Helw commenced work at the duty station to 22th January 1994 when Volker Rossbach completed his assignment. The difference in the commencement and termination of the consultants' duties proved to be of no disadvantage to the project since the combined period was so long that continuity was ensured. On the contrary, the total time during which experts were present was thus extended to 15 months which facilitated the development and implementation of the curriculum.

Apart from this project, UNIDO has provided and is still providing assistance to the textile industry in Bangladesh through other projects (see Annex II).

PART 1

COMMON ACTIVITIES AND OUTPUTS

I. TEACHING PROGRAMME IN THE COLLEGE

A. Academic Year

There is no conformity for starting and finishing dates of each year of the course, as shown in Annex III. This problem is quite common in the universities and institutions of higher education in Bangladesh, frequently resulting in the overlapping of courses of the same year (see for example in Annex III: 4th year session 90-91 and 4th year session 91-92) and is known as "session jam".

For various reasons given below, it is difficult for each course to be completed within one calendar year and normally it takes from fourteen to eighteen months (see for example in Annex III, the 3rd year session 90-91 with a starting date 17/11/91, and the starting date in 4th year session 91-92, 22nd September 1993).

The introduction of a semester structure which should, ideally, avoid any "session jam" has already been announced by the Bangladesh Ministry of Education. So far, however, the majority of the institutions of higher education, including the BCTT, still support the annual system.

There are various reasons for extending the academic calendar year:

With the agreement of teaching staff, the academic year can be extended beyond the normal 36 weeks if the syllabus has not been completely covered by the lectures. Especially part-time teachers often do not respect the set periods of teaching. In addition, it is difficult to keep within this period of 36 weeks due to stoppages and disruptions of the teaching programme.

Following the completion of classes for a particular year of the four year course, there is preparation time of about two months before the start of examinations. The examination for each course year takes place at different times of the year. The time to complete all examinations of each individual session tends to be prolonged because of the number of days which is allowed between two successive examinations as follows:

Table (1 - 1) Time phase between examinations

Marks/examination	Days between two successive examinations
100	5
75	4
50	3

In addition, examinations may be postponed due to student sickness, even if there is only one sick student. If the authorities refuse to postpone the examination in case of any minor reasons, heavy pressure is at once put on the authorities, sometimes ending in demonstrations. The result of all this is that there is no set semester, term structure or fixed holidays for the College staff. Also, because regular classes and examinations frequently overlap classroom work is disrupted as the teachers' presence is required in the examination room.

B. Interruptions of teaching programme

Annex IV shows the frequent interruptions of the teaching programme in the BCTT noted from the arrival of the consultants to the duty station in October 1992 up to the end of January 1994. The total number of weeks of this period was 56 weeks.

The interruptions of the teaching programme are classified into four categories as follows:

1 Category A represents official holidays and total 46 days. On these days the BCTT was completely closed.

2 Category B represents the unofficial holidays (e.g. for examinations, the Islamic month of Ramadan, etc.) totalling 62 working days. On these holidays, only the teaching programme is interrupted and the local teaching staff is free. The consultants made use of these opportunities to make industrial visits with the former Principal and to prepare lecture notes and formulate the modified curriculum.

Attempts by the consultants to continue the teaching programme during Ramadan failed since students showed insufficient interest.

3 Category C represents hartals (general strikes) announced by the political parties totalling 11 days. On these days, the BCTT was like many public institutions completely closed. Many private companies insist that employees make up for lost time, but such a rule is not applied in the BCTT.

4 Category D represents the students' strike at the BCTT which started on 16th June 1993 and ended on 3rd August 1993. The main reasons for the strike were that the students were not content with the "session jam" and the frequent interruptions of the teaching programme. Other reasons were that the students had to wait for a considerable time (up to five months) for the notification of the results from the previous year. In addition, in late May three teachers refused to take classes or set examinations. During the students' strike the other teaching staff and the expatriate consultants performed their non-teaching duties in the College.

During the period under consideration, 1.11.92 to 14.11.93, see Annex IV, the total number of days off without teaching were 145 which represents 44.7% of the total available days (324 days) based on a six-day week. Most of the days-off are obviously unnecessary (see Category B in Annex IV). If this time-off could be avoided the teaching programme could be made much more compact. On the other hand, it should be stressed that the overall number of annual work days in the College when teaching takes place (about 165 days) compares well with the corresponding figure for university institutions in Central Europe, e.g. Germany (about 160 days). This comparison ends even more favorable for the BCTT when it is considered that an extraordinary student strike of about 6 weeks took place which is included in the calculation of the number of annual work days for the period when the consultants were in the College. For "normal years" without such strikes, the overall number of annual work days (about 200 days) is even above the corresponding figure for institutions of the secondary level, e.g. vocational schools for textile technology in Central Europe (about 185 work days). Such a comparison, however, makes sense only if research is included in the calculation. So far there have been only very limited research activities in the BCTT.

C. College Students

There are about 250 to 300 students enrolled in the College who were accepted for admission only after having passed a severe selection procedure. The College has about 1,100 applications annually, of which only 500 students are allowed to participate in an admission test and 60 of these participants are then finally accepted. The students of the BCTT are considered to have, besides those of the Bangladesh University of Engineering and Technology (BUET), the highest standard of all the institutions of higher technical education in Bangladesh.

The number of graduates is about 45 at the end of the "fourth year", after having studied for six or seven years! After the introduction of garment technology, the number of graduates shall, according to the Ministry of Education, be doubled.

Only about 10% of the students are female. This situation may change after the introduction of garment technology. About 1% of the students are foreigners (eg. Nepalese and Pakistanis).

The distribution of the students into the three specializations (yarn manufacturing, fabric manufacturing or textile chemistry) shows that there was most interest in textile wet processing/textile chemistry, and only relatively little interest in fabric manufacturing.

Table (1-2) Students distribution to the three different specializations.

Session	Yarn manuf.	Fabric manuf.	Wet processing
89-90	18	11	20
90-91	15	5	20
91-92	21	5	26

An obligatory class attendance of at least 80% is required of students but, in fact, over half fail to reach this level. Nevertheless, they manage somehow to be transferred to the next year. This includes "student leaders" (leaders of student unions, student organizations of parties etc.) who never visit any classes at all.

Although at times there was so much tension in the College due to demonstrations against the then Principal, fighting between different student organisation fractions, or student elections, that it became necessary for the riot police to be posted in the College grounds, the three consultants never had to fear for their personal safety.

Many of the students show a low level of discipline. Classes have to be dropped the day before holidays because there is not enough student participation. Late arrival to classes is a regular habit. It is also normal that only some students prepare a report and all the others copy this word for word. On the other hand, some of the students are highly motivated in their studies and even attend voluntarily classes in a specialization for which they have not enrolled. Other students supported the three consultants considerably. For example, some of the mill visits which are included in the job description of the consultants were possible through practical arrangements by the students. Students also helped in tidying up of the workshops and in organizing seminars (see Part 4) and made even material available (fabrics, etc.) for use in the practical classes.

Textile technology studies in the BCTT go only up to the B.Sc. level which is considered by many highly developed countries for purely formal reasons in sufficient even for applying for scholarships. Since it appears impossible to introduce M.Sc. courses even on a medium-term basis, one should look for interim solutions e.g. opening the M.Sc.

courses in production engineering, mechanical engineering and chemical engineering at BUET and Dhaka University for B.Sc. holders of BCTT to obtain a M.Sc. in a shorter time and thereby considerably enhance the chances of the graduates subsequently receiving scholarships abroad.

The graduates of the BCTT are highly sought employees by the textile industry. Only about 1% of all the employees of the textile mills are holders of a B.Sc. degree showing that the latter have a lot of responsibility in the mills, corresponding fully to the situation in Central Europe. The majority of all the BCTT students already have job offers before leaving the college, contrary to many other institutions of higher technical education in Bangladesh. About 2000 degree holders of BUET are actually jobless.

D. National teaching staff

The list of the national teaching staff of the BCTT at the time of arrival of the first two consultants is shown in Annex V. Thirteen members including the then Principal, Dr. M. Rahman of the BCTT cover all the fields of textiles, and the academic specialization of each staff member is given.

Apart from the then principal of the BCTT, all teachers have been on fellowships to Leeds University, UK, see Annex VI. The Principal of the BCTT has also been on an overseas study tour. The aim of these fellowships was to improve the staff's teaching skills.

Part-time teachers and teachers for non-textile subjects are not considered. Mr. Monirul Islam who was, in the framework of this project, at Leeds University in the United Kingdom took an M.Sc. degree course in the field of fabric finishing. He returned on 7 July 1993. Two other teachers, Dr. M. A. Baqui and Md. Shahidullah whose specialization is in short staple spinning and testing - were on "continuous informal leave", for over two years after the expiry of their regular leave. In the meantime, the authorities have terminated their services. Thus, the long-standing shortage of national teaching staff in short-staple spinning and testing will probably be rectified in the foreseeable future since these vacancies can now be filled. A third teacher (non-textile subjects) who is also on a continuous informal leave has already been replaced by a mechanical engineer.

In the meantime, Mr. Nazimuddin Ahmed (fabric structure, design and colour) and Mr. A.B.M. Abul Kassem (long-staple spinning, carpet manufacture and specialized textile products) have retired, causing further staff shortages. Two new members of staff, Mr. Alimuzzaman Belal (fabric manufacture) and Mr. Julhash Uddin (wet processing) joined the BCTT in July 1993. Although each of them has taken over the position of Foreman, they have, nevertheless, a full teaching load.

There are now only ten teaching staff including the Principal-in-Charge. Within one year, another teaching staff (Mr. Raisuddin) is to retire at the age of 57 years.

When calculating the future demand of teachers at BCTT, three points should be taken into consideration:

1. The fulfillment of the basic needs enabling every subject of the curriculum to be taught;

2. The proposed work load of the different levels of the teaching staff (see table 1-4);

3. The student distribution among the different specializations(see Table 1-2). This is important for the practical instruction since one teacher can obviously train only a limited number of students. Since the present curriculum as well as the proposed version contain a lot of practical periods, this point deserves special attention as the student distribution among the different specializations is very biased in favour of wet processing.

All new teachers appointed in the future should be given some training although they will have missed the opportunity of additional technical training from the consultants. An offer was made some time ago for teacher training to be carried out at the Polytechnic, next to the Textile Technology College, but it was never taken up.

Three teaching staff were candidates for promotion which finally took place in July 1993. Promotion is a long, drawn out procedure, the requirements of which vary with the grade of lecturer (see Technical Report of Frank Eckersley, DP/ID/SER.A/1659 dated 12 July 1993).

Table - (1-3) Promotion requirements

Grade	Requirements
Lecturer	B.Sc. First class
Assistant Professor	50% of requirements, 3 years teaching, minimum 50% P.S.C. 3 years B.Sc., 2 years M.Sc.
Associate Professor	66% - 6 years teaching as Assistant Professor 33% - P.S.C., 9 years teaching experience + PhD
Professor	66% - 3 years teaching as Associate Professor, 33 % - P.S.C., 12 years teaching + PhD

The three consultants consider the present requirements and procedure of promotion of the teaching staff to be an unsuitable system for an institution of tertiary education. They recommend that the appointment and promotion system be modified to allow the general standard to be raised.

1. Published research work, e.g. based on their master or Ph.D. thesis taken abroad should be considered as part of the requirements for promotion. The publications should be in a refereed textile journal.

2. The teaching staff should be permitted to continue R & D work in one of the research institutions, e.g. Bangladesh Jute Research Institute, TIDC or the BSTI. For this, the teaching load of the teaching staff must be kept within certain specified limits to give them the necessary time for carrying out the research work. The following table represents a proposal for the work load at the various levels which is similar to those in Central European institutions of higher education.

Table - (1-4) Proposed work load of teaching staff

Category	h/wk
1. Lecturer	14
2. Assistant Professor	12
3. Associated Professor	10
4. Professor	8

It is also important to improve the College/industry relations to identify areas of research work relevant to the industry's needs.

3. The status of the BCTT must be changed either by the complete assimilation into the University of Dhaka or by the establishment of the College as an autonomous, degree-awarding body as has already been recommended in many previous reports. The time needed for promotion and filling vacancies would be reduced as it would not be necessary to refer to high levels of authorization. In addition, R & D could be assigned a much higher priority than at present when only a limited number of staff shows any activities. The status of the BCTT is not in keeping with its importance to Bangladesh being the only higher institution for education in textile technology. With the introduction of clothing technology in the syllabus and taking into account the prominent position of the garment industry in the country the question of the College's status will become even more urgent.

Since the BCTT is the only higher institution for Textile Technology in Bangladesh there is practically no personnel exchange between different colleges. Furthermore, the teaching staff is not encouraged (e.g. by a reduction of the teaching load, bonus, etc.) to seek such exchange (e.g. joint projects with industry or research institutes, organisation of seminars, etc.). There is, therefore, the risk that the teachers become, owing to this mental isolation, excessively preoccupied with each other which leads to internal intrigues, competing factions and plots against the Principal. To remedy the situation it is suggested that, after an expansion of the existing institution, a second College be established to create a more competitive and open atmosphere. In addition, the teachers should be given preferential opportunities for study tours abroad to overcome the isolation of the College.

E. Teaching effort of the consultants

Some of the teaching staff at the BCTT and also the Principal, until he left, were greatly overworked with excessive teaching hours. This situation arose due to the teachers on fellowships in the United Kingdom and has been exacerbated by the "informal leave" of the three textile teachers and the retirements of two further teaching staff. With this ongoing emergency situation, the arrival of the two consultants in October 1992 and the third in January 1993 was greeted with relief at BCTT.

The consultants started to teach 3rd year (session 90/91 and 91/92), 4th year (session 89/90, 90/91 and 91/92), and also 2nd year (session 90/91 and 91/92) students. The three consultants taught between 10 and 15 h/wk on these courses. Only at the end of the individual consultants' stay, was the teaching load reduced.

Much to the surprise of the consultants, the UNIDO-proposed curriculum was not in use. Instead, a modified version of the old curriculum was still being applied. The consultants taught the old curriculum and, at the same time, introduced topics which are expected to be included in the new curriculum proposed by the consultants. The result was that the teaching objective in the job description (see Annex I) was fully covered. In addition, classes in the second year were taken up by the consultants.

During visits by the three consultants to textile mills (together with the Principal up to the middle of June), it became clear from the comments of the mill managers that the manual practical skills of the graduates were poor. The consultants also realized that this aspect was not sufficiently covered in the teaching programme. The local teaching staff explained this deficiency by a general lack of materials. Nevertheless, the three consultants showed that it was still possible to carry out successful practical training with the students regardless of the shortage of materials.

The different demands and expectations of students on one hand and of the local teaching staff on the other created a problem in the classes of the consultants. Often the standard of teaching was not appropriate for either side, i.e. too high for the students and too low for the local teaching staff. Compromise was not easy since the students didn't dare to comment on the level of teaching in the presence of the local teaching staff.

Much of the non-teaching time spent at the College was taken by tutorials in the consultants' office. Tutorials are normally not given at the College but due to the new technology, books and resources which the consultants had brought with them to Bangladesh, tutorials became an important part of the consultants' duties.

II. ADJUSTING AND REFINING THE CURRICULUM

A. Modular Curriculum

The curriculum and syllabus originally proposed by UNIDO already some years ago had not been adopted even in parts. From the verbal comments of the BCTT staff it was gathered that the College regarded the level of the technology subjects as too low for BCTT standards. On the other hand, the proposed engineering syllabi were considered to be better than BCTT's own. Nevertheless, they were not being applied either.

The basis of the curriculum and syllabus which are presently used was already laid in 1980 when a straight 4-year B.Sc. course in textile technology was introduced showing a specialization in the 4th year either in Advanced Cotton Processing, Advanced Jute Processing or Advanced Chemical Processing. To give the curriculum and syllabus a modern outlook ("process based" instead of "fibre based") nomenclatures were changed to Advanced Yarn Manufacture, Advanced Fabric Manufacture and Advanced Textile Chemistry from the session of 1987-88 (Annex VII). The current subdivision of teaching staff into a cotton department, jute department and textile chemistry department had not been changed, however. This is likely to create a problem in future.

The present syllabus is not satisfactory: there is a lot of duplication of subject matter from one year to another. The intention has probably been to create a better "anchoring" of the most important subject matter in the minds of the students but, in fact, the effect is often the opposite since each teacher relies on the other teaching the subject matter and this does not always happen. As a result, even the most important subject matters are sometimes not taught at all. In addition, parts of some syllabi require modernization and some of the

terms used are unclear. The engineering, automation and computer application part is considered to be below standard. Finally, the present curriculum does not contain any continuous assessment. Because of this, students require disproportionately long time for the preparation for examinations which again leads to excessive lengths of total study time.

One of the consultants (El-Sayed Md. El-Helw, Textile Technologist, Fabric manufacturing) presented the basis of a modular curriculum plan (see Annex VIII). Comments by the Principal and College staff, as well as those from management in the industry, have been taken into consideration when refining and adjusting this curriculum plan by the three UNIDO consultants. The Principal differences between the old curriculum and the proposed version are summarized below:

1. The first year subjects have been planned so that a broad scientific base is given to the whole course. Textile fibres is the only textile subject included in the first year and is basic to the development of the course into textile technology in subsequent years;

2. A gradual build-up of textile technology in second, third and fourth years;

3. A much greater engineering content was included because of comments from industry and also following the previous curriculum proposed by UNIDO;

4. An increase in the share of computer applications;

5. The ratio practical/theoretical teaching was changed in favour of practical because of the comments from industry; and

6. Introduction of continuous assessment of 40% of the total marks of each subject was allocated for this assessment and 60% for the final written exam. The evaluation of the students' activities may be carried out through verbal discussions in the workshop, reports on practical training topics in the workshop, attendance percentage and periodical tests.

The curriculum plan was submitted to the Principal, Dr. Mustafizur Rahman in March 1993. Three months passed before there was a feedback but it consisted of counter-proposals from teaching staff rather than comments on the submitted curriculum. A meeting of teaching staff and consultants was not possible at this time because three members of staff were refusing to carry out their College duties.

The first discussions took place after the end of the students' strike and when a new Principal-in-Charge had been appointed and after the consultants had written a letter to the Principal-in-Charge pointing out how little time was left before the first consultant, El Sayed El Helw, would complete his assignment at the College.

A number of meetings followed to discuss a new curriculum. These took place first with members of the teaching staff at BTTC, then with the Secretary at the Ministry of Education together with representatives of the industry and university and later with the Director General of Technical Education and senior members of the College teaching staff. The most important demand put forward in these meetings was to give Garment Technology more space in the curriculum.

Garment Technology had already been introduced in the session 1983-84 as a compulsory subject in the 4th year, but played only a minor role (3 periods per week theory and 2 periods per week practical). It was now proposed to include Garment Technology in the textile technology course on the same basis as yarn, fabric and wet processing technologies. The UNIDO consultants suggested that this upgrading of Garment Technology was academically unsound as a Garment Technology specialization also requires study of fashion and design. There should be less emphasis on science-based subjects and more on other subjects, including art. There would also be logistic problems such as training of teachers and equipping a workshop with suitable machines in time for the second year of the course. The consultants suggested alternatives but these were not accepted and garment technology is to be included in the Textile Technology curriculum plan. This has been prepared and is shown in Annex IX.

During the course of the meetings to discuss the curriculum plan, many changes were made to he proposal submitted by the UNIDO consultants. In particular, the modular structure was not accepted by the College. Some changes made at earlier meetings were reversed at subsequent meetings. The curriculum plan proposed by the consultants in March 1993, differed in many respects from the one in use at the College. Some of these changes were retained in the latest plan of January 1994. This plan still has to be approved by the Academic Council of Dhaka University before being put into operation. These changes include:

1. The retention of the first year subjects to give a broad science base to the course and also to include one textile subject on Textile Fibres.

2. Although the amount of engineering and computer science was reduced it is still much higher than in the present curriculum.

3. Continuous assessment was retained at 40% for practical subjects but the percentage was reduced for theory subjects to 20%.

4. The ratio of practical work versus theory is now satisfactory and the time for project work was increased.

A comparison between the number and percentage of periods allocated for each subject group in the scheme presently in operation at the College, the scheme proposed by the consultants and the latest proposed scheme is shown in Table 1-5.

Table 1-5

Present running curriculum

A	B		C		D		E		F		G	
Year of Course	Textile Technology		Maths and Science		Engineering		Computer Studies		Management & Communication		Tables	
	Periods /Week	%	Periods /Week	%	Periods /Week	%	Periods /Week	%	Periods /Week	%	Periods /Week	%
1	6	17.7	20	58.8	6	17.76	-	-	2	5.9	34	100
2	30	76.9	5	12.8	4	10.3	-	-	-	-	39	100
3	39	92.9	-	-	-	-	-	-	3	7.1	42	100
4	28	73.7	-	-	3	7.9	3	7.9	4	10.5	38	100
Total Course Periods	103	67.3	25	16.3	13	8.5	3	2.0	9	5.9	153	100

UNIDO Consultants proposed curriculum

A	B		C		D		E		F		G	
1	2	5.6	16	44.4	11	30.5	5	13.9	2	5.6	36	100
2	20	55.6	3	8.3	13	36.1	-	-	-	-	36	100
3	34	94.4	-	-	2	5.6	-	-13.9	-	-	36	100
4	22	61.1	-	-	3	8.3	5		6	16.7	36	100
	78	54.2	19	13.2	29	20.1	10	6.9	8	5.6	144	100

Latest (January 1994) proposed curriculum

A	B		C		D		E		F		G	
1	2	5.6	24	66.6	8	22.2	-	-	2	5.6	36	100
2	28	71.8	2	5.1	7	18.0	2	5.1	-	-	39	100
3	30	78.9	-	-	-	-	5	13.2	3	7.9	38	100
4	31	81.6	-	-	4	10.5	-	-	3	7.9	38	100
	91	60.3	26	17.2	19	12.6	7	4.6	8	5.3	151	100

The values shown for textile technology in the latest proposed scheme includes the four specializations of yarn, wet processing and garment technology. The inclusion of garment technology has reduced the time allocated to the other three specializations.

B. Preparation of Syllabi

Mr. El Sayed El Helw (fabric manufacture) prepared syllabuses in fabric manufacture, engineering and also in management in collaboration with the other consultants. These were submitted to the College before he left Dhaka in September 1993 and before the curriculum plan was finalized in its present form. According to subsequent rules each subject of the syllabus should be presented on one single page in the submission to the University authorities.

Subsequently, the writing of each syllabus was given to members of staff concerned in teaching each subject. They used some elements of the syllabi of the UNIDO consultants, e.g. the basic engineering part from Mr. El Sayed El Helw as well as all basic wet processing, computer application, and polymer science material from Mr. Volker Rossbach. Certain parts were, however, simply transferred by the college teachers from the present running syllabus (Annex VII) to the new one (Annex IX).

III. SUPPORTING THE NATIONAL TEACHING STAFF

Meetings were arranged at the beginning of the stay of each consultant with the group of teaching staff designated to him. The meetings were intended to help in the preparation of class notes and discussing the contents of the present college syllabi and those prepared by Bolton. Problems involving workshop practice were discussed and plans for practical training and industrial visits were prepared.

This section of the job description was not fully covered. In the case of the fabric manufacturing group, there were about five meetings with the individual teachers of which only two meetings covered scientific subjects. In the other two fields of specialties, the meetings were more frequent but still not to the level that was first envisaged. However, some of the teaching staff designated to Mr. Rossbach attended his classes regularly. In addition, the Principal of the BCTT attended regularly the lectures of Mr. Rossbach and occasionally those of the other two consultants. The lack of success in this section may be explained partially by the time devoted by the College teachers to BCTT duties, e.g. to the various meetings.

Requests were made through the BCTT and the UNIDO Country Director in Dhaka to expedite the engagement of new teachers but without success until July 1993, when two new teachers were appointed towards the end of the students' strike. Due to the heavy teaching loads of the new teachers (20 hours/week), it was difficult to find time when both consultants and teachers would be free from other duties.

IV. COLLEGE/INDUSTRY CONTACTS

There is a very good relationship between the BCTT and some factories in the textile industry. This is due to the large number of textile graduates working in the industry. Since the B.Sc. course was introduced in 1981, some 500-600 persons have graduated from the College. There are also many diploma graduates in the industry from earlier years, some of them having risen to high positions in the industry. The former Principal of the BCTT, Dr. Mustafizur Rahman, is very highly regarded by the former College graduates now working in the textile industry, especially those whom he taught in the specialization of textile chemistry and wet processing.

Several industrial visits were made with students. Unfortunately, the frequent breakdowns of the College bus hampered this activity.

Other visits were made without students, often with the former Principal, to mills and industrial organizations.

A meeting was held at the offices of BTMA with the Chairman of the organization. BTMA represents over 50 factories in the private sector, which includes a large number of spinning mills but also some for weaving, dyeing and finishing. Although the BCTT was criticized, as indicated in Annex X, nevertheless shortly after our visit a request for assistance was received from BTMA regarding expected waste losses after spinning. A further meeting was held with the Secretary of BTMA to discuss problems related to the importation of yarns. There was another quick response to a visit to the BTMC Head Office. BCTT was requested to give advice on roller and saw ginning and was able to assist in this matter.

Annex X lists all visits made, number of graduates employed and management comments about BCTT graduates and future developments. In addition to those listed, visits were made to British Council as indicated in Chapter VI. In December 1992, three days were spent by Messrs. Frank Eckersley and El Sayed El Helw at the BSTI attending a workshop on "Objective Oriented Project Planning" (OOPP). It was jointly organized by the Government of Bangladesh and UNIDO and the present project DP/BGD/85/162 was used as an example. Relative to the "OOPP" workshop, a visit was made to TIDC on 1 April by the three consultants for discussions with the Principal, Dr. Aftabuddin Hossain Chowdhury. Its purpose was the assessment of the actual needs of the strengthening of TIDC. All the points in Annex-V of PPD 234 25/1/93 were discussed and the Principal of TIDC supplied written information about some items. Some of the points were covered in proposals which were submitted to and approved, in principle, by the Bangladesh Government.

TIDC was established with UNIDO assistance during the period 1979-84 and is still part of the national sector of BTMC. The probable privatization of BTMC is expected to allow TIDC to become a national training and development centre for the textile and garment industry. There is a clear case for co-operation between the BCTT and TIDC. Most of TIDC staff are BCTT graduates and some of them have taken higher degrees in the UK. TIDC was carrying out an interesting experiment with an intensive three-month training course in textiles for ten mechanical engineering graduates to work at Padma Textile Mills.

Discussions with management during the visits (approx.30) to mills and other textile-oriented institutions were taken into consideration when the consultants wrote their proposed curriculum plan. Information was obtained regarding possible future increases in graduate numbers as indicated in Chapter V. A closer relationship between the industry and the College was also encouraged during these visits. The attention of the mill employees was drawn to the new equipment which was delivered by UNIDO to the BCTT in the hope that cooperation would result between the textile mills and the College. Consequently, companies made some experiments with the new equipment to determine the degree of dye exhaustion by colorimetry. In addition to these joint mill visits, the respective consultants also made individual visits. These were dealt with in a separate part of the consultant's report.

In order to strengthen the relations between the college/industry, the organization of seminars is necessary to attract professionals of the mills and, at the same time, giving the students an opportunity to meet the professionals and to gain knowledge of actual textile technology. Two such seminars were organized by Mr. V. Rossbach on 18 Sept. and 9 Dec. 1993, (for the programme see Annex XI). Both seminars, one held in the College with about 350 participants and the other held in the German Cultural Centre with about 200 participants, were filled up to the last chair with one third of the visitors coming from mills and the rest being College students. Both seminars were mostly financed by the industry and were organized under the active participation of College authorities and College student associations. Further seminars could not be organized due to the short period of stay of the consultant and the preparatory time which is required for each seminar. However, the College authorities were given seminar materials (video films about wet processing) and addresses of potential sponsors and companies in Europe who would be willing to send speakers. The German Cultural Institute, the Goethe-Institute, Dhaka, would be willing to help the College to organize future seminars, in particular making available its facilities for showing video films. A 3rd and more academically oriented seminar was given to the teachers and students on 8 Jan. 1994, by Prof. J.W.S. Hearle from Manchester University (see Annex XI).

V. ASSESSMENT OF SHORT/MEDIUM/LONG-TERM MANPOWER REQUIREMENTS

There have been approximately 500 to 600 graduates from the B.Sc. course at the BCTT since 1981. The number of students graduating is at the moment about 45 (see Chapter I, Section C).

A. Short-term planning

There is a self-regulating mechanism by the students themselves for each of the present three specializations in the fourth year of the course. Although the total number of students cannot be changed for the final year, each student opts for the specialization of his/her choice. The decision may be affected by the student's ability in a particular area, e.g. chemistry, but it is also affected by job prospects. It is only clear to the students at the end of third year studies which specialist area offers the best prospects (see Table (1-2) for the number of students in the different specializations).

B. Medium/long-term planning

At present, the medium and long-term requirements of graduates for the textile industry are particularly uncertain. In the public sectors of the industry the BTMC and BJMC mills face an uncertain future because of huge debts and pending privatization. Workers in both organizations are fiercely opposed to privatization because of possible mill closures and consequent job losses, and frequent workers' demonstrations disrupt normal production. Neither at BTMC nor BJMC would anyone estimate future requirements. Only TIDC (part of BTMC) is optimistic about their future as a national training centre for the textile and garment industry but was also unable to estimate future requirements.

There is more optimism in the private sector and it is probable that an increasing number of graduates will be required. Some mills are being built and many others are at the planning stage. At present, the actual increase in numbers required could not be estimated and there is uncertainty regarding Government policy especially in backward linkages in the industry. At present, 90 percent of the finished fabric used by the garment industry which has mushroomed during the past ten years or so is imported.

The garment industry is also employing a few graduates in textile technology, particularly for the inspection and quality control of the fabric.

After having visited textile mills in different fields of specialty and places in the Dhaka area, the general opinion is that the BCTT should have a modest increase in numbers entering the first year of the course. Additionally, if the actual length of the course could be reduced to four years this would give a temporary increase in the number of graduates.

However, it was found very difficult to quantitatively estimate the actual need of the industry for the graduates of the BCTT and the numbers entering the first year of the course. The figures given for the need of the industry spread over a very wide range. In general, the figure of a minimum of 50 given in previous reports is estimate to be relatively low. An increase of about 20% (i.e. up to about 60 graduates per annum) may be necessary to take into account the current expansion of the local textile industry. The wastage through the four years course (20%) is taken into consideration, when estimating the number of entrants.

As reported in Chapter II, it is expected that the College will have a new curriculum in the near future which will include garment technology as a specialization. In view of the importance of the garment industry in Bangladesh, job opportunities of the graduates will be greatly enhanced. Taking this into consideration, the number of new entrants could be doubled when the new curriculum is introduced and additional staff and equipment is provided. There should also be much greater opportunities for female students.

VI. LIBRARY

The library is well stocked with books but there were no up-to-date books on the shelves when the experts arrived. Some books were brought from the UK and Germany for the library and funded by UNIDO. These are listed in Annex-XII.

The supply of textile magazines over an extended period would be helpful but there has been insufficient funds for these to be obtained on a regular basis. The quarterly journals of the Textile Institute for 1992, were ordered in the UK and funded by UNIDO but no others have been supplied.

Due to an initiative of Mr. F. Eckersley, a visit was made to the British Council in Dhaka in an attempt to obtain a book grant for the BCTT library. These grants have been discontinued but as a result of the visit, an offer of "withdrawn from shelf" books was made. They were all non-textile books but a useful set of 120 books was obtained on chemistry, physics, mathematics, statistics, engineering materials and teacher training. At present, no textile books are stocked at British Council but a request was made to them to consider opening a textile section at the library. A list of textile books which were ordered by the British Council is given in Annex XIII.

Funding of a library for books and magazines on a continuous basis is essential for the B.Sc. course in textile technology at the BCTT for both staff and students.

The consultants brought their own books, journals and teaching aids such as slides and transparencies to the College. They provided the library with some recent references and made those books etc. available to it and also handed over copies to the teachers. These are listed in Annex XII. A request to the teachers to make their personal books available to the library has had only little response.

VII. MACHINES AND EQUIPMENT

The BCTT was established originally as a school of textiles in 1950. In 1979-80 it was upgraded to a College with the authority to award B.Sc. degrees without receiving any additional equipment. The old equipment part is still unchanged as described in the UNIDO report DP/ID/SER.A/647 dated on 31/10/1985.

None of the older machines conform to normal safety standards due to missing machinery guards. A rehabilitation of these machines would be too costly; a complete replacement is necessary. Many of the old machines cannot be used at all and can only be classed as museum pieces.

To improve the situation, several modern machines and other equipment were delivered to the BCTT during the preparatory stage of this project (see Annex XIV). Most of these machines and equipment are still in good running condition.

The weaving and knitting machines had their raw material delivered by the machine manufacturers. Regarding the wet processing workshop, the newly delivered machines were left without installation waiting for

the arrival of Mr. V. Rossbach who started immediately with this task, even though it is not part of his job description. Nevertheless, there are still some problems in this workshop as some of the equipment have electronic parts and there are difficulties owing to the voltage fluctuation in Dhaka. As a result, some of the equipment cannot be put into operation until clarification has been received from the manufacturers of the machinery and the company who re-wired the workshop has been received.

In general, the wide range of processing and testing equipment and machinery at BCTT can be considered, for the time being, to be more than sufficient for educational purposes up to B.Sc. degree in textiles with the exception of the equipment in the yarn manufacturing workshop, yarn testing, textile chemistry, general chemistry and in the physics laboratory.

The new machines in the yarn manufacturing workshop, namely the drawframe and rotor spinning frame, are essential but unnecessarily expensive. Other essential machines such as the speedframe and the ringframe were not replaced and the existing machines are in a poor and dangerous condition. Yarn testing equipment such as, for example, Uster Evenness Tester would be necessary for a B.Sc. course. The old equipment and machines need repair, renovation or replacement. The condition of this equipment has deteriorated owing to lack of regular maintenance. Therefore, it is essential that the authorities of the BCTT ensure that all equipment of the BCTT, especially the recently installed equipment within the framework of this UNIDO project is properly and regularly maintained.

The textile wet processing workshop is now equipped, in some aspects even overequipped. Some of the machinery (drying oven/curing oven) are overlapping in their fields of application, while other machines are so versatile and complicated that it is doubtful whether they will be used to their full potential. Nearly completely missing is the non-textile, specific but necessary standard equipment, such as a refrigerator for storing solutions, a shaking machine, a viscometer, etc. Also small items such as wire nets, tube carriers, etc. are missing. Many of these items are particularly necessary for textile chemistry investigations.

The general physics and chemistry laboratories also need much more equipment for student practical.

During a meeting with the Secretary of the Ministry of Education, he requested that a list be prepared on additional equipment, still considered necessary for the Textile Technology course at BTTC. This was done and it includes items covered in more detail in Parts 2 and 4 of the report. A list of equipment necessary for the technological as well as science sections is given in Annex XV and XVI.

Classrooms are old-fashioned and lack modern facilities. The "Black boards" for example are painted plaster sections on the walls of the classrooms. The teaching aids provided in the project have been one overhead projector, one slide projector and two large and bulky screens. To help improve teaching methods, a "teaching aids and reproduction section" is necessary with adequate funding.

The condition of the buildings is deteriorating and, through the broken panes of glass birds are flying around the workshops and fouling the new machines. Water is often leaking into the workshops and into the main College block during the wet season. Rotting wooden window frames require replacement as do panes of glass in parts of the buildings. Standards of maintenance of machines and buildings are abysmal and there is a shortage of cleaning staff. (There is only one for the whole College). This is difficult to accept in a country where unskilled labour is both abundant and cheap.

The textile wet processing workshop and the laboratories for chemistry and physics urgently need a check-up of all plumbing (water and gas need repairing). There is, for example, a steady drop of the gas pressure in the workshops which leads to the conclusion that there is a potentially dangerous leakage somewhere.

VIII. PROJECT DESIGN

It is beyond the scope of this report to give comprehensive comments on the project design. Only two points should be commented which are directly related to the jobs of the consultants.

Even in the higher education institutions in industrialized countries when there are no benefits for the individual teachers, it is extremely difficult to motivate them to keep their teaching (syllabus and way of presentation) on an up-to-date standard. For strengthening the motivation of the teaching staff of the BCTT, the project design should have contained some incentive elements, e.g. rewarding teachers with particularly good performance with extended fellowships abroad. Although nearly all of the teachers are over the age of 50, several of them are obviously still very receptive.

The new machines and equipment, provided by UNIDO, are intended to be used for teaching. To increase the interest of the teachers in becoming more familiar with the equipment and especially its maintenance, the equipment should have also been selected taking into account how the individual teachers could make maximum use of the machinery, e.g. using it in the wet processing workshop for sample preparation, recipe optimization, testing and providing testing services to the industry. In fact, most of this work has, thus far, been carried out in the laboratories of the dyestuff producers or outside Bangladesh (testing laboratories in Hong Kong and Singapore). At present, the individual teachers performing such consultancy gets less than 20% of the earnings, the rest being distributed in the College and to higher authorities. It would be more appropriate to reverse this ration to 80% for the teacher, 20% to the College. To train the teachers in serving the mills and to open contacts and persuade the international garment trading companies to let the testing be done in Bangladesh, however, would have required a much higher consultancy component in this project.

PART 2

SPECIAL ACTIVITIES AND OUTPUTS IN YARN MANUFACTURING

This part is covered by Mr. Frank Eckersley in his report of November 1993.

PART 3

SPECIAL ACTIVITIES AND OUTPUTS IN FABRIC MANUFACTURING

This part is covered by Messrs. El Sayed and El Helw in September 1993.

PART 4. SPECIAL ACTIVITIES AND OUTPUTS IN TEXTILE WET PROCESSING

I. WORKSHOPS AND LABORATORIES

A. Workshops

The textile wet processing workshop consists of three sections:

- One section with old machines;
- One section with laboratory desks for chemical experiments;
- One section for the new machines and apparatus. This section is separated from the other two sections by a newly erected wall.

The section with old machines takes up about two-thirds of the whole area. This machinery is about 30 years old and of production scale. Apart from a generator for compressed air which is in working condition and can be used for the jet dyeing machine, none of these machines was operational during the stay of the consultants. In fact, they look as if they had not been operated during the last twenty years. These machines are used simply to show what such machines look like and to give students an idea how the fabric flows through them. The consultant's proposal to scrap this machinery and to take the students for industrial visits to see modern machinery in operation was not accepted by the teachers. One of the reasons given for this was the Government would not give a permission to scrap the machinery.

Although there are about five workers and helpers in the workshop and laboratory there is normally very little activity. Some corners are filled up with miscellaneous junk, the boards are full of various old items and containers with dyestuffs are scattered around at random. The new machinery is not systematically laid out in the workshops. The same applies to the arrangement of the plug-sockets. A diagram of the electrical wiring was not available but it appeared to be rather unprofessional. For example, the switches and the lights and ceiling fans they control were in different rooms. (The wiring was done by Siemens Bangladesh Ltd.)

Most of the machines delivered under this project were hardly used before the consultant in wet processing arrived at the end of January 1993, although they had been delivered in 1991/1992, and the wiring of the workshop was finished in the middle of 1992. For unspecified reasons the local teaching staff did not run the machines. The situation changed only after a teacher who had a two-year scholarship through UNIDO returned from the U.K. in June 1993, and took some initiative in the workshop.

The consultant arranged the machines according to their needs for water and electricity and their function (production vs. testing). He operated about half of the more complex machines and apparatus one after another (sometimes in the presence of the local teaching staff) and prepared simplified versions of the manuals which were then used to carry out experiments with the students. Many of these machines had or developed problems, for most of which solutions were found or at least initiated during the stay of the consultant.

The biggest problem, common to all machines and equipment with the exception of the Mathis Coating Plate and Crockmeter, was their sensitivity to voltage fluctuation. The fluctuation of the voltage in Bangladesh is on such a scale that the use of voltage stabilizers are essential in most cases. No photocopier, TV or PC is operated without such a device. Nevertheless, the electric wiring of machinery was completed by Siemens Bangladesh Ltd., in presence of the local teachers without taking such precautions even though some of the machines (e.g. Fine Oven DH 62 from Yamato Scientific Co., Ahiba Turbocolor TU-1000) have keyboards which are similar to those of photocopiers. In addition, all the machines were protected by Siemens Bangladesh Ltd. with only 13 Amp fuses insufficient for many machines and equipment. When the fuses melted, the workshop employees simply by-passed them with wire so that these machines were not protected at all. This was detected by the consultant when the first of these unprotected machines (Type Rotadyer from John Jeffrey Ltd., Banbury/U.K.) showed damages.

Siemens Bangladesh Ltd. denied all responsibility for causing the damage of the two dyeing. Several formal requests addressed to Siemens Bangladesh Ltd. for confirmation that the work was done by the company itself (and not, e.g., by a local subcontractor) remained unanswered. It is hard to believe that a reputable international company could deliver such poor service for an order of such magnitude (US$ 55,000). The College authorities were advised to try at least to take legal action since the consultant could not stay long enough to do this. The consultant sent a letter of complaint to the company headquarters in Germany.

All the machinery manufacturers (from U.K., Japan, Hungary, Austria and Switzerland) had to be contacted to get the technical requirements for electrical protection. Some of them reacted only after several reminders but finally a firm was selected and contracted to deliver and install protective circuit breakers. The matter will be followed up by the UNIDO office in Dhaka.

Besides protection against voltage fluctuation another general problem was the lack of running water in the workshops. Because some of the dyeing machinery must be cooled by running water to reach its full potential, the availability of running water is crucial. This was done but, as the water system in the building had not been used or maintained

for at least twenty years, the entire plumbing had to be overhauled. This work had not been completed by the time the consultant left the duty station.

Many of the machines and apparatus are so complicated that a manual has to be followed for operation, maintenance and servicing. When the consultant arrived, however, the first manuals had already "disappeared" and others had began to decay due to the hot and humid conditions. To assure a longer life for these machines, copies of all manuals were prepared and sealed in clear sheet protectors.

The choice of the individual machines and apparatus was, in most cases, well made. But some apparatus are redundant, too complicated or caused problems for other reasons. Some comments on these machines and apparatus are as follow:

Vindon Scientific Laboratory Oven

This is a simple and compact device. The manual comprised of only half a page which was inadequate to operate the apparatus. After contacting the U.K. based manufacturer several times, a complete manual was obtained piece by piece. A short version of the manual which is sufficient for the students to operate the oven was prepared by the consultant, sealed under a clear sheet protector and posted on the wall near to the apparatus for practical use.

Yamato Laboratory Oven DH 62

This is a laboratory oven which is especially suitable for resin curing but can also be used for drying. It can be operated with several time-temperature programmes but this is far too complicated for student use. This apparatus duplicates the function of the Vindon Scientific Laboratory Oven and the latter is therefore unnecessary.

The Laboratory Oven DH 62 was, for some reason, firmly fixed right in the middle of one of the entrances to the workshop. Following the intervention of the consultant, Siemens Bangladesh Ltd. corrected this absurdity, the wires were taken out of the concrete floor and a socket was installed. This was also done at another place with a further line. Only after tedious discussions was this correction work done free of cost.

John Jeffrey Engineering Rotadyer

After preparing a simplified, short version of the manual (as for the Vindon Oven, see above) this machine could also be operated by the students themselves. This machine was extensively used by the consultant during student practical and its electronics sustained slight damage. Advice regarding the nature of the type of damage and how to repair the apparatus could only be obtained from the manufacturer after repeated requests. For the Rotadyer there is an older, mechanized model which would perform the same tasks as the one in the College but without the risk of electronic damage. It has to be questioned why that model was not chosen by the College.

For this machine to operate at its full potential (High Temperature dyeing), a high boiling point liquid such as glycerine has to be used which was (for the first time) made available through UNIDO. It is doubtful whether the College will be able to provide this in future.

DKK pH Analyser

To make this instrument usable for students, a simplified short version of the manual was prepared. Critical point for this instrument will be the proper use and maintenance of its sensitive glass electrode. Proper grounding is essential.

For some reason, a pH analyser running at 110 V was planned to be purchased and a special facility for this voltage was installed in the workshop. (The normal voltage in Bangladesh is 220 V). Later, in fact, an instrument working at 220 V was purchased. Since then, no apparatus works at 110 V and there is no reason for the installation of a 110 V facility.

Jenway 6050 Colorimeter

Six colorimeters of this type were purchased by UNIDO. The colorimeters can be easily operated. Nevertheless, an even simpler version of the manual was prepared for use by the students. A solder point in one of the colorimeters was dislodged. Thanks to the help of Mr. U. Ebert, who works at UCEP in a Swiss Government programme, the instrument was repaired. Special bulbs - the most sensitive parts of the instrument - were sent from the U.K. to assure a longer useful life for these instruments.

AHIBA TURBOCOLOR TU-1000

This highly versatile and complicated apparatus has not been in working condition so far. After correspondence with the manufacturer, it was concluded by "long-distance diagnose" that the instrument must have been overheated during use and the overheating prevention unit was damaged. The overheating switch stays open and has to be repaired by an electrical engineer.

SDL-Colour matching cabinet

This easily assembled instrument was probably damaged during transport. According to the teaching staff, many tubes were already destroyed when it arrived at the College, others later when the instrument was operated without being protected against power fluctuation. In addition, the wiring in the instrument was damaged. The problems were solved with the help of Mr. U. Ebert from UCEP. Spare bulbs will be brought by the SDL engineer when he comes to train the staff on the jet dyeing machine.

SDL-Crockmeter

Since the clamp for holding the fabric had disappeared it was (together with the plastic punch) brought from Germany. The reddish painted parts of the apparatus have already begun to get rusty. SDL was informed that this cannot be accepted.

SDL-Light fastness tester

Some parts of this instrument are painted in the same colour as the crockmeter and, as the crockmeter, also show signs of rust. Comments about that from SDL are still pending.
The principle of light fastness testing was shown to the College teachers and, in addition, to some staff members of BSTI. BSTI got under the UNIDO project DP/BGD/91/006, among other things, a similar type of light fastness tester from SDL but did not know how to run the apparatus.

Although the instrument is quite appropriate for educational purposes it does not correspond to ISO, ASTM or BS standards since it uses a Mercury lamp and not - as specified in the standard specifications - daylight and Xenon Arc light sources. Therefore, this apparatus can be used with confidence at only for in-house testing. Since it would be desirable to use the apparatus by the teachers in consultancy work as well as for teaching, (see Part 1, Chapter VIII) the SDL-light fastness tester was obviously not the best choice.

Imaqine Texipress Chief Machine

The manual for this apparatus had disappeared by the time the consultant arrived. A new one was sent from Europe. Since there was no transfer paper available, the perfect functioning of the machine could only be demonstrated after some transfer paper was brought from Germany.

Computex Scourotester

This apparatus caused problems for the teachers right from the beginning since the Hungarian manufacturer mistakenly provided only a German manual. Nevertheless, a local engineer tried to operate the apparatus but failed. When the consultant arrived, the English manual had in the meantime also arrived but the apparatus did not work any longer.

SDL-Jet dyeing machine

The jet dyeing machine is the most demanding equipment of the workshop since it needs power current, pressurized air and running water. All that was in fact available in the workshop up to the end of December 1993, and the lines and tubes are provisionally fastened to the machine. Since the machine is complicated to operate, an engineer from the manufacturer has to come to train the teaching staff. This was included in the contract from the beginning .

It was proposed to SDL that the person to be sent should be familiar with electrical engineering. Therefore, the pending problems with two of the 25 machines (Turbocolor and Scourtester, see above) could soon be solved. In addition, this engineer could evaluate the work for voltage protection and check the quotations for the final installation of the Jet dyeing machine. The requests for the corresponding quotations had been prepared when the consultant left Bangladesh.

When the consultant arrived, there was a tremendous disorder in the storage for dyestuffs, auxiliaries and chemicals so that a lot of time was wasted searching for specific dyestuffs required in the student's practical. The situation improved when the Head of the Textile Chemistry Section brought some order to the chaos but still the labels on many dyestuff containers were hardly legible. With the help of students the containers were re-labelled and the labels were protected with special transparent adhesive tape brought from Germany. Many labels, however, were so decomposed that they were not legible at all.

Up to about 1985, stock lists were kept for the dyestuffs, chemical reagents, etc. and also apparatus. For some reason, this practice was discontinued. The actual stock comprises all the important dyestuff classes although some products are more than 40 years old. Representatives of the European Dyestuff Manufacturers (e.g. BASF Bangladesh Ltd.) commented that they are willing to import dyestuffs from Europe specifically for the College but, so far, the teaching staff has not responded to this offer. Yet they blamed the lack of dyestuffs and chemicals for not holding up-to-date practical classes. This is also true for fabrics, yarns, etc. In many cases, the students themselves had to supply such materials to make sure that their practical could be held (see also Part 1, Chapter I, Section C).

A general problem in running the workshop is that its technicians and workers do not have sufficient knowledge of English to read the labels of the dyestuff containers and the manuals, etc. The Principal-in-Charge was asked to provide a Bangla translation of at least of the manuals to the workshop employees.

B. Textile chemistry laboratory

Besides experiments in dyeing, printing and finishing there are, corresponding to the present syllabus (see Annex VII), a lot of experiments that should be performed by students in analytical textile and fibre chemistry, e.g., estimating of hardness of water, detecting damaged fibers, identifying and purifying dyes. However, these experiments cannot be carried out because some of the necessary equipment is missing, e.g., a refrigerator for storing solutions between practical, electrical balances, a centrifuge, soxhlet and magnetic stirrer. In addition, small glass items like beakers, pipettes and graduated flasks are missing. A detailed list of these items is shown in Annex XV .

C. Science laboratories

The laboratories in general chemistry and general physics are also insufficiently equipped: In view of the new curriculum which contains an even higher proportion of science than the former one and the planned doubling of admitted students, all of whom have to pass a science laboratories programme, this situation is unacceptable. Detailed item lists are shown in Annex XVI.

II. TEACHING PROGRAMME

A. College staff

During the stay of the Consultant there were altogether five full time persons engaged in the teaching of textile wet processing/ textile chemistry, fibers, polymers science and quality control (chemical part):

Dr. Mustafizur Rahman B.Sc.(Hons) (Chem.D.U.) M.Sc. (Chem. D.U.) Ph.D. (Polym. Chem. Univ. London) DIC (Chem.Tech.Imp. Coll. Lond.) Post-Doc (Notre-Dame Univ.,Ind. USA)	Professor and up to August 1993 Principal	Dyeing, Printing and Finishing, Textile Chemistry, Polymer Chemistry, Quality Control (left the college after having been prevented from carrying out his duties since June 1993)
Mr. M. A. Khalequ B.Sc. (D.U.) M.Sc. (Chem.D.U.) B.Sc.(Text. C.U. India)	Professor and since September 1993 Principal-in-Charge	Dyeing, Printing, and Finishing
Mr. Md. Monirul Islam A.T.I. (Jute, Dhaka) B.Sc.(Text. D.U.) M.Sc.(Text. Leeds)	Lecturer	Dyeing, Printing, and Finishing (rejoined the College in July 1993, after staying abroad)
Md. Sirajuddin Bhuiya A.T.I. (Jute, Dhaka) PGD (Text. Ind., Leeds) M.Sc. (Dyeing & Finishing, Leeds)	Instructor	Dyeing, Printing, Finishing, Fibre, and Fibre Physics
Julnash Uddin BSc. (Text. D.U.)	Foreman Instructor	Dyeing, Printing, Finishing, Polymer Science, Man-made Fibers (joined the College in July 1993

Although the College seems to be quite well staffed for wet processing, compared to the other specialties, with four teachers in this subject, this is in fact only partially true since the student numbers in this specialty are the highest (see Table 1-2 in Part 1). Furthermore, the composition of the teaching staff in textile wet processing is not well-balanced. After the Principal transferred to another College there hasn't been a teacher at the College with a specialty in the chemical side of textile wet processing. Important and very specialized fields such as dyestuff and auxiliary chemistry, physical chemistry of dyeing, fibre chemistry, etc., are thus not covered. There is also an imbalance in the technology of wet processing since there is no expertise in printing technology. The authorities should make sure that the next teacher taking an M.Sc. degree abroad specialize in textile printing.

B. Teaching

During the stay of the consultants, students of the second, third and fourth years of the Textile Technology Course were taught for a total of between five and twelve hours per week.

Work was disrupted in all classes and attempts were made to concentrate a 36-week course into a much smaller number of teaching periods. In addition, some extra hours were given. The situation was similar in yarn manufacturing and fabric manufacturing sections.

The following courses were given:

2nd year, Textile Chemistry-I-Theory

2 hours or 1 hour per week, 50 students, duration from 2 February to 9 November 1993. Topics covered:

- Water in textile wet processing: various impurities, purification, softening, zeolithes.
- Basic chemicals in textile wet processing: Chemistry, properties and uses of various acids, alkalis, salts, oxidizing and reducing agents.
- Detergents in textile wet processing: Elementary idea of theory of detergency and general idea of surface active agents in textiles.

3rd year, Textile Chemistry-II-Theory

1 hour per week, 50 students, duration from 4 Aug. to 22 Dec. 1993. Topics covered:

- Finishing: Mechanical finishing/chemical finishing, finishing machineries, types of padders, process variables in padding, face padding, knife coating.

- Anticrease finishing, resins; softening, filling, water repellent finishing, waterproof finishing, flame retardant finishing, antistatic finishing, soil and stain repellent finishing, moth proofing.

4th year, Advanced Chemical Processing-Theory

(Session 89-90), 20 students, 10 hours in a compact seminar at the end of February 1993. Topics covered:

- Physical Chemistry of dyeing: Mechanisms, structure of dye solutions; dyeing kinetics, diffusion, pore model, free volume model; dyeing equilibrium, chemical potential and standard affinity, absorption isotherms.

4th year, Advanced Chemical Processing-Theory

(Session 90-91), 4 hours per week, 20 students, duration of 2 Feb. to 10 Oct. 1993. Topics covered:

- Advanced surface active agents: Chemistry, preparation, general classification and properties, nomenclature, mechanism and theories of detergency, evaluation of detergency.

- Advanced technology of pretreatment and bleaching: Desizing, scouring, fluorescent brightening agents - Chemistry, classification, general properties, nomenclature, mechanism of brightening agents, application to various fibers, effects of various factors on brightening.

- Colour Chemistry: Nature of light and colour, subtractive and additive methods of colour measurement, objective colour measurement, spectrophotometers.

- Advanced technology of dyeing: Chemistry, classification, nomenclature and general properties of disperse dyes, carriers, carrier and HT-dyeing, jets and overflows, thermosol and other continuous processes, dyeing of polyester cotton blends; chemistry, classification, nomenclature and general properties of acid dyes and premetallized dyes, nylon dyeing, differential dyeing; chemistry, classification, nomenclature and general properties of basic dyes, acrylics dyeing.

- Advanced Technology of Printing: Conventional textile printing, pigment printing, transfer printing, flock printing, direct printing, discharge printing, resist printing, screen-preparation and application, flat and rotary screen printing.

4th year, Advanced Chemical Processing-Practical

(Session 90-91), 4 hours per week, 20 students, duration from 15 April to 11 Oct. 1993. Topics covered:

- Pretreatment of polyester, HT-dyeing of polyester, effect of various heat-setting temperatures on the dyeability, determination of the degree of dye exhaustion by colorimetry, Lambert-Beer law, combination dyeings, use of Colour Index, migration test, use of grey scales, computerized dyestuff recipe calculation, trichromatic dyeing, wet fastness testing,fibre identification by staining.

4th year, Advanced Chemical Processing-Theory

(Session 91-92), 2 hours per week, 26 students, duration from 23 Sept. to 21 Dec. 1993. Topics covered:

- Advanced surface active agents: Chemistry, preparation, general classification and properties, nomenclature, mechanism and theories of detergency, evaluation of detergency.

- Advanced technology of dyeing: Chemistry, classification, nomenclature and general properties of disperse dyes.

4th year, Advanced Chemical Processing-Practical

(Session 91-92), 2 hours per week, 26 students, duration from 15 Nov. to 3 Jan. 1994. Topics covered:

- Use of a colorimeter, determination of an absorption spectrum, use of a pH-meter

4th year, Quality Control-Theory

(Session 90-91), 3 hours per week, 40 students, duration from 4 May 4 to 15 June 1993. Topics covered:

- Quality in textile finishing, textile raw materials analysis, qualitative fibre analysis

The subjects taught corresponded by and large to the present syllabus (see Annex VII) although the Principal determined how much each particular subject was to be emphasized.

As can be seen from the proceeding compilation of the teaching program, basic textile chemistry was taught throughout the whole period (to 2nd Year Students) besides a lot of technology (dyeing, printing, finishing) to the 3rd and 4th year students which comprised approximately one year's worth of course work.

For the 4th year students two tests were organized (with participation on a more or less voluntary basis), one being more fundamental and dealing with the subject of light (absorption, emission, reflectance, spectral colour/complimentary colour, light as a form of energy), and the other one being more technically oriented and dealing with the subject of polyester dyeing (features of disperse dyes, HT-dyeing/carrier dyeing, jets and overflows, reductive after treatment, dyeing of polyester/cotton blends). In both tests half of the students passed, some of these showing an excellent understanding of textile chemistry/wet processing.

The consultant recommended the best 4th year students for scholarships to Germany (DAAD, German Academic Exchange Service) and Belgium (B.A.D.C., Belgium Administration for Development Co-operation). Many of the students, however, showed a very low level of understanding and obviously lacked basic knowledge of physics, chemistry and engineering and were unable to bridge the gap between those subjects and textile wet processing.

Communication in English was a problem. After a certain settling-in phase, the consultant and students agreed on a certain form of communication during the instruction especially for difficult topics: the consultant taught in English and after each important phase of the course (introducing and explaining of a new topic, making sure the material was understood, reviewing, etc.); first, one of the students summarized the phase in English; second, the consultant corrected if necessary; third, the student summarized again in Bangla. The consultant attempted to cover the material described above by using modern visual aids. In particular, the overhead projector (supplied in the framework of this project) was used extensively. In addition, actual technical bulletins, company leaflets, etc., of textile machinery manufacturers as well as samples of textile materials were used for purposes of illustration.

As already stressed in the general part of the report, the local teachers do not take the practical education of the students very seriously. While organizing practical for the 4th year students the consultant realized that the majority of the students themselves do not consider this part of their education satisfactory. So 90% of the students accepted the offer to participate in a one week "summer school" about trichromatic dyeing and they repeatedly asked the consultant to organize practical courses after the machinery in the workshop could no longer be used. In addition, they used their connections in the textile industry to get special fabrics which were indispensable for some courses. Managing a group of 20 students, however, was not easy, particularly in the course in which the computer-assisted recipe calculation (programme RAISA from BASF) was demonstrated. For this course, only one computer was available (the consultant's). The reports prepared at the end of the practical showed that some students had acquired an excellent knowledge of the subject but many others simply copied from their more advanced classmates.

Since the college bus was nearly permanently broken down, only four visits could be made to dyeing mills in the project's microbus (with 20 4th year students!). Details are given in a list in Annex XVII. (This type of visit is characterized in this list with an asterisk). Most of these visits were initiated by the students themselves.

C. Support to local staff

The assistance to the local teaching staff took place on various levels:

- The teachers assigned to work with the consultant and also the Principal, participated more or less regularly in the theoretical and practical classes of the consultant.

- Detailed experimental procedures for performing practical work in the textile wet processing workshop and in the textile chemistry laboratory were given to the College.

- The practical use in teaching of the more complicated equipment, supplied by UNIDO, was demonstrated to the local staff.

- A lot of books, teaching aids and other materials were given to the local staff.

- Contributions were made to various subjects of the syllabus. One of the duties of the consultant was to support and guide the local teachers in improving their teaching skills and technological knowledge. In particular, the improvement of teaching skills can be best done under realistic classroom conditions, i.e. through the participation of the respective teacher during the consultant's class. However, the response of the teaching staff to such offers varied.

The teacher for the 2nd year (basic textile chemistry) visited the respective theoretical classes throughout the whole stay of the consultant.

The 4th year theoretical classes in wet processing (session 90-91) were visited by all the teachers and the Principal up to summer 93 when he left the College. For the practical classes, however, they showed up only occasionally.

In addition to the conventional "chalk and talk" method, the consultant made full use of overhead projection in all theoretical classes, in particular to explain complicated machinery construction and to save the time normally consumed for designing tables and diagrams on the blackboard. In addition, photocopies of the overhead projection foils used during the class were distributed to the students and teachers. After finishing the teaching programme in January 1994, the overhead projection transparencies were handed over to the various teachers according to their specialties (see Part 4, Chapter II, Section A). The number of transparencies which were handed over are given in parentheses:

- Dyeing and printing (28)
- Pretreatment and bleaching, finishing (17)
- Natural fibers (20)
- Man-made fibers (32)

In addition, several transparencies about proteins and amino acids were handed over to the teacher in general chemistry who belongs to the non-technological teaching staff and is, therefore, not included in the list shown above. The transparencies are English translations of the materials used by the consultant for his teaching

in Germany. Some of them originate from the "German Foundation of the Chemical Industry."

In addition to these overhead projection materials, leaflets and brochures from textile machinery manufacturers were also given to the students, as the rich illustrations (coloured drawings, good photos) enabled them to at least visualize what up-to-date wet processing machinery looks like (for details see Annex XII-8). For pedagogical purposes, such complex and exhaustive material can be used only sporadically in BCTT classes. But this material, which comprised nearly 1500 pages about the latest textile wet processing machinery (a compilation of information from about 40 European and American companies) is an excellent source of information for students, teachers as well as professionals in the textile mills. This material, bound in 8 volumes, is available in the library (see Part 4, Chapter VI).

The technological knowledge of the teachers who visited the consultant's classes could be improved only to a limited degree through this class attendance because the level of instruction was determined largely by the level of the students. Nevertheless, the consultant tried to respond to the needs of the teachers by covering "complicated subjects" requested by the Principal: e.g. objective colour measurement and physical chemistry of dyeing. The task of improving the teachers' technological knowledge (see the consultant's job description) was more directly accomplished by numerous personal discussions and talks about specific points of textile wet processing. The intensity of these contacts, however, varied from teacher to teacher. In addition, some classes about Polymer Science were given exclusively to the teachers.

The content of practical classes was determined on one hand by the given syllabus and on the other by the materials which could be made available. That practical classes was held, despite the difficult material situation, which was demonstrated by the performance of altogether 30 periods. A copy of the best report by a student where the experiments were described in full detail was handed over to the College. In addition, two textbooks with a lot of experiments in textile wet processing, textile chemistry and fibre chemistry were given to the library (see Part 4, Chapter VI).

III. ADJUSTING AND REFINING CURRICULUM

Neither the original curriculum from Boston proposed by UNIDO nor the modular curriculum (and its corresponding syllabus) proposed by the three consultants were considered appropriate by the College teachers (see Part 1, Chapter II).

Apart from the introduction to garment technology, the present curriculum was used as the basis for discussion about modification of all the other subjects in the curriculum. Up to 22 December 1993, there was a steady modification of the curriculum and the corresponding syllabus. At a certain point during these, sometimes very controversial, discussions, syllabi were written down in outline form by the consultant. These comprised:

1st year	Physics Chemistry Polymer Science
2nd year	Wet processing I Textile Chemistry Fibre Analysis Textile Raw Materials II (Man-made Fibers) Computer Science
3rd year	Wet processing II Application of Computers in Textiles
4th year	Wet Processing III Dyeing theories and colour matching Dyeing & Finishing Mills organisation

Although, as it turned out, these syllabi represented only an intermediate step in the discussion, they later served as a basis for modifying and checking the completeness of the final syllabus. Polymer Science, Textile Applications of Computers as well as the fundamentals of wet processing and newer technologies in wet processing were to a large extent transferred from that proposal to the final syllabus. In addition, the consultant made sure that the syllabus was free of duplications.

IV. COLLEGE / INDUSTRY CONTACTS

Visits with other consultants and students to mills, industrial organizations, etc., are reported in Part I, Chapter IV and Part 4, Chapter II, Section B.

In addition, the consultant met with representatives of textile companies or textile-oriented companies. Most of them sought advice on the solution of mill problems or on designing new dyeing, printing and finishing mills. A list of the companies and the persons met appears in Annex XVII.

Although mostly specific technological topics were discussed during these meetings, some information about the general situation was also obtained from the mill staff. Especially interesting were their comments concerning aspects of technology transfer from highly developed countries to Bangladesh.

The budgets of these companies are too low to buy new machines, so second-hand machinery is frequently purchased from Europe. Sooner or later this machinery needs repair. But to get an engineer from the European company that originally delivered the machinery costs the Bangladesh textile company 40,000 Taka (US$ 1,000) per day!
Another example also illustrates how expensive the transfer of technology to Bangladesh is. To get a highly specialized expert in pigment printing (just retired from the market leader in Germany), a Bangladesh Chemical Company paid a monthly fee of 600,000 Taka (US$ 15,000). To reduce the costs of technology transfer for the textile industry and textile-related industries, some industrialists recommended more practical training of local teachers sent on fellowships instead of purely theoretical education. The teachers should expand their knowledge not so much in universities but more in the service departments of machinery producers, dyestuff manufacturers, etc. Other industry representatives criticized the programme of the College curriculum as not being sufficiently practically oriented.

During these visits to the mills the consultant drew the attention of the factory management to the new machinery supplied by UNIDO to the College, and in particular to its potential importance for the determination of fastness properties and rendering other types of services to the mills (e.g. recipe optimization, sample preparation, faults detection, etc.). Obviously, there is an urgent need for these services in Bangladesh. Thus far, part of this need has been satisfied by the local subsidiaries of international dyestuff companies and the rest by testing laboratories in Singapore and Hong Kong.

After this promotion of the newly established facilities at the College, some textile mills actually contacted the College with requests for services but not as many as had been hoped for. The extension of such cooperation would obviously be highly desirable (see also Part 1, Chapter I, Section D) as it would mean that the equipment is operated more frequently and thereby kept it in good running condition. To provide an incentive for the teachers to engage in such extra-curricular work, it is recommended that their share of the money earned be increased from the present 20% to 80%.

Two seminars were organized, oriented to professionals as well as students (see part 1, Chapter IV). Both were well attended and were reviewed in Bangladeshi newspapers. The programme of these seminars is given in Annex XI. In one of these seminars (organized at the College) speakers of BASF Bangladesh talked about the biodegradability of textile auxiliaries and current trends in pigment printing. Because of the good attendance at his lecture, the Managing Director of BASF offered to repeat such a seminar two times per year. The College has, to date, not responded to this offer. The seminar was partially financed by BASF.

The other seminar was organized in cooperation with German Cultural Centre. This was necessary since video films of two German textile manufacturers (Kleinwefers-Ramisch/Krefeld and Dornier/Friedrichshafen) were shown and the College had no facilities for that. Both companies contributed substantially to the costs of the seminar. The consultant gave a lecture about the present situation of the textile sector in Germany. Both seminars were only possible owing to the logistic support of the students. In the framework of this project several recent video films prepared by textile machine manufacturers in Italy, Germany, and Denmark were brought to Bangladesh and handed over to the College for further use (see Annex XVIII). Since the German Cultural Centre is willing to organize additional textile seminars there is a clear case for cooperation with the Textile College. This was pointed out to both sides. Also, several European textile machinery companies would be prepared to contribute to seminars in Dhaka. These are: Biancalani & C., Patro/Italy; Arioli & C, Gerenzano/Italy; MCSS p. A., Urgano/Italy; Benninger AG, Uzwil/Switzerland; WEKO Biel AG, Biel-Bienne/Switzerland; Bitexma GmbH, Herbertingen/Germany. Since these companies normally send their representatives only once per year to South Asia, the consultant's tenure was too short for him to organize these seminars.

V. SHORT/ MEDIUM/ LONG TERM MANPOWER PLANNING

This point was already discussed in detail in Part 1, Chapter V. As mentioned earlier, students can choose in the 4th year between yarn manufacturing, fabric manufacturing, wet processing (and in the future presumably also garment technology). During the last 3 to 4 years about 40 to 50% of the students consistently chose wet processing, 35 to 40% yarn manufacturing and 10 to 20% fabric manufacturing (see table (1-2) in Part 1). These choices roughly correspond to job opportunities, and there has been little variation in these percentages over the years.

This could mean that there has been no change in the manpower demands of the different branches of the textile industry.

After the introduction of Garment Technology as a 4th specialty, however, the graduate forecast has to be completely reevaluated.

VI. LIBRARY

As mentioned, all the consultants contributed various materials to the library (see Part 1, Chapter VI and Annexes XII and XVIII) Some books on the application of computers in textile manufacturing were funded by UNIDO and brought from Germany. These books were necessary due to the introduction of this topic as one of the new subjects in the new curriculum.

Copies of several personal books in wet processing, textile and fibre chemistry as well as polymer science were made available for the students in the library, some of them very recent and others classical. Among these books were also two laboratory books (Earland and Raven; Experiments in Textile and Fibre Chemistry; Thompson, Dyehouse Laboratory Practice). These will enable the teachers to introduce new experiments for the practical classes.
For the information of the teachers but also for professionals from the mills who visit the library occasionally, reprints from the last edition of Ullmann's Encyclopedia of Industrial Chemistry were made available. These articles, written by professionals for professionals, cover many topics of dyestuffs, auxiliaries, wet processing etc. on a high and practice-oriented level.
Video films and a collection of company brochures, which were also handed over to the library, were mentioned earlier.

GENERAL RECOMMENDATIONS

The recommendations made in previous reports where no action has been taken should be reconsidered. The main one is that more autonomy should be given to the BCTT or that the BCTT should be assimilated into the University of Dhaka. Many of the problems which exist at the BCTT are related to lack of progress in acting on this recommendation.

Other recommendations for action to strengthen the BCTT are as follows:

1. The urgent appointment of new teachers in the field of yarn manufacturing and testing. In addition, a teacher with a chemical background for wet processing is needed.

2. Additional equipment and accessories are required for textile testing and textile chemistry laboratories and in the yarn manufacturing workshop to bring these to an acceptable standard. Also, a rehabilitation/ modernization of some machines and some essential accessories is necessary.

3. In view of the doubling of student numbers who will pass through the science laboratories (after the introduction of garment technology specialization) the laboratories in physics and general chemistry need urgently additional equipment.

4. To provide an incentive for the teachers to use (and to maintain!) the equipment at the BCTT, their share of the money earned from consultancy work should be increased dramatically, e.g. from the present 20% to 80% of the amount earned.

5. It is necessary for the Ministry of Education to have a budgetary provision for the maintenance of machines, equipment and to procure consumable items such as processing material. A regular allowance is also required for purchase of books and technical magazines for the library.

6. It is also recommended that the Ministry of Education allocate funds to improve the maintenance of the College buildings, for their regular cleaning and to provide a continuous water supply for the wet processing workshop and toilet facilities.

7. The setting up of a visual aids section would help to improve the efficiency of teaching. This should be also include the supply of teaching aids and the upgrading of the classrooms.

8. The BCTT authorities, staff and students should jointly plan and coordinate the start and finish of each year of the course. The target should be to complete the work in a normal academic year.

9. The number of teaching hours for each grade of lecturer should be established.

10. The best graduates should be appointed as demonstrators, working towards full teaching staff membership. A transitional phase of at least 15 years should be required for a Ph.D and as a condition for teaching staff membership in the textile field at the BCTT.

11. In the long term, to open the way for the BCTT graduates to obtain higher qualifications abroad (e.g. Ph.D), an M.Sc. course should be introduced. As an immediate interim measure, the M.Sc. courses in production engineering, mechanical engineering, and chemical engineering at BUET and Dhaka University should be opened for B.Sc. holders of BCTT. The opportunities for the graduates to receive scholarships abroad would be considerably enhanced, since in many countries a B.Sc. is not considered sufficient for a scholarship application.

12. It is recommended that the Ministry of Education rather than enlarging the BCTT to serve the growing textile industry (and garment industry) in Bangladesh, establish a second College of Textile Technology. This would promote a more competitive and open climate and help to avoid internal intrigues and plots against the Principal.

13. To overcome the isolation of the BCTT, it is recommended that the Ministry of Education motivate the teachers through a bonus system (e.g. reduction in teaching load) by encouraging contacts outside the College, e.g. joint projects with research institutes and mills and by organizing seminars with lecturers from abroad.

14. Although it is outside the scope of the present project, the proposal to include a garment technology specialization will require a workshop to be set up with a wide range of sewing machines, tables, cutting machines and other equipment. Additional specialist teaching and maintenance staff will be required.

Immediate planning is necessary for teachers and equipment to be available for the second year of the course. The proposed college syllabi in garment technology cover technology but are weak in fashion and design. Expertise in these areas will be necessary if the garment industry of Bangladesh is to develop from its present dependence on imported fabrics.

In the long term, completely new course in garment technology should be established at the College. It need not have a very strong scientific base but some subjects in textile technology would be useful for garment technology also.

SUBSTANTIVE OFFICER'S COMMENTS

The report covers the expert's assignment from October 1992 to January 1994 as a textile chemist, attached to the Bangladesh College of Textile Technology (BCTT) in Dhaka.

The author reviews in a candid fashion the College's facilities, staff, the student body and the curricula providing constructive criticism and making practical recommendations.

It is evident from the material presented in the body of the report and in the annexes that the author and his two team members have provided a competent and valuable service to the BCTT under very difficult conditions. Both he and his colleagues have clearly performed with enthusiasm and dedication well beyond their official brief and it is fervently hoped that their recommendations and proposals receive the attention they deserve. Reading between the lines one gets the impression that the author is not altogether confident that will happen in all cases. However, even a partial heeding of the advice given would be a step in the right direction. The report is recommended reading for the teachers and the students alike at the BCTT - not to mention Government authorities concerned.

Annex I

UNIDO

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
PROJECT IN THE PEOPLE'S REPUBLIC OF BANGLADESH

28 November 1988

JOB DESCRIPTION
DP/BGD/85/162/11-03/J13102

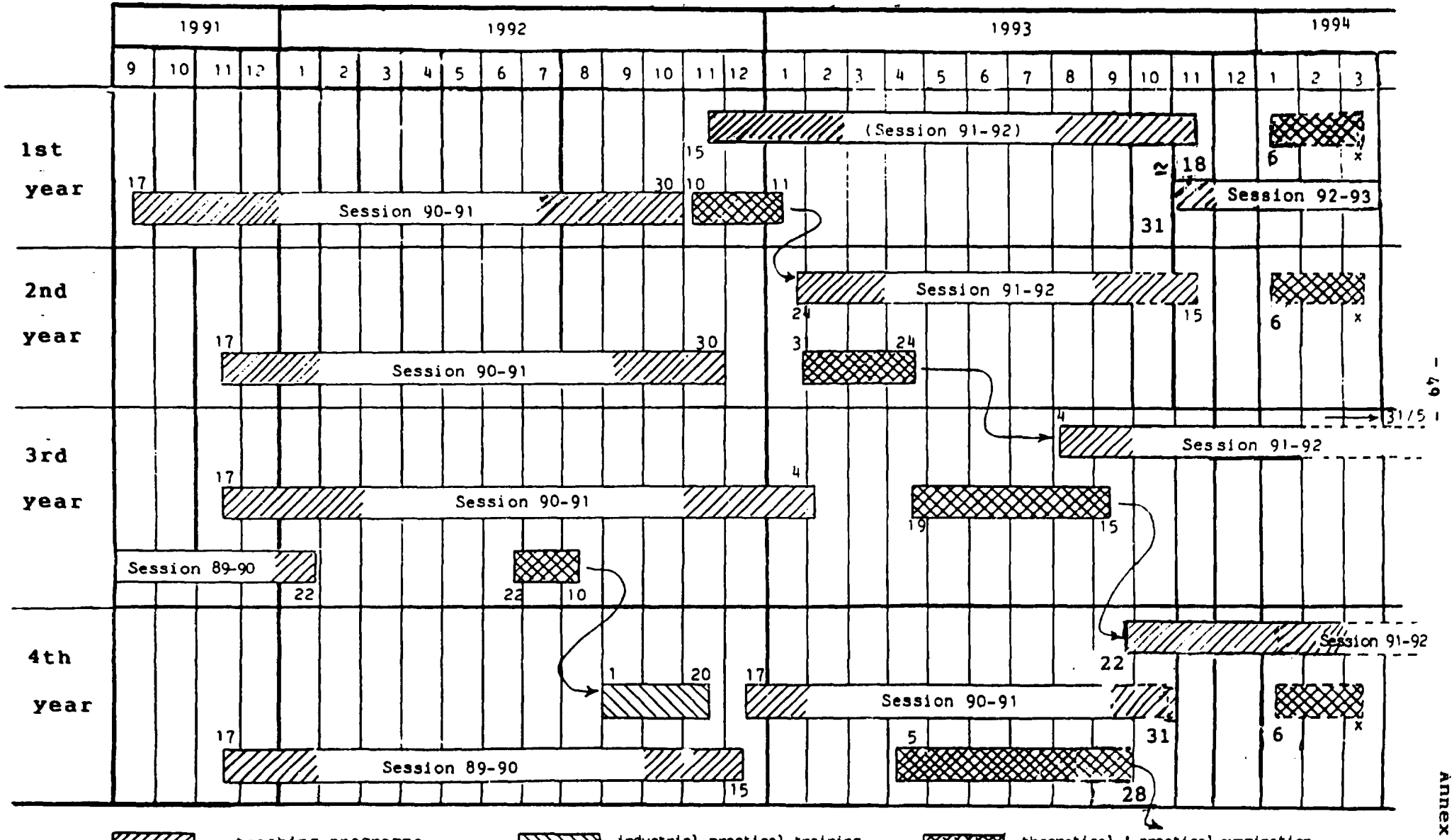
Post title	Textile chemist (wet processing)
Duration	12 months
Date required	as soon as possible
Duty station	Dhaka
Purpose of project	Strengthening of the Bangladesh College of Textile Technology
Duties	Attached to the Bangladesh College of Textile Technology and under the general supervision of the National Project Director, the Principal of the College, the expert will participate in the teaching of 3rd and 4th year students in wet processing. This will include adjusting and refining the new curriculum developed during the preparatory phase of this project, supporting and guiding the local teaching staff designated to him as counterparts to improve their teaching skills and technical knowledge and, in particular, promoting active College/industry contacts through frequent factory visits with the students and by linking course assignments with real factory situations to the extent possible. He will also assist the Principal in assessing the short, medium and long-term man-power requirements of the textile and jute industry in the wet processing sub-sector.
Qualifications	Degree in textile technology or textile chemistry. A minimum of five years of industrial experience and 3-4 years of teaching experience.
Language	English

Annex II

Apart from this project UNIDO has provided and is still providing, the assistance to the textile industry in Bangladesh through the following projects:

1 - DP/BGD/75/013 Jute Products Research.
2 - DP/BGD/79/030 Central Testing for Jute Goods.
3 - DP/BGD/80/010 Assistance to Jute Industry.
4 - DP/BGD/82/006 Textile Industry Development Programme.
5 - DP/BGD/84/051 Private Textile Mills - Production Management Systems.
6 - DP/BGD/91/006 Assistance to the Bangladesh Standards and Testing Institutions.

Session Jam in BCTT



Interruptions of the Teaching Programme
(1/11/1992-31/1/1994)

A) Official holidays

Month	11/92	2/92	1/93	2/93	3/93	4/93	5/93	6/93	7/93	8/93	9/93	10/93	11/93	12/93	1/94	Total	%
Dates	7	16+25	-	8+21	22+(24+25)	14	1+6	(1-3)	1	10+18+31	1+28	14+31	7+13	15(25-30)	11		
Total	1	2	0	2	3	1	2	3	1	3	2	13	2	7	1	43	9.4

B) Unofficial teaching programme suspension

Month	11/92	12/92	1/93	2/93	3/93	4/93	5/93	6/93	Total	%
Dates	3	(26-31)	(16-18) 21+27	7+20 (22-28)	(1-21) 23 (27-31)	1+13	11 (23-31)	(5-8)		
Total	1	6	5	8	24	2	9	4	39	12.9

C) Hartals (Strikes)

Month	11/92	12/92	1/93	2/93	4/93	5/93	6/93	7/93	8/93	10/93	Total %	
Dates	8	8	26	6+10	4	13	-	19	15	(10+30)		
Total	1	1	1	2	1	1	-	1	1	2	11	3.2

D) College Strike

Month	6/93	7/93	8/93	Total	%
6Dates	(14-30)	(3-18) (20-31)	(1-3)		
Total	13	24	3	40	8.8

The dates in brackets show long interruptions including the 1st and the last days but excluding the week ends (Fridays) and other categories of interruptins.

Annex V

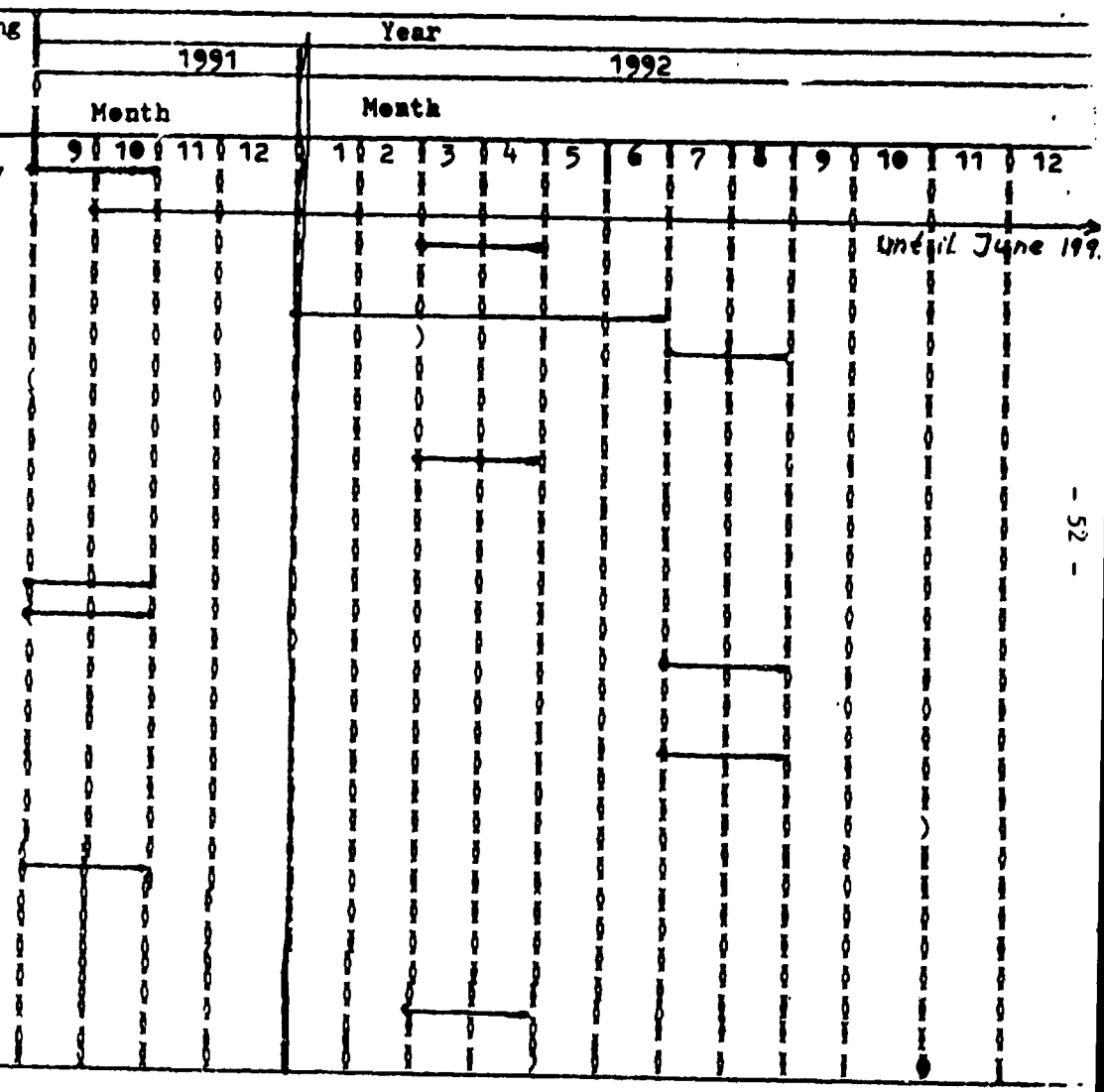
College of Textile Technology, Dhaka.

Names of technical teachers with their qualifications, designations and the subjects they teach.

1.	Mr.M.A.Khalequ	B.Sc.(DU). M.Sc.(Chem. DU) B.Sc.(Text.CU.India)	Professor	Dyeing, Printing and Finishing.
2.	D.N.C.Sutradhur	B.Sc.(Text.CU., India) Ph.D.(Yarn Manuf., Leeds)	Associate Professor	Short Staple Spinning & Quality Control.
3.	Mr.A.B.M.Abul Kassem	Dip.(Jute Tech, Dundee) PGD(Text. Leeds)	Associate Professor	Lont staple spinning, carpet manufactures and specialised textil products.
4.	Mr.Sk.Md.Hasanuzzaman	B.Sc.(DU) PGD(Text.Leeds) M.Sc.(Text., Leeds)	Assistant Professor	Knitting, Fabric Struct: and Analysis, Fabric Quality Control.
5.	Mr.Nazmuddin Ahmed	B.Sc.(DU) Dip.(Spg., Wvg. Dhaka) Completed courses in spinning & Weaving but no certificate was awarded(Bradford).	Chief Instructor	Fabric Structure Design and Colour.
6.	Dr.M.A.Maqui	Dip.(Text. Dhaka) B.Sc.(Text. DU) Ph.D.(Text. UMIST)	Lecturer	Short staple spinning and testing.
7.	Mr.Mashud Ahmed	B.Sc.(Text.DU) M.Sc.(Text.Guelph, Canada)	Lecturer	Weaving & Specialised Textile products.
8.	Mr.M.A.Kashem	B.Sc.(Text.DU) PGD(Clothing, Leeds) M.Sc.(Text., Leeds)	Lecturer	Long staple spinning and clothing technology.
	Md.Monirul Islam	A.T.I.(Jute, Dhaka) B.Sc.(Text.DU)	Lecturer	Dyeing, Printing and finishing.
10.	Md.Raisuddin	B.Sc.(DU) B.Sc.(Text.Leeds)	Instructor	Weaving and Knitting.
11.	Md.Serajuddin Bhuiya	A.T.I.(Jute, Dhaka) PGD(Text.Ind., Leeds) M.Sc.(Dyeing, Finishing, Leeds).	Instructor	Dyeing, printing, finishing, Fabre and fibre Physics.
12.	Md.Shahidullah	A.T.I.(Text.Tech. Dhaka) PGD(Text.Ind., Leeds) M.Sc.(Text.Sci. & Eng. Leeds)	Instructor	Short staple spinning & Textile Testing.

EEP/85/162 - College of Textile Technology.

Field	Candidates	Place of Training
-Dyeing, Priating Finishing.	Mr.M.A.Khaleq	Leeds University U.K.
	" Md.Monirul Islam	" "
	" Md.Serijuddin Bhuiya	" "
-Yarn Manufacture (Short Staple)	Dr.N.C.Sutradhur	" "
	Dr.M.A.Baqui	" "
-Yarn Manufacture (Long staple)	Mr. M.A.Kashem	" "
- Fabric Manufacture(Weaving)	Mr.Nazmuddin Ahmed	" "
	Mr.Md.Raisuddin	" "
	Mr.Mashud Ahmed	" "
- Fabric Manufacture(Knitting)	Mr.Sk.Md.Hasanuzzaman	" "
- Fabric Manufacture(Carpet Manufacture)	Mr.A.B.M.Abul Kassem	" "
-Textile Testing	Mr.Md.Shahadullah	" "



COLLEGE OF TEXTILE TECHNOLOGY
UNIVERSITY OF DHAKA

Marks Distribution for B.Sc. Degree Course in Textile Technology.

IST YEAR

.No.	Subjects.	Marks. Theory.	Practical
	English	50	-
	Mathematics	100	-
	Physics-I	75	25
	Physics-II	75	25
	Chemistry-I	75	25
	Chemistry-II	75	25
	Textile Fibre	50	-
	Textile Mechanics	75	-
	Textile Processes	100	-
	Engineering Drawing	-	50
	Workshop Practice	-	50
		675	200

Total Marks= 875

2ND YEAR.

Yarn Manufacture-I	100	50
Fabric Manufacture-I	100	50
Textile Chemistry-I	100	50
Fabric Structure, Design & Colour.	100	-
Textile Testing-I	75	25
Polymer Science	50	-
Statistics	100	-
Electrotechnics	50	25
	675	200

Total Marks = 875

3RD YEAR

Sl.No.	Subjects	Marks. Theory	Practl
1.	Yarn Manufacture-II	100	50
2.	Fabric Manufacture-II	100	50
3.	Textile Chemistry-II	100	50
4.	Fabric Structure & Analysis	75	25
5.	Textile Physics-I	100	-
6.	Textile Testing-II	75	25
7.	Man-made Fibre Production	50	-
8.	Industrial Management-I	100	-
		700	200

Total Marks = 900

4TH YEAR.

1.	Textile Physics -II	100	-
2.	Quality Control	75	25
3.	Specialised Textile Products	75	25
4.	Mill Engineering & Organisation	100	-
5.	Industrial Management-II	100	-
6.	Any One of the Following:- (a) Advanced Yarn Manufacture (b) Advanced Fabric Manufacture (c) Advanced Chemical Processing.	100	25
7.	Computer Systems & Programming	75	25
8.	Clothing Technology	75	25
		700	150
		Sub-Total = 850	
**9.	Industrial Training	50	
10.	Project.	100	
11.	Comprehensive Viva	50	
	Grand Total of Marks 3700	Total Marks- 1050	

** Industrial Training of approximately two months duration will take place immediately after the 3rd year Final Examination.

B.Sc. in Textile Technology Ist Year(Part-I)

ENGLISH — Marks: 50

1. Sentence - its meaning, different kinds and analysis.
2. Paragraph writing. 3. Descriptions, 4. Application.
5. Precis Writing: The Crime or Poverty - Bernard shaw(Compulsory)
   David Copper field by Charles Dickens | Any One.
   The Praise of idleness by Burtrand Russel. |
6. Essay Writing.
7. Commercial Correspondence - writing for publication,factory communiation at all levels.
8. Phrases and Idioms, Corrections.
9. Communication and Language - Its importance to the Technologist.
10. Technical report ~~xxx~~ writing, collecting information, drafts and revisions, writing memos etc.

B.Sc. in Textile Technology Ist Year(Part-I)

MATHEMATICE — Marks:- 100

Calculus:

Rules of differentiation. Successive differentiation, Partial differentiation and Leibentz's theorem. Maximaand Minima . Integration. Integration by substitution and by parts. Integration of rational algebric functions.

Algebra and Trigonometry:

Differential equations with constant co-efficients and their solutions. Determinants and their application to the solutions of linear equations.

Complex numbers; De-movres theorem, Euler's theoren, Gregori series, Exponential series, summation of series.

Vector:

Addition and subtraction of Vectors, Resolution of Vectors, Product of two vectors.

Solid Geometry:

Rectangular cartesian co-ordinates. Direction cosines.Equations of planes, straight lines and spheres.

Books recommended:

1. Differential and intoegral calculus by: B.C.Das.
2. A Text Book of Co-ordinate geometry By: A.F.M.A. Rahman.
3. A Text Book of higher Trigonometry By: A.Satter.

B.Sc. in Textile Technology 1st Year(Part-I)

PHYSICS - I Theory Marks: 75

Properties of Matter:(General Physics and Light).

(a) Elasticity:- Elastic and Plastic bodies, stress, types of stress, strain, types of strain, behaviour of a strained wire, Hook's Law, elastic constants, experimental determination of young's modulus and rigidity modulus, Poisson's ratio, limits of poisson's ratio, compressibility, relation among the elastic constants, energy in a strained body, variation of elasticity with temperature.

(b) Moment of inertia, radius of gyration, theorems of moment of inertia of simple cases(uniform rod, solid cylinder, sphere, fly wheel) determination of moments of inertia of a body by torsional pendulum.

(c) Surface Tension: Molecular theory of surface tension, demonstration of surface tension, phonomena due to surface tension, surface tension and total surface energy tension in curved surfaces, capilarity and angle of contact, determination of surface tension of water, effect of temperature on surface tension.

(d) Viscosity: Definition of viscosity, co-efficient of viscosity and its measurements, Poiseulilless equation for viscosity, variation of viscosity with temperature, importance of knowledge of viscosity, relation between viscosity and friction.

(e) Light:- Wave theory of light, Huyghen's principle, interpretation of laws of reflection and refraction by Huyghen's principle, Interference.measurements of wave length of light by bi-prism, difraction difraction grating and its use. Polarisation, Nicol's prism, Polarometer, compound microscope.

PHYSICS PRACTICAL-I Marks: 25

Determination of (a) elastic constants by various methods.
(b) acceleration due to gravity by compound pendulum.
(c) moment of Inertia.
(d) density of water at various temperature.
(e) surface tension of water and mercury.
(f) focal length of convex and concave lens by various methods.
(g) refractive index of liquid by using prism & convex lense.
(h) the angle of the prism by spectrometer method.
(i) wave-length of light.
(j) specific rotation of different soln.by means of polarometer.
(k) viscosity of water by capillary method.

B.Sc. in Textile Technology 1st Year (Part-I)

PHYSICS - II Theory Marks:75

1. Electricity and Magnetism:

(a) Static electricity:- Electric potential, field, intensity, electrostatic induction, Gauss's theorem and its application, capacity of a parallel plate condenser.

(b) Current Electricity:- Electromagnetic induction, Co-efficient of self and mutual induction, discharge of a condenser through resistance, R.M.S. and peak value of alternating current, ~~LxRx~~ L-R-C circuits.

(c) Intensity of magnetisation, permeability, susceptibility, characteristics of diamagnetic, paramagnetic and ferromagnetic substances.

2. Heat and thermo dynamics:

(a) Temperature and its measurements, gas thermometers, Platinum, resistances thermometer; nature of heat, specific heats of gases and their measurement.

(b) Kinetic theory of gases, derivation of gas laws and Van-der-waal's equation, isothemal and adiabatic changes.

(c) Energy conservation and first law of thermodynamics, reversible and irreversible changes, enthalpy and heat capacity, interconversion of heat and work, carnot cycle and engines, second law of thermodynamics, absolute temperature scales, refrigerator, disorder, entropy, available work. Radiation and Black body radiation and Crooptons effect.

(d) Thermodynamic functions, Helmholtz-and Gibb's functions, Clausius clapeyron equation.

PHYSICS PRACTICAL - II Marks: 25

1. Determination of (a)Co-efficient of linear expansion of solid, (b) Specific heat of solid and liquid and (c) thermal conductivity of metals (d) Measurement of High temperature by means of thermocouple and potentiometer.

2. Determination of (a) resistance of a wire by P.O. box (b) Specific resistance by meter bridge(c) Resistance of a Galvanometer by Half deflection method(d) E.C.E. of copper and (e) Value of J by electrical method.

Books recommended:

1. Concepts of Electricity & Magnatism - Huq. & Roy
2. A text book of Practical Physics - Prof. K.Din.
3. A Text book of Heat - T. Hossain.

B.Sc. in Textile Technology 1st Year(Part-I)

CHEMISTRY -I Theory Marks: 75

Physical Chemistry.

1. Thermochemistry: 2. Chemistry of dilute solutions, Osmotic Pressures, Van't Hoff's theory of Dilute Sol. Raoult's Law for vapour pressure lowering. Elevation of boiling point, & depression of freezing point. 3. Homogeneous Equilibrium:- Law of mass action, Mathematical formulation of the Law of mass action & its application to Chemical reactions. 4. Heterogeneous Equilibrum. 5. Electrolytic Dissociation & conduction. 6. Ionic Equilibrium. 7. pH, Buffer Sol. & Indicators. 8. Chemical Kinetics:- First & Second order reactions, Mathematical formulation of Firs First & Second order reactions. Methods of determination of the order of a Reaction. 9. Colloid [illegible] s Chemistry:- Classification of Colloids, preparation, properties Importance of Colloids.

Inorganic Chemistry.

1. Electronic Theory of Valency:- Electrovalency, Covalency, Co-ordinate linkage, chlorate groups, variable electrovalency, Di-covalancy of Hydrogen Odd-Covalencies, compound Radical cations, complex ions.

2. Preparation, Properties & uses of the following:- (a) Bleaching powder, (b) Hydrogen Peroxide, (c) Hypochlorous acid (d) Chlorine (e) Sodium Hypoclorite (f) Sodium Chlorate, Sulphur dioxide, sodium hydrosulphite, sodium sulphite, sodium bisulphite.

CHEMISTRY PRACTICAL -I Marks: 25

1. Qualitative analysis of inorganic mixtures contain not less than three radicals including insoluble & interfering radicals.

2. Volumetric analysis:- (i) Acidimetry & Alkalimetry e.g. preparation of approx. N/10 HCL, H_2SO_4 & CH_3COOH. Solutions & their standardisation (ii) Preparation of standard alkali solution.

3. Analysis of Oils & Fats for (a) Acid Value, (b) Saponification value (c) Iodine value (d) Flash Point.

Books recommended:

1. Modern Inorganic Chemistry By: Jagindar Singh
2. Introduction to Modern Inorganic Chemistry By: S.Z.Haider
3. A Text Book of Inorganic Chemistry By: J.R.Partington
4. Inorganic Chemistry by: P.D.L. Thorne
5. A Text Book of Practical Chemistry By: A.Khalique
6. A Text book of Quantitative Inorganic Analysis by: A.I.Vogel.
7. Quantitative Analysis by: Willis Conway Pierce
8. Elementry Physical Chemistry by: S.R. Palit
9. Principles of Physical Chemistry by: Hoque and Nawab

B.Sc. in Textile Technology 1st Year(Part-I)

CHEMISTRY - II Theory Marks: 75

Organic Chemistry

1. A general study of paraffins, Olefines acetylenes, alkyl halides, mono, di,.try hydric alcohol, aldehydes, ketones,amines,monobasic acid & their esters halides, anhydrides & amides.

2. Carbohydrates: Mono & Disaccharides.

3. Chemistry of proteins: Amino acids, Classification, Physical & Chemical reactions of amino acids.

4. Aromatic hydrocarbons.

5. A general study of the following derivatives of benzens:- (a)Nitre, (b) Amino, Sulphonic acides, aldehyles, ketons, mono alcohols & Carboxylic acids.

CHEMISTRY PRACTICAL-II Marks: 25

1. Detection of elements:- Carbon, sulphur, hydrogen, nitrogen, halogens; Oxygen, in inorganic compound.

2. Identification of organic comps. Containing one functional group out of the following:- ethyl alcohol, Isopropyl alcohol. tert butyl alcohol, pheno-acetone.

Acetophnnone, benzophenone, acetaldehyde, formaldhyde, benzaldehyde, formic acid. acetic acid, oxalic acid, benzoic acid, aniline, methyl amine (Analysis should include the following:- (1) Physical examination(ii) Physical constants. (ii) Elementary analysis of detectable elements(iv) Solubility group with the following solvent only (a) Water, (b) 5% solution of sodium bi-carbonate, NaOH & HCL (c) Conc- H_2SO_4 (v) Classification tests (vi) Any specific tests for the above class of comps. etc.)

3. Oxidation, Reduction, titration involving:- (a) Preparation & standerdation of N/10 $KMnO_4$ Sol. with Oxalic or sodium oxalate sol. (b) Determination of ferrous iron with standard $KMnO_4$ Sol.(c) Preparation of standard N/10 $K_2Cr_2O_7$ Sol. & determination of ferrous & ferric iron by using internal indicators.

(d) Preparation of standard N/10 Iodine Sol. & standardisation of $Na_2S_2O_3$

(e) Determination of the available chlorine in bleaching powder.

(f) Determination of the Na_2CO_3 content of washing soda.

(g) Determination of the hardness of water.

Book recommended:

1. A Text Book of Organic Chemistry By: Hafizuddin Ahmed & A.Jabber Mian
2. Organic Chemistry by: P.B.Sarker, E.P.C. Rakshil
3. Organic Chemistry by: I.L.Finar
4. Organic Chemistry by: Morrison & Bajed
5. Advanced Organic Chemistry by: B.S.Bahl & Avun Bahl.

B.Sc. in Textile Technology Ist Year(Part-I)

TEXTILE FIBRES Marks: 50

Fibre. Characteristics of a Textile Fibre. Classification of fibres. History, geographical distribution, cultivation, growth, extraction, yield, grading, structure, composition, properties, characteristics and uses of seed fibres, bast fibres, leaf fibres, fruit fibres, animal fibres and mineral fibres. Brief idea of man made fibres. Trends and potentialities of natural and man made fibres. The importance of Textile fibres and its industry in the economics of developed and developing countries.

Book recommended:

1. Mathew's Textile Fibres - Manersberger.
2. Man-made Fibres - Macrieff.

B.Sc. in Textile Technology Ist year (Part-I)

TEXTILE MECHANICS Marks: 75

Different types of motions of a body. Transmission of motion by wheel and other gearing, belt, rope and chain drives. Conversion of various forms of motion and mechanisms e.g. shedding tappets, thread guides, cams etc into motion. Eccentricity effect of Cranks. Epicyclic gear trains and differential motion. Projectile motion.

Impact of forces, Momentum. Kinetic energy. Work and Power, Springs. Torque and work done by torque. Accelerating and running torques for steady running machines. Torsion and its application.

Moments of forces and its application in Textile machines and industries. Methods of finding the radius of gyration of revolving or oscillating bodies.

Friction, co-efficient of friction and its application, coil friction.

Books recommended:

1. Textile Mechanics by : Hanton
2. Applied Mechanics - A.Z. Khurni
3. Textile Mathematics Vol-II & III - J.E. Booth.

B.Sc. in Textile Technology Ist Year(Part-I)

TEXTILE PROCESSES Marks: 100

A. An introduction to the historical development of Textile Processing industry.

B. Yarn Manufacture:

Introductory study of the basic principles involved in the yarn manufacture from fibrous raw material- Opening & Trash removal in natural fibres, Carding, Combing, Roller drafting. Mechanism of twisting & winding. Survey of spinning practices for various types of fibres.

Introduction to different m/cs. used in spinning operation for different fibres.

Dimension, concept of count,tex. etc. Calculations involving count.

C. Fabric Manufacture:

Flow charts for weaving preparatory processes. Introduction to winding, Warping, Sizing, Dressing, Beaming & M/cs. involved.

Ordinary weaving machines & their mechanisms. Introduction to different types of looms & their special features.

Elements of fabric structure. Introduction to knitting. Dirrerent types of knitting processes.

A brief idea of nonwoven.

D. Fabric Finishing:

Introductory idea of scouring, bleaching, dyeing, printing & final finishing processes for common textiles & M/cs. used for these processes with special references to cotton and jute fibres.

Books recommended:

1. Text - b' Ran' T. N. Bose.
2. Cotton Industry - J.H. Carl Tmac.
3. From fibre to Fabric - A Gale.

B.Sc. in Textile Technology Ist Year (Part-I)

ENGINEERING DRAWING — Marks: 50

Introduction to the subject, planning of a drawing sheet. Lettering. Dimensioning and its principles, working drawing and its requirements, projection and its types, projection of a simple solid, Isometric projection of a typical solid figure. Pictorial projection, oblique and auxiliary planes. section of a cub on horizental and vertical planes; Tangent planes to surface contact, Inter-Pretation. Development of surfaces such as as right circular cone, a truncated cylinder, cylinder, cycloids, epicycloids Hypo-cyloid, and involute of a circle, gear profile, cam profile for rocking lever as follower. Displacement of curves such as sine curve. Design of tappet for plain and twill weaves. Reading of different views of different objects making free-hand sketches of Textile machinery parts. Geometric construction of Textile design.

Books recommended:

1. Geometrical Drawing by I.H. Morries. for Art students.
2. Engg. Drawing By Lombardo, Jhonson Short.

B.Sc. in Textile Technology Ist Year (Part-I)

WORK SHOP PRACTICE — Marks: 50

1. Use of measuring Instruments, filling, chipping, drilling, reaming, and tapping.
2. Exercise on lathe machines such as plain turning, tapper turning and thread cutting.
3. Practice on grinding, shaping and milling machines.
4. Use of carpentry tools, practice on wood working machines such as Bench saw, circular saw, planer and turner. Making of models.
5. Heat treatment of steel such as annealing, normalizing, quenching, tempering and surface hardening.
6. Use of smithy tools such as punching, piercing and joining of metal by forging.
7. Moulding and casting such as Molding Processes and casting processes.
8. Welding such as gas welding and electric arc welding processes and their applications.

Books recommended:

1. Workshop Technology Part-I,II,III By:- Burghardt.
2. Machine shop(theory and Practice) by: Wagnehner, Anthur.

B.Sc. in Textile Technology 2nd year(Part-II)

FABRIC MANUFACTURE -I Theory Marks: 100

Preparatory Processes:

Various systems of yarn preparation. Various kinds of yarn packages, for staple and filament yarns. Principles and mechanisms of non-automatic and automatic winding machines for all types of packages(Cone, Cheese, Pirn etc) Precision winding. Stop motions, yarn clearers, tensioning devices . Winding deffects and their prevention. Package density. Beam and warping processes and mechanisms.

Causes of warp breakages, ingredients of a size mixing, optimum size percentage, methods of application. Different types of sizing machines and their mechanisms. Factors controlling percentage of size added. Relation between warp breakage rate of staple yarn and weight of size added. The breakage-size curve. The shirley automatic sizd box. The sizing of low-twist continuous filament yarn and blended yarn. Solvent sizing, Drafting of sized warps.

Calculations concerning speed, productivity and efficiency of preparatory machines.

Weaving:

Historical development of weaving machines. Basic weaving machinsms. Various types of shedding-Tappet shedding, Shed timing. Beat-up and sley movement. Sley eccentricity and its effect. Double beat-up.Faults caused by bet up. Displacement versus timing curves for sley and Picking-over and under picking mechanisms. Shuttle motion and shuttle flight control. Shuttle box. Shuttle checking - different methods used in single and multiple shuttle boxes. Warp protectors. Weft forks, tempion shuttle guards, selvadge motions. Methods of drawing, twisting and knotting, Take up and let-off motions. Loom drive and brakes.Automatic weft replenishment. Dobby shedding - negative and positive dobbies. Cross-border dobby and cam dobby. Calculations on production, efficiency and take up of cloth in loom.

Knitting:

Weft-knitting:- Definition and distinction from warp. Knitting. Machines. straight-bar; flat;V-bed;sinker-wheel; single-cylinder;hose; superim-posed. Cylinder; half-hose; cylinder-and-dial; interlock; rib; plain; jacquared; garment- length; knitting actions of these machines; specifications and end-uses of their products.

FABRIC MANUFACTURE-IPRACTICAL Marks: 50

Study of contruction & working of (1) Cheese Winding(2) Cone Winding (3) Pirn winding m/cs,.study of contruction & working of warping & sizing machine.

Study of loom mechanisms-timing diagram of all the loom motions,setting of shuttle box & box swell check straps & picking strap take-up motions Weaving of plain, twill, honey comb,etc weave fabrics in hand loom. Practice on Knitting machines.

B.Sc. in Textile Technology 2nd Year (Part-II)

YARN MANUFACTURE-I Theory Marks: 100

Grading & classification of important textile fibres. Characteristics of Textile fibres as considered by a spinner. Ginning. Mixing/Batching: Objects, methods and selection of economic mix/batch. Batching emulsion and its use. Shirley Analyser.

Blowroom:

Principales of opening & cleaning. Detailed study of blow room machinery. Recent developments. Causes of lap wt. variations & their control. Blow room lines for different grades of cotton.

Carding:

Functions & Principles of carding. Detailed study of different types of carding machines for processing different types of fibre. Card clothing/pinning. Stripping and grinding. Recent developments.

Draw Frame:

Objects, effect of doubling, drafting & drawing. Detailed study of different types of drawing frames for processing different types of fibres. Different drafting systems, recent developments.

Irregularity:

Theoretical consideration, causes of irregularities - random fibre arrangement, variation in fibre fineness, imperfect fibre control, drafting wave. Roller slip, roller nip movement, roller eccentricity roller vibration effect of irregularities on yarn & cloth characteristics.

Defects at various stages of the above processes and their remedies. Maintenance, settings, waste extraction and waste control, Calculations of speed pertaining to above machinery and production.

YARN MANUFACTURE -I PRACTICAL Marks: 50

Detailed practical study of Mixing, batching blow room, Carding & Draw frame used in the spinning sequence for cotton & Jute fibre processing. Dismantling & erection of above spinning machines.

Books recommended:

1. Cotton Spinning Vol-I & II .. W.S. Taggart.
2. Manual of Cotton Spinning Vol. I,II, Part-I,Vol.II Part-II,Col.III, Textile Institute
3. Introduction to the study of spinning. W.E. Morton.
4. Compendium study on Modern Jute Technology Part-I, S.Paul.
5. Jute Fibre to Yarn R.R.Atkinsion
6. Jute Spinning H.Ahmed.
7. Carding Jute & Similar Fibre. J.M.Mather.

B.Sc. in Textile Technology 2nd Year(Part-II)

---TEXTILE CHEMISTRY - I Theory Marks: 100

Applied Chemistry:

Water;various impurities, purification,softening for wet processing & other purposes, working of zeolite, water softeners, softening of the main water supply.

Chemicals: Chemistry, properties & uses of various acids, alkalis, , salts, exidizing agents, reducing agents in Textile wet processing.

Detergents: Elementary idea of theory of detergency & general idea of surface active agents in textiles.

Technology of Bleaching:

Chemistry of various inpurities in natural & man-made fibres & their removal, preparatory processess prior to bleaching - singeing, desizing, scouring, souring. Bleaching, methods of bleaching ,Cotton,Jute, silk wool etc. Machines for processing in loose state, packages & fabrics. Defferts & damages in bleaching, their causes & rectification.

Chemistry of Dyes:

Elementary idea or colour & constitution. Classification of dyes. Various theories of dyeing. The chemistry, general classification nomenclature & general properties of direct, basic - acid, mordant, sulphur & vat dyes.

Thchnology of Dyeing:

Dyeing machines for loose fibres, hanks. Packages, for modern fabric developments.

History of dyeing, dyeing processes for different fibres, such as cotton, jute, wool, silk etc. with direct, basic, acid, mordant, sulphur & vat dyes, the effect of various factors on dyeing. Various after treatment processes to improve lustre, fastness,tendering etc. Various dye bath assistants & their functions.Stripping.

TEXTILE CHEMISTRY - I PRACTICAL Marks: 50

Estimation of hardness of water, and different process of hardness removal,Estimation of available chlorine, Practical application or Direct, Acid, Basic mordant, sulphur and vat dyes on cotton,jute, wool and silk. Practical work on various dye house machinery used for dyeing and preparation or cloth for dyeing.

Books recommended:

1. Scouring & Bleaching - E.R. Trotman.
2. Bleaching - J.T. Marsh.
3. Textile Chemical & Auxilaries - H.C. Speel.
4. Dyeing of cellulosic fibres & related processes - Cockett & Milton.
5. Bleaching,Dyeing & Chemical Technology of Textile fibre-E.R.Trotman

...

B.Sc. in Textile Technology 2nd year (Part-II)

FABRIC STRUCTURE AND DESIGN & COLOUR Marks: 100

Basic weaves - representation on point papers. The influence of thread spacing, yarn properties and weaving variables on the fabric produced from a given design. Plains, cords, twills, sateens, strains & derivatives, diced weaves. Drafting & Pegging.

Weaves for special textures - combining weaves, end-and-end & pick-and-pick, transposing ends and/or pick crepe weaves, honey combs. Grecians, Brightons, Bedford cords, welts and piques. Warp and weft-backed cloths. Developing spots and small figured effects by (a) combination of weaves and (b) use of extra warp and/or weft. Inter-changing of warp and/or weft in backed cloths. Sett/Count/Weight calculations for simple woven structures.

Theory of colour. Primary, secondary and tertiary colours. Complementary colours. Hues, tints and shades, contrast & harmony in texture & colours in combination. Colour & weave effect. Origin & basis of patterns from examples of historic & modern fabrics. Enlarging and arrangement of motifs.

Simple & Compound figured twills, standard ground weaves, distribution of spots & figures.

Books recommended:

1. Textile Design & Colour - Watson.
2. Advanced Textile Design - Watson.
3. Grammer of Textile Design - Nisbet.
4. Elementary to Textile Design & Fabric Structure. - Reed.
5. Woven Cloth construction - Robinson.
6. Tant-o-Rang - T.N.Bose.

B.Sc. in Textile Technology 2nd year (Part- II)

TEXTILE TESTING)-I

Theory Marks:75

Introduction; general information and standards; the history of measurement, usefulness of international system; definition in SI; precision of measurement.

Standard methods of test:- Introduction; new standards; revised standards; general information of Bangladesh Standards; other standards;patents.

Sampling for the determination of fibre properties- general requirements; numerical and length-biased samples; extent biased;squaring and cut-squaring; dye-sampling; zoning;tong and core sampling methods for wool. Yarn sampling methods; fabric sampling methods;cloth sampling methods.

The effects of variability:- Introduction, variability, specimen length and strength; variability and other quantities; composite-specimen effects; variability in practice; changes in specimen during test.Equilibrium absorption of water:- Introduction, definitions, measurement of regain; relation between regain and relative humidity; the control of the testing room atmosphere; some factors affecting the regain of textile materials and their properties; conditioning of processes.

Fibre Dimensions: Introduction; fibre length measurement of different fibres. Measurement of fibre fineness; maturity. twist, convolution and nodes of related fibres.

Yarn Dimensions: Limear Density, Court of Yarn number, Yarn count and yarn Diameter; Twist, and Twist Measurement;Yarn Hairiness.

TEXTILE TESTING -I PRACTICAL Marks: 25

Determination of (a) Trash Content of Cotton,

(b) Fibre length.

(c) Fibre fineness, (d)Maturity ratio of Cotton Fibre.

(e)Hank Sliver & Rove.(f)Count of yarn in Textile English Count,Continental & other system.

(g) Lea count by knowles balance,(h)Lea strength by lea strength tester.(i)Twist of single & doubled yarns.

(j) Single yarn strength & extension by pendulum lever tester.

(k) Yarn count from (i) Small sample,(ii)Fabrics.

Books Recommended:

1. Principales of Textile Testing - Booth.

2. Textile Testing - Skinkle.

3. B.S.I. Hand Book No.1.

B.Sc. in Textile Technology 2nd year(Part-II)

POLYMER SCIENCE. Marks: 50

Polymerization and its classification; cellulosic fibres; chemical constitution; effect of acid, alkalies, heat and light; oxidation of cellulose with oxidizing agents.

Derivatives of cellulose:- Cellulose esters and ethers. Viscose and acetate rayons.

Protein fibres:- Chemical constitution of wool and silk, chemical raction of Wool:- treatment with water, steam, acids, alkalis and oxiding agents. Action of light. Chemical reaction of silk. Regenerated protein fibres. Synthetic fibres. Criteria of fibre forming polymers. Chemical constitution of Polymides:- Nylon 6, Nylon 6.6, aromatic Polyamides, Polyolefins, Polyvinyl alcohol and polyvinyl chloride fibres. Chemical properties of these fibres.

The Polymer - natural of man-made; fibrous molecules; Molecular weights of fibres; kinds of molecular weights of polymers-number average molecular weight and weight average molecular ~~xxixh~~ weight.

Viscosity; end groups; chain length. Synthesis of fibres; stereoregular fibrous polymers-two dimensional and three dimensional regularity in polymers.

Orientation and crystallinity; crystalline regions; degree of crystallinity; degree of orientation; the influence of orientation on fibre properties; unfolding of molecules.

Crystallization and melting of polymers; the glass transition; elasticity of solid polymers in rubbery, crystalline and glassy form. Depolymerization, polymer degradation and chemical modification; fibre properties and performances.

Books recommended:

1. Man-made Fibre - Moncriff.

B.Sc.in Textile Technology 2nd Year (Part-II)

STATISTICS Marks: 100

1. Historic development of the subject.
2. Presentation of data - Tabular and Diagramatic
3. Frequency distribution, Grouped frequency distribution and their presentation in the form of frequency polygon and Histogram.
4. Measures of central tendency:-
   (i) Mean(a)Arithmatic Mean,(b)Geometric Mean,(c)Harmonic Mean
   (ii) Median, (iii) Mode.

Their Definition, computation, Advantage, Disadvantages & uses.

5. Measures of dispersion:-
   (i) Range, (ii) Mean Deviation,(iii)Quartile Deviation,(iv)Standard deviation (v) Skewness & Kurtosis.

Their Definition, computation, uses.

6. Correlation:-
   (i)Correlation co-efficient, (ii) Spearman's Rank Correlation co-efficient.
7. Time Series:
   (i) Definition, characteristics & components (ii) Measurement of tread by (a) Method of moving average.(b) Method of least squares.
8. Sampling:- Definition of population, sample, parameter and statistic etc.
   (i) Simple Random Sampling, (ii)Stratified Random Sampling.

Their Definition, computation, use, advantage & disadvantage.

9. Tests of Significance:
   (i) t- Test:-
   (a) Comparison of a sample mean with a known population mean when S.D. is known and when S.D. is not known.
   (b) Comparsion of two sample means when S.D. is known and also when it is unknown.
   (c) Paired t - Test, its practical use in Textile Industry.
   (ii) X^2 - Test - Simple application and its practical use in Industry.
10. Probability:- Simple idea of probability.
11. Distributions:-
   (i) Binomial, (ii) Poisson,(iii) Normal,.Calculation of their Mean and standard Deviation.
12. Design of experiments.

Books recommended:

1. Basic Statistics - Goon, Gupta, Dasgupta,
2. Statistical methods in Accountancy Commerce & Economics - N.G.Das.
3. Basic Statistics - Nagar & Das.

B.Sc. in Textile Technology 2nd Year (Part-II)

ELECTROTECHNICS Theory Marks :- 50

Direct Current:

Generators and their characteristics. Motors and their characteristics Curve. Alternating current: Alternating voltage and current, vector representation of alternating quantities. Flow of A.C. through coils. Inductance and resistance in series, and in parallel. Flow of A.C. through capacitance. Inductance, resistance and capacitance in series series and and in parallel. Power in A.C. circuits. Power factor, and power factor improvement. Resonance circuit Transformer. Polyphase currents in circuit. Production of rotating magnetic field. Induction Motors. Speed control of Inducting Motors.

Electronics:

Free electrons. Thermionic emission. Directly heated emitters. Indirectly heated emitters. Diodes, characteristics of diodes and rectifier. Diodes with condenser input level. Diode detector. Bridge rectifier. Diode filter or smoothing circuit. Voltage doubling. Triodes characteristics. Triode as an amplifier. Distortion. Tuned circuit Parallel resonant direcuit. Voltage amplification. Power amplification. Photocells. Junction Diode. Transister.

ELECTROTECHNICS PRACTICAL Marks: 25

D.C. circuits:- Study of D.C. series generator and characteristic curves or current and E.M.F. Study of a D.C. shunt generator and characteristic curves of current and E.M.F. Efficiency of a D.C. machine by retardation method & graphs of load current and efficiency. Efficiency of D.C. machine by Swinburns test, graphs of load current and effeciency. Characteristic curves of Torque, Flux, and speed against current for a D.C. Series motor, characteristic curves of Torque, Flux, and speed against current for a D.C. shunt motor. Speed control curve of a D.C. shunt machine by ward leonard method. Speed control curves of a D.C. motor by filed control method. Speed control curve of a D.C. motor by series parallel control method. Vector diagram from the readings taken from a circuit containing resistance and inductance in series. Vector diagrams from the readings taken from circuit containing resistance & capacitance in series. Measurement of powdr consumed by an inductive load by 3 watt mater method. Measurement of power consumed by a inductive load by 2-watt-meter method. Measurement of power consumed by a inductive load by 1-watt-meter method. Delta-Delta, star-delta, and Star-star connections, with 3 phase transformer and voltage relation on each side and efficiency. Study of mercury Arc Rectifier. Performance characteristic(graph, between efficiency and current) Study of Diode as Rectifier and relation between the out-puts. Study of bridge Rectifier-Illumination:-Determination of the mean horizontal candle power (M.H.C.P.) Determination of mean spherical candle power (M.S.C.P.) Determination of relation of candle power to watts consumed and candle power to volts applied for the given bulb.

B.Sc. in Textile Technology 3rd Year(Part-III)

YARN MANUFACTURE - II Theory Marks: 100

Comber:

Objects, comber lap preparation- different systems & their effects. working principles of different types of combers, comber waste and waste control. Recent developments.

Speed Frame:

Objects, detailed study of fly frames as employed in the processing of short & long vegetable fibres. Theory of flyer spinning - drafting, twisting & winding. Differential motion and building motion. Ordinary & modern drafting systems, & recent developments.

Ring Frame:

Objects, Brief study of Mule spinning. Theory of Ring spinning machine. Detailed study of Ring frame. Drafting systems. Principles of twisting & winding, study of cop building & bunching motion for direct weft spinning. Different forces acting on the traveller & their effect on the yarn. Factors affecting optimum spindle speed. Faults in Ring spinning & their remedies. Causes of end-breakage in Ring spinning. Recent developments. Maintenance. Calculations.

Doubling & Reeling:

Study of doubling & twisting machines. Different systems of doubling. Folded yarn, fancy yarn & sewing thread manufacture. Reeling & bundling of yarn. Spin plan.

Brief study of woollen worsted and silk yarn manufacture. Faults at the various processing stages and their remedies.

Maintenance. Settings, waste control. Calculations pertaining to above machinery and productions.

YARN MANUFACTURE -II PRACTICAL Marks: 50

Detailed practical study of comber, speed frame, Ring frame, Doubling, Reeling & bundling machine used in the spinning, sequence for cotton & Jute fibre processing.

Dismantling & erection of above spinning machine.

Books recommended:

1. Manual of Cotton Spinning - Textile Institute. Vol-IV Part-I & II, Vol-V.
2. Theory & Practice of Jute Spinning- Lawson & William.
3. Introduction to Jute Spinning - S.N. Kar.
4. Wollen & Worsted Yarn Manufacture - A.W.Radchiff.
5. Theory of Flax Spinning - A.V. Pingle.
6. Worsted Drawing & Spinning - H.Walker.
7. Cotton Spinning - Vol-III - W.S. Taggert.

B.Sc. in Textile Technology 3rd Year (Part-III)

TEXTILE CHEMISTRY - II Theory Marks: 100

Chemistry of Dyes:

The Chemistry, general classification, nomenclature & general properties of Azoic, Aniline Black, Mineral Colorants, onium Reactive dyes & Pigments.

Technology of Dyeing:

Dyeing processes for different fibres such as cotton, jute, wool & silk with Azoic, Aniline Black, Mineral colorants, onium, Reactive dyes & Pigment. The effect of various factors on dyeing, various after treatment processes to improve lusture, fastness, tendering etc. variuus dye bath assistants & their functions, stripping.

Technology Printing:

Printing materials & equipments, different methods of printing block, spray, screen & machine printing of different textiles, styles of printing, machine used for printing, ageing etc. Printing processes for different fibres with direct, basic, acid, mordant, sulphur, vat, azoic aniline black, onium, Reactive dyes I pigments. Assistants used in Printing & their functions. Printing faults & their remedies.

Technology of Finishing:

History of finishing chemicals, agents & auxilaries used in Textile finishing, finishing processes, temporary finish, chemical finishing with traditional finishing agents, & disalvantages, Physical or Mechnnical finish- calendering, embossing, raising etc. Finishing machineries & their developments - semipermanent finishing with modified starches, water soluble cellulose esters and nemiresins.

Permanent finish - mechanical - antishrink, chemical -

1. Swelling & dispersion - mercerisation & parchmentisation.
2. Deposition of cellulose & its derivatives, synthetic lattice.
3. Resins - various exteenal & internal application for anticrease, antishrink, water repellency etc.

Different finishing for jute goods.

TEXTILE CHEMISTRY-II PRACTICAL Marks: 50

Printing different fabric with Direct, sulphur, vat Azoic, Aniline black & Pigments, solubilised vat using different methods. Starch finishing & calendering, shower, water & fire proofing.

Books recommended:

1. Bleaching, Dyeing & Chemical Technology of Textile Fibres-E.R.Trotman.
2. Dyeing Fibre Blends - Cheethams.
3. Physical Chemistry & Dyeing - Vickerstaff.
4. Advances in Textile Processing - Lyun.
5. Chemical Technology Dyeing & Printing - Diserence
6. Principles of Cotton Printing - Kelc.
7. Principles of Practice of Textile Printing - Knecht.
8. Introduction to Textile Finishing - J.T. Marsh

B.Sc. in Textile Technology ~~Part-III~~ 3rd Year(Part-III)

FABRIC STRUCTURE AND ANALYSIS Marks: 75

Double cloths(self & centre warp stitched) welding in backed & double cloth. Warp & weft pile structures including terry towels. Gauze & lene fabrics. Introduction to Brokade, Damark & Tapestry Fabrics.

Planning elaborate figured styles for dobby and jacquard looms, by weave combination in single cloths, by use of extra warp and/or weft yarns, by interchanging yarns in backed and double cloths. The basis of figuring in multiple warp and weft structures. Sett/Count/ weight calculations for compound woven structures.

FABRIC STRUCTURE AND ANALYSIS PRACTICAL Marks: 25

General procedure in the analysis of single and compound cloths and the completion of weaves from partial analysis. Determination or yarn counts, sett, reed width and warp length for the reproduction of fabric samples of all types - natural and man-made, staple and continuous filament. Factors affecting dimensional changes in fabrics, practical tolerance limits when reproducing fabric from a given sample. Setting of cloths, unbalanced in sett and/ or count and the application of these rules for the calculation of sett in a given count and weave and for various weights and end uses. The application of the variables affecting count, sett and weight for the calculation of sett/count/weight in similar or modified cloths. The practical setting of compound structures. Knitted fabrics: General procedure for the analysis of knitted fabrics. Practical relationships between machine gauge, yarn count, and knitted stitch length. Calculations of weight of knitted fabrics.

Books recommended:

1. Advanced Textile Design & Colour - Watson.
2. Grammer of Textile Design - Nisbet.
3. Elementary to Textile Design & Fabric Structure - Reed.
4. Weaving Calculation - Seugupta.

B.Sc. in Textile Technology 3rd year (Part - III)

TEXTILE PHYSICS - I Marks: 100

Theories of mechanical properties: A variety of approaches; theories of time-dependence; structural effects; thermodynamic effects.
Mechanical properties of fibres: Terminology and definition; tensile tests - experimental methods - results; fibre fatigue and damage; compressibility and resilience; fibre entanglement; fibre friction; swelling; shrinkage; torsion; bending.

Optical properties of fibres: Introduction; reflection; refraction; absorption and dichroism; lustre.

Dielectric Properties: General introduction; electronic properties of solids, conductors and insulators; definition of dielectric properties; measurement; the effect of frequency, moisture, temperature and other factors; results.

Electrical Resistance of Textiles: Introduction; definitions; methods of measurements; results of experiments; theoretical considerations.
Static Electricity: Introduction; theories of static electrification, measurement of static charge; results and explanation of the phenomenon of static electrification in textiles and its remedies in textile processing.

Thermal Properties: Introduction; thermodynamic laws; Molecular motion and temperature; thermal parameters; theories of heat transfer and their application to the thermal properties of fabrics; structural changes in fibre on heating; energy changes associated with changes of state including transition temperatures of fibres.

Setting of Fabrics: Introduction; characterization of set; physics of setting; mechanism of setting; set by chain stiffening; set by interchain bending; set by crystallization; set by chemical reaction; types of chain interaction; set within fibres; the action of force; the whole fibre; between fibre effect - bonding between fibres.

Fibre Friction: Introduction; Measurement of fibre friction; Empirical results; Nature of friction; The friction of wool and other fibres.
Fibre moisture region.

Books recommended:

1. Mechanical Properties of Textile Fibres
2. Physical properties of fibres - W.F. Morton & J.W.S. Hearle
3. Experiments of Fibre Physics - Beevers

B.Sc. in Textile Technology 3rd Year (Part-III)

TEXTILE TESTING -II Theory Marks: 75

Fabric dimensions:- Fabric length, fabric width; fabric thickness; threads per inch in woven fabric; crimp of yarn in fabric, tensile strength of fabric, air permeability, fabric stiffness, handle and drape; crease resistance and crease recovery; serviceability, wear and abrasion resistance; the pilling of fabrics; flammability; water and fabric relationships. Carpet testing:- durability of carpets; carpet thickness; carpet compression.

Evennes Testing:- Introduction; the nature of irregularity; index of irregularity; methods of measuring and assessing irregularity;electronic capacitance tester; photoelectric tester; causes and effects of irregularity; interprentation of the results of irregularity; determination of periodic variation; the location of the sources of periodic faults; instruments used in fault location; miscellaneous testing instruments such as tension meter, stroboscope, tachometer, neb counting.

Estimation of damage to fibre materials. Determination of amount of size & filling in textile fabrics. Identification of dyes in substance & fibres. Colour fastness tests. Analysis of finishing agent.

TEXTILE TESTING -II PRACTICAL Marks: 25

Determination of (a) Fabric weight/unit area.
(b) Size percentage in fabric.
(c) Cloth thickness
(d) Porosity of fabric.
(e) Fabric strength(Strip & Crab method)by CRT method.
(f) Abrasion resistance of fabric
(g) Fabric crease recovery,tearing strength,water repellency,water absorption.

Carpet Testing,
Identification of fibres from a given sample(single or blended)

Books recommended:

1. Principles of Textile Testing - Booth.
2. Textile Testing - Skinkle
3. Textile Testing - Lomax.
4. B.S.I. Hand Book No. 1
5. Carpet Testing - WIRA.

B.Sc. in Textile Technology 3rd year (Part-III)

MAN MADE FIBRE PRODUCTION

Marks: 50

Introduction to the production of man-made fibres. Principles of melt spinning, dry spinning and wet spinning. Viscosity of melts and structures. Drawing and Moulding of fibres. Machinery for the production of man made fibres. Main features for the production of some important fibre forming polymers e.g. viscose, cellulose acetate, polyamides, acrylic and polyester fibres. Bicomponent and multicomponent fibres - their production and properties. Elastomeric fibres their production, structures, properties and uses. Carbon fibres: Precursors, carbonization, graphitization, structure, properties and uses.

Composite fibres, glass fibres and metallic fibres - their production, properties and used in textile and related industry. Economic and social aspects of man made fibres.

Books recommended:

1. Man-made fibres - Moncrieff.
2. Man-made fibres, Vol-I(Science & Technology)Mark,Atlas & Cernin.
3. Processing of Polyester Cotton Blends- Trivedi & Kulkarhi

B.Sc. in Textile Technology 3rd Year (Part-III)

INDUSTRIAL MANAGEMENT - I Marks: 100

Management Principles:

Evolution:- Contributions to management thoughts and the evolution of methods: F.W. Taylor, F.B. Gilbreth, Gantt, Fallett, Henri, Fayol, E.S. Rowntre etc.

Concept of organisation, administration, scientific management, duty, responsibility, accountability, authority, delegation, and delegation of authority. Specialisation.

Principles and Functions of Management - Planning, organising, Directing, motivating, coordinating, controlling, communicating and decision making.

Leadership and its development- qualities, duties and responsibilities of a Manager, Factory Manager, personnel Manager, supervisor etc. Levels of authority and responsibility.

The place of coordination and communication in Managements.

Personnel Management:

Concepts: Policy, structure and functions of personnel Department. Line organisation, Line and staff organisation and functional organisation, Manpower Planning, recruitment, interviewing, selection, training.

Job Evaluation: Bases of wage systems, method employed in rate setting. Advantages of job analysis and evaluation. Techniques of job evaluation, an analysis of methods used in grading jobs. Development of job specification, salary grading.

Employee Discipline and grievance handling procedures.

Remunerating human resource. Incentive systems. Time and piece work methods. Bonus schemes. Other financial incentives to output efficiency. Non-financial incentives.

Organisation of employees and work-people, ILO, trade union organisation, Collective bargaining. Labour welfare, trade disputes, joint consultation, Conciliation Industrial Accidents Bangladesh Factory Act, Labour Act and Workers compensation act.

Production Management:

Production Functions. Types of Production, Factors of Production- Production Planning & Control - Plant Location and Layout. Materials Management. Maintenance Management, Organisation and Production Planning for Process and Engg. enterprises.

Books recommended:

1. Management Control Manual for Textile Industry - Enric, N.L.
2. Time study manul for Textile Industry - Enric, N.L.
3. Personnal Administration by Pigores & Myers.
4. Management of organisation - H.G. Hicks.

B.Sc. in Textile Technology 3rd Year(Part-III)

FABRIC MANUFACTURE - II Theory Marks: 100

Weaving:

Multiple shuttle box motion. Pick-at-will motions. Mechanisms, for producing Terry-Pile fabrics.

Jacquard Shedding:

Ordinary, Cross-bordered & fine-pitch on jacquards & their mechanisms & working principles. Harness ties, casting out, card cutting; different types of automatic looms, feelers, Warp stop & weft. Stop motion. Box loader, loom winder.

Time studies in weaving & calculation of Weavers load, running, attained & over-all effeciencies. Warp & weft breakages in weaving & their causes. Cloth costing.

Cloth faults & remedies.

Knitting:(Weft Knitting):-

Types of needle; machine gauge; cum systems. Positive-yarn-feeding systems. Instrucments used in testing and quality control of knitted fabrics & garmets.

Warp-Knitting:

Definition & distinction from weft-knitting. Tricot machines, machine with upto four guide-bars; multi-bar machines; machines with special attachements knitting actions of these machines; specifications & end uses of their products.

Raschel machines, single-needle bed; double-needle bed; high & low bar Jacquard; curtain-net-raschel, multipurpose machines; machines with special attachements; knitting actions of these machines; specification & end-uses of their products.

Types of needle; function of various knitting elements; machine gauge, let-off motions; methods of drive.

Mechanisms & methods for achieving fabric specifications; run-in measurement.

Non-Woven:

Definition, production & properties of main-types of non-woven fabric including bonded-fibre fabrics, stitched bonded fabrics & needle-loom fabrics.

FABRIC MANUFACTURE - II PRACTICAL Marks: 50

Study of Drop-box looms:- Box setting, chain building, Dobby lag pegging & cloth weaving, jacquard card cuttin for cloth weaving. Study of loom machineries.

Books Recommended:

1. Automatic Weaving- Hanton., 2. Modern Developments in Weaving- Dux Bury. 3. Advanced Textile Design- Watson, 4. Warp knitting Technology-D.F. Paling. 5. An Introduction to warp knitting - D.B.G.Thomas, 6. Dubied knitting Manual-1967. 7. Advanced Knitting Principles - NKOA, 8. Nonwoven Textile-Paper. 9. Non woven Fabrics - F.M. Buresh.

B.Sc. in Textile Technology 4th Year(Part-IV)

TEXTILE PHYSICS - II Marks: 100

Fibre structure:- General introduction; Methods of investigation of xtrx structure; The problem of fibre fine structure; Natural cellulosic fibres; Regenerated and modified celluloses; Protein fibres; Synthetic fibres; Conclusions.

Physical methods of investigating fibre structure with

Light Microscopy: Introduction; Instrumentation; Techniques; Application to fibres; Special Tests.

Electron Microscopy:- Introduction; Instrumentation; Techniques; Applications to fibres.

X-Ray Diffraction:- Introduction;Instrumentation;Techniques;Cellulose Fine Structure; Crystal Form and Dimensions; Degree of Order; Size of the ordered Regions; Orientations.

Relatings between the molecular structure and physical properties of some natural and man made fibres.

An Engineering Approach to Textile Structures:- Introduction; Textile Properties and Textile Structures; On structural Mechanics of Fibres; Mechanics of simple yarn structures: Blended Yarn Structure. Mechanics of Bent Yarns; Tersional buckling; Yarn bending and buckling in fabrics; Geometry of fabric structures Deformation of woven fabrics;Bending Deformation in fabrics.Nature of yarn Rupture: Breaking extension of Yarn; Yarn Tenacity; Work of Rupture of Yarn.

The Geometrical properties of plain clothes:- Introducting; The calculation of the Geometry Knowing the Crimp Ratio and Thread spacing; The Ge Geometry of the Jammed condition; The geometry of the Non-plain fabrics; The concept of similiar clothes; The application of cloth Geometry.

The tensile properties of woven fabrics:- Introduction;Geometrical changes during the extension of clothes; The load-extension modulus; The Gereralised modulus of a fabric; conclusions.

Books recommended:

1.Structural Mechanics of Fibre, Yarn & Fabric - Hearle,Crosberg,Baker.
2.Mechanical Properties of Textile Fibres, ed.R.Meredith.
3.Physics of fibres by H.J. Woods.
4. Physical Properties of fibres by W.E.Morton and J.W.S.Hearle.
5. Moisture in Textiled edited by J.W.S.Hearle and RH.Peters.
6. Physical Methods of Investigating Textile edited by R.Meredith& J.W.S.Hearle.

B.Sc. in Textile Technology 4th Year(Part-IV)

QUALITY CONTROL Theory Marks: 75

Historical background of the development of Statistical Quality Control (S.Q.C.)Definition and purpose of statistical Quality Control(S.Q.C.) Standards for Textile materials(A.S.T.M.,B.S., Indian Standards, and Bangladesh Standards).

Control Charts:

(i) for Mean (ii)for range (iii)for fraction defectives,(iv) for number defectives(v) for number of defects per unit and (vi)Modified Control charts.

Quality Control in Textile Industry.

(i) Control of Yarn Quality.
(ii) " " Fabric "
(iii) " " Bag "
(iv) " " Twine "
(v) " " Wastage "

Snap reading; techniques & uses.

Interpolation and extrapolation,Acceptance sampling,Analysis of variance. Duties and responsibilities of quality control officers. Tests of significance. Analysis of correlation.

Considerations for evolving a system for process control. Control of mixing; quality & cost, waste & cleaning in blowroom & carding, comber waste. Measurement & analysis of productivity. Control of yarns count, strength, evenness & imperfection. Statistical interpretation of data. Case studies. System of process control for weaving measurement & control of quality, productivity & waste in winding, warping, sizing, drawing, weaving, control of consumption of accessories of the above machines. Case studies.

Importance of testing of dye stuffs, chemicals & auxiliaries. The importance of keeping standards & the various factors responsible for deviation from standards. Curative & preventive measures for quality control.

QUALITY CONTROL PRACTICAL Marks: 25

(i) Performing practical on serial number 6,4,7,9,11,12 above.
(ii) Visit to mills to have knowledge on mill practice of quality control of (a) a Jute Mill (b) a Cotton Spinning & weaving Mill (c) a Dyeing & finishing mill (e) a carpet mill & submit report.

Booksrecommended:

1. Outlines of statistical methods used in Textile Industry-Beerly & Cox.
2. Process Control in Cotton Spinning - Grade, A.R.
3. A Manual of Quality Control in Spinning - Ratman.
4. Handbook of Textile Testing & Quality Control - E.B.Grover.

B.Sc. in Textile Technology 4th Year (Part IV)

Specialized Textile Products — Theory Marks: 75

Industrial Fabric Classification, Detailed study of Construction Particulars, principles, Mechanisms & Machines used for the manufacture of Rope, Carpet, Tufting/Braid, lace, Nets, Filter, Type, Belting, Laminates/Toilet fabric, Quilting, Tapestry, Muslin, Lappet & Swivel and their end uses.

Specialized Textile Products Practical — Marks: 25

1. Analysis of different types of carpets and ropes.
2. Designing card cutting and lacing of Jacquard; Designs suitable for carpets.
3. Visit to carpet mills and observe the running of carpet looms.
4. Handling the carpet loom and maintenance of carpet producing machinery and equipment.
5. Handling the twist frame, laying machine and cabling machine.
6. Handling the braiding and lacing machines.

Books recommended:

1. Braiding, Braiding Machinery
2. The Technology of Cordage Fibre & Ropes - Darid Hanmid
3. Tape yarns - D.C. Hossack
4. Modern Carpet Manufacture - A. Crosslant
5. Applied Textiles - E. Linton

B.Sc. in Textile Technology 4th Year(Part-IV)

MILL ENGINEERING & ORGANISATION. Marks: 100

1. Steam raising plant:
   Boiler and its types, combustion and draught, properties of steam, steam for power and process work, thermal insulation of steam pipes.
2. Power Plants:
   Steam engines, gas and turbine engines. Diesel engines.
3. Supply and Distribution of electrical energy to Textile Mill.
4. Mill Illumination, heating, ventilating and humidifying systems.
5. Elementary strength of material as applied to Mill construction:- Stress-strain analysis, stress - strain diagram of a mild steel and hard steel. Mechanical properties of materials, shear force and bending moments.
6. Pump, its types, characteristics and application:- (1) Centrifugal, (2) Rotary, (3) Reciprocating, (4) Oil Pump, (5) D-Turbine.
7. Conveyors used in Textile Mill - Belt conveyors, chain, crane, fork lift truck, conveyors, pneumatic and over head crane.
8. Fire hazards and preventive systems.
9. Lubrication:- Properties and importance of lubricants, Cost of lubricants.

Organisation:

Selection of site, Planning of factory buildings, different types of factory building suitable for Textile Mill. Planning, Layout & balancing of machineries of Textile Mill. Transport systems used in different departments of Textile Mills. Staffing. Maintenance & Cleaning. Replacement theory. Machine interference. Case study of BMR of a Textile Mill.

Books recommended:

1. Heat Engines - Pandya & Shah.
2. Elements of Mechanical Engineering - Patel & Karmchandani.

B.Sc.in Textile Technology 4th Year (Part-IV)

INDUSTRIAL MANAGEMENT-II Marks: 100

Management Economics:

Basic concepts in economics - Utility of goods, wealth, Value, Price & want. Theory of utility of supply & demand. Elasticity of supply & demand. Problems of allocation and investment study. Capital budgeting decisions.

Management Accounting:

Single entry and double entry system, journal, Ledger, Partnership, share, Joint stock company. Manufacturing, trading, and profit & loss accounts. Balance sheet. Elements of cost accounting, overhead costs, standard costs. Cost control and cost reduction. Budget and Budgetary control, Budget fore casting. Stock taking and control of stock and stores. Planning Techniques profit planning, strategic planning. Management control structure, Product Planning and control. Management information systems and Managerial Accounting.

Analytical Management Techniques:

Procedure and application of Analytical Techniques. Linear Programmin. Transportation. Simulation, Queing theory. Network Analysis-PERT/CPM, Method study and Flow Chart. Work Measurement. Time study - technique of making study, Rating, Skill, effort idle time, fatigue and working conditions. Standard data - methods of determination and uses. Activity sampling.

Marketing Management:

Marketing functions. Marketing Tools. Purchasing Policy. Sales. Forecasting and sales programme. Pricing of Products, Product Mix. Channels of Distribution. Sales Promotion and Advertisement. Consummen behaviour, product planning and Development. Export Marketing. Marketing Research. Marketing Organisation.

Books recommended:

1. An Introduction to work study by I.L.D.
2. Economic & Introduction to its Basic Principles - J.K. Mitra.

B.Sc. in Textile Technology 4th Year (Part-IV)

ADVANCED CHEMICAL PROCESSING. Theory Marks:100

Advanced surface Active Agents:

Surface active agents, Chemistry, Preparation, General classification and properties, nomenclature, mechanisms and theories of detergency. Evaluation of detergency.

Advanced Technology of Bleaching:

Desizing:-bromite desizing, scouring:-solvent scouring, pressure-loc or vapour loc bleaching:-ultra rapid continuous bleaching, fluorescent brightening agents-Chemistry, classification, general properties, nomenclature, machinsm of brightening, application to various fibres, effects of various factors on brightening, fastness, evaluation of fluorescence. Bleaching of man-made fibres and their blent's , evaluation of bleaching.

Colour Chemistry:

Nature of light and colour, substractive and additive method of colour measurement, Timtometer, colorimeter and Spectrophotemeters, Brightness and Lusture, instruments for mensuring brightness and lusture, instrumental shade match.

Physical Chemistry of Dyeing:

Dye Solution, diffusion of dyes in Textile fibres, dyeing equilibrium kinetics of dyeing.

Advanced Technology of Dyeing:

Chemistry, Classification, nomenclature and general properties of disperse dyes; Principle, application and Dyeing processes for man-made fibres and their blends with different classes of dyes, the effects of various factors on dyeing, various after-treatment processes to improve fastness and tendering, various dye bath assistants and their functions, stripping, solvent dyeing of texturized textiles, dyeing faults, causes and rectification, testing of dyed materials-fastness tests and standards, indentification of dyes; purfication and estimation of dyes.

Advanced Technology of Printing:

Screen-preparation and application, flat and rotary screen printing machines;.Transfer print-preparation,application,advantages and disadvantages over convention block print,metal print,pigment print.

Advanced Technology Finishing: Resins-Chemistry,general classification, preparations, properties,nomenclature,application,effects of various factors,advantages and disadvantages;.Ammonia-mercerisation,Physical & Chemical aspects,application, machineries,advantages and disadvantages over conventional. Flamerepellency,soil and stain,repellency,antibacterial & antifungal finishes,permanent press;solvent finish,lamination and coating.

PRACTICAL Marks: 50

Measurement of fluidity of fibres,Determination of cunumber,Determination of Methylene Blue number, Identification of hydro cellulose and oxycellulose. Identification of dyes,Purification and estimation of dyes, estimat estimation of alkaline damage to dyes,fastness tests.Application of different finishing;Bleaching materials to improve the quality.Application of disperse dyes on synthetic fibres.

ADVANCED YARN MANUFACTURE

Short Staple Spinning: 30 Lecture.

Control of mixing cost & quality 1

Further study on the modern trend and developments of Ring Spinning machinery form Blow room to Bailing. 2

Standardization of hanks. speeds, settings. Trash content, cleaning efficiency, nep content and CV% at various stages of yarn manufacturing processes for different counts. 3

Waste control in Blow Room, Carding and Comber & at other stages of yarn manufacture. 2

Theory of Ring Spinning, Theory of end-breakage, Mechanics of fibre entanglement & hook formation during carding. Teeoretical analysis of fibre opening & fibre transfer in carding. Hook removal in drafting. 5

Detailed study of the processing of man-made staple fibre viz Viscose rayon, Polyester & Acrylic fibre & their blends with cotton on Cotton Spinning machinery. Properties of blended yarn. 5

Detailed study of the Modern Spinning systems:- Open-end Rotor Spinning Wrap spinning, Air-jet Spinning, Friction spinning & other latest techniques of yarn production. 5

Study of the characteristics of yarn to be considered for the evaluation of yarn quality. 1

Waste Spinning. 1
Planning of a spinning mill. 2
Labour & work load in spinning. 1
Implementation of process control in short staple spinning. 2

Long Staple Spinning: 30 Lectures:

Study of the modern method of softening, cleaning and up-grading of low-grade Jute and Mestha. 2

Modern developments in batching emulsion, application and carding processes. 3

Types of modern drawing frames:-(i) Spiral (ii) Push-bar. Modern developments in jute drawing systems. 2

Detailed study of modern Jute, Flax, Wool spinning ststems. 3

Types of modern drafting systems as used in long staple fibre spinning:-(i) Apron draft system (ii) F.L.T.M. Double apron draft system. 3

Factors considered for the production of different qualities and counts of jute yarns. 2

Faults in yarns. 1

Reasons for yarn breakages. 1

Yarn cost factors. 1

Production of 'Stainless' and C.B.C. Yarns. 1

Manufacture of jute blended yarns on the different spinning systems. 1

Properties and end-uses of blended yarns. 1

Recent developments in long staple spinning machinery and processing technology(Repco,Spingard, Wrap-spun,core-spun, Twist-less ect.) 2

Planning of jute spinning mills to produce yarns for standard Jute fabrics. 1

Treatment of cuttings.(Mackie & Fraser systems). 1

Waste recovery. 1

Dust extraction and utilisation of wastes(traditional and Non-traditional uses) 1

In-process control factors in jute spinning mills. 2

PRACTICAL: 2 x 12= 24 Lec.

Practical processing of different counts of cotton or blended Yarn &or a small samples of cotton or man-made staple fibre and a complete analysis of the yarn specimens together with details of manufacture,commercial application,interpretation of its results for statistical evaluation. Maintenance of different machines involved in cotton yarn manufacture.

2 x 12 = 24 L

Practical processing of different counts of Jute or blended yarn from a small samples of jute fibre and a complete analysis of the yarn specimens together with details of manufacture,commercial application,interpretation of its results for statistical evaluation. Maintenance of different machines involved in jute yarn manufacture.

Books recommended: ---ooo---

1. Processing of Polyester fibre blends-Trivedi & Kulkarini
2. Polyester blends spinning Vol-I to III-Jagannathan.
3. Spinning in 70s -P.R.Lord. 5. Rotor Spinning-Dyson.
6. The Yarn Revolution 1976-Textile Instt.
7. New Ways to produce Textile 1972-Textile Instt.
8. Process Control in Cotton Spinning-A.R.Grade&T.A.Subramaman
9. Cotton Spinner's Hand Book-R.Jagannathan.
10. Textile Mill Technical Data Book- R.Jagannathan.
11. Manual of Cotton Spinning-Vol-I to Vol-V
12. Textile Journals.
13. Jute-fibre to Yarn. by R.R.Atkinson
14. Carding-Jute and Similar Fibres-by J.N.Mather.
15. Fibre and Yarn Quality in Jute Spinning-by Dr.HIP Stout.
16. A Manual of Process quality Control in jute manufacture-by R.R.Atkinson.

ADVANCED FABRIC MANUFACTURE

Weaving: 60 Lectures:

Study of interrelationships between winding rate, winding-on diameter, surface velocity, yarn traverse velocity, net winding velocity & angle of wind. Average angle of wind, increase in cone and spool diameter, relation between traverse velocity & diameter in the uniform build of cone and spool. 3

Introduction to balloon theory. Tension variation during unwinding of cone, pirn cop, and spool. 1

Comparative study of different techniques of sizing and dressing: Slasher, solvent, foam, electrostatic, hot melt, high pressure, polymer emulsion & combined sizing. 3

Desadvantages of sizing. 1

Analysis of weaving performance of sized yarn. 1

Description of attempts to substitute sizing operation. 2

Shirley picking & take-up mechanism. 2

Differences between conventional & un-conventional looms. 12

Classification of Modern looms. 1

Sulzer loom:- Features, picking & beating-up mechanisms, mechanism of weft insertion, advantages of sulzer loom over conventional loom. Weft withdrawal systems in modern looms. Weft patterning in sulzer loom. 4

Jet Loom:- Features, Mechanisms of weft insertion, control of jet flow, Reasons for inclination of warp shed, Advantages & disadvantages of jet looms. 3

Rapier:- Features, Classification, Rapier drive mechanisms, weft transfer methods & their mechanisms. 3

Multiphase looms:- Features & construction of flat & circular multiphase looms, mechanism of shedding, picking & beating, weft patterning, passage of warp through a circular loom, suitability of circular loom. 3

Conventional & various uncoventional selvedges & calculation of weft waste percent. 2

Standard commercial fabrics (Jute, Cotton, Synthetic and their blends). Factors to be considered in choosing a fabric for particular end use condition. 2

Relavant calculations for production, efficiency, weaving machinery allocation & production management. 3

Waste control in weaving. 1

Knitting: 40 Lecture

Production of high quality double knit cloth, influence of structure on fabric quality and dimensions. 2

Production, properties and end uses of sliver knit high pile fabrics. 2

Principles of linear and nonlinear cams used in weft knitting machines. 1

Study of forces acting on the needle. Resolution of forces and its impact on the fabric quality. 2

Pattern and selection devices: Principle of needle selection, cam selection and pattern wheel selection. 2

The preparation of yarn warp knitting. 1

Structural representation, properties and end uses of milanese, raschel net marquisette, and raschel lace. 2

Movements of main knitting parts through displacement diagrams for raschel machine with two needle bars in operation. 1

Study of modern raschel machine mechanisms-Fabric take-up and batching mechanism, warp let-off motions. 4

Derivation of the expression for the tightness factor, areal density & width of plain weft knitted fabric.

The phenomenon of robbing back in weft knitted fabric. 1

The relaxation shrinkage in weft knitted fabric and its practical implications. 1

Mechanical shrinkage control of knitted fabric. 1

Non-Woven:

Modern techniques developed for the production of textile non-wovens. 2

Study of the factors which influence the properties of non-woven fabrics. 1

End uses and envirnmental problems in the non-wovens. 1

PRACTICAL

Study of winding, warping beaming/sizing dressing & loom faults & their remedies. Comparative study of various conventional loom mechanisms.(like-shedding,picking,beating, take-up,let-off,weft patterning,weft replenishment(Pirn;cop,shuttle),warp stop,weft stop etc.). Study of Terry loom. Study of various setting points in preparatory & weaving machinery & their effects on changing. Investigation of the differences between Jute,Cotton & Synthetic looms. Practical demonstration of different modern loom mechanisms.Production of Woven cloth(Both Jute & Cotton). Identification of fabric faults. Erection, Overhaul & maintenance of weaving machinery(Jute, Cotton & Synthetic.) 30

Production of various types of structures in fabric with weft and warp knitting machine. Practical understanding of dimensional stability of produced knitted fabrics. 20

Book recommended:

1.Technology of Warp Sizing by Columbine press(Publishers)Ltd. Manchester,U.K.
2.Sizing:Keystone to quality fabrics, by-AATCC,U.S.A.
3.Textile Mathematics Vol.3 by- J.E.Booth.
4. Modern preparation & weaving machinery by-A.Ormerod.
5. Weaving:Conversion of Yarn to Fabric by-P.R.Lord & M.H.Mohamed.
6. Principles of Weaving by-R.Marks & A.T.C. Robinson.
7. New ways to produce textils by-Textile Institute.
8. Modern developments in Weaving machinery by-Victor Duxbury,GRWary
9. Shuttleless looms by-J.J,Vincent.
10.Manual of Nonwovens- Dr.Radko Krema, 11.Non Woven fabrics-Buresh.
11.An Introduction to warp Knitting-DGB Thomas.
12. " " " weft " - J.A.
13. Knittin Technology-David J Spencer.
14. Warp Knitting Technology-D.F.Paling.

Clothing Technology

DETAILED SYLLABUS

1) INTRODUCTION: 2 x 1 = 2 hrs.

i) A brief history of the development of Garments Industry with particular reference to Bangladesh Garments Industry.

ii) Fashion trends in different countries traditional and modern.

iii) Nomenclature of different types of Garments, Category numbers of different items, which is imposed by different Countries.

iv) What is quota ?

2) DESIGN, PATTERN & SAMPLE OF GARMENTS: 6 x 1 = 6 hrs.

i) Pattern preparation including factors affecting the quality of Garments and the effeciency of the Garments production.

ii) Pattern check method.

iii) The Inlay of each part.

iv) Measuring Method.

3) STRUCTURE & SEQUENCE OF PROCESSES OF CLOTHING INDUSTRY: 20 x 1 = 20 hrs.

i) Introduction to the structure of the clothing Industries & the general sequence of processes used in clothing manufacture.

ii) Cutting, cutting terms, name of each part.

iii) Kinds of style of different parts of Garments.

iv) Cutting Procedure.

v) Explanation of catting processes

vi) Marking method, kind of marking method.

vii) Laying, how to calculate the needed quantity, now to convert the width of undertaken cloth, how to calculate the laying (spreading) yardage when determining assortment, Calculation of assortment, cloth laying quantity.

viii) The Procedure of Interlining works kinds of interlining, interlining marking method, explanation of interlining processes.

ix) Sewing, general sewing terms.

x) Sequences of sewing processes.

xi) Explanation of each sewing processes

xii) Garments Finishing.

4) GARMENTS COMPONENTS: 2 x 1 = 2 hrs.

i) Raw Materials
ii) Sewing Threads.
iii) Buttons.
iv) Metal Fasling
v) Interlining
vi) Labels.

5) CLOTHING MACHINES & EQUIPMENTS: 13 x 1 = 13 hrs.

i) Spreading machine
ii) Cutting Machine
iii) Band knife machine
iv) Single needle lock stitch machine
v) Double needle chain stitch machine.
vi) Different types of overedging machines.
vii) Button attach sewing m/c.
viii) Button hole sewing m/c.
ix) Interlook m/c.
x) Bontack m/c.
xi) Collar point cutting m/c.
xii) Collar point turning m/c.
xiii) Collar forming m/c.
xiv) Collar bollom cutting m/c.
xv) Cuff forming machine
xvi) Pocket creasing machine
xvii) Fuse processing machine.
xviii) Stamping, iron, gauze, presserfort folder etc.

6) REGENT DEVELOPMENTS IN CLOTHING ENGINEERING & TECHNOLOGY: 2 x 1 = 2 hrs.

Practical Class for Clothing Engineering and Technology 5 x 2 = 10 hrs.

1. Study of different Garment Machinery.
2. Garments Design & Pattern, (Pattern making for different Garments).
3. Garment Cutting.(Fabric cutting by cutting Machinery for making different Garments)
4. Garments Assembly. (To attach different parts of Garments by using sewing machine).
5. Garments Finishing (Garments Ironing, Folding etc.)
6. Work visits & Lay-out planning of Garments Factory.

COMPUTER SYSTEMS & PROGRAMMING

Detailed Syllabus

-3

Computer history and classification
- Early-age computers to modern computers
- Types of computers- analog, digital and hybrid computers
- Differences between analog, digital and hybrid computers
- Micro, Mini and Mainframe computers, their differences and overlapping
- Present day computer applications

-8

Digital computer organisation
- Functional parts and general organisation of a digital computer, analogy between computer and human operations
- CPU - microprocessorns a CPU, bus organised architecture of microcomputers
- Concept of memory - main memory and secondary memory
- Ideas of input/output ports and hardware handshaking

-4

Programming concepts and prelinineries
- Computer peripheral devices, mass storage units
- Important terminologies for Programmers and classification of languages
- Steps involved in computer programming
- Concept of program and data, data file and database

-10

Flow-charting
- Introduction to problem/system analysis
- Flow-charting symbols and conversions
- Flow-chart construction technics and advanced flow-charting

-35

Computer programming
- Programming language BASIC
- Concepts of assembly language programming
- Assembly language program linking conversions
- Using the I/O ports and driver/interface software
- C as a better solution for software interface and portability
- Pascal and ideas of structured programming

-15

Computers in textile industry:
Process control in textile industry and role of computers. Computer as a tool for quality control and costing in textile industry. Electronic management and MIS coupling in textile. industry. Computer aided automation-its effect on industry and society. Role of computer managers in industry.

-25

Laboratory experiments
- To find the sum, mean and standard deviation of a set of N numbers
- To arrange N numbers in ascending/descending order using index and bubble sort technics
- To find the sum of all the elements, diagonal elements of a square matrix, and to find the sum, difference and product of two matrics
- To develop a mini salary system for a textile industry
- To develop a mini sales administration system
- To develop a mini product movement system in industry warehoused
- To develop an on-line MIS(employee) for a textile industry
- To develop a micro product appreciation analysis system for future planning assistance in textile industry
- To develop a micro-color graphic design selection and testing system for textile industry
- To develop a prototype micro market trend forecasting system for textile industry

1st YEAR: B.Sc, IN TEXTILE TECHNOLOGY

COURSE	HOURS PER WEEK			MARKS			HOURS FOR FINAL EXAMINATION
	LECTURES	TRAINING	TOTAL	CONTINUOUS ASSESSMENT	FINAL WRITTEN EXAMINATION	TOTAL	
Mathematics	3	1	4	40	60	100	3
Physics	3	2	5	50	75	125	3
Chemistry	3	2	5	50	75	125	3
Polymer Science	2		2	20	30	50	2.5
Mechanics	3	1	4	40	60	100	3
Machine Drawing		3	3	30	45	75	2.5
Engineering Materials	2	2	4	40	60	100	3
Computer Science	2	3	5	50	75	125	3
Textile Raw Materials I	2		2	20	30	50	1
English Language	2		2	20	30	50	1
TOTALS	22	14	36	360	540	900	26

2nd YEAR: B.Sc, IN TEXTILE TECHNOLOGY

COURSE	HOURS PER WEEK			MARKS			HOURS FOR FINAL EXAMINATION
	LECTURES	TRAINING	TOTAL	CONTINUOUS ASSESSMENT	FINAL WRITTEN EXAMINATION	TOTAL	
Theory & Design of Machinery	3	2	5	50	75	125	3
Statistics I	2	1	3	30	45	75	2.5
Electrical Engineering	3	1	4	40	60	100	3
Mechanical Engineering (Hydraulic, Pneumatics & Thermo-dynamics)	3	1	4	40	60	100	3
Textile Fibre Physics & Testing	3	1	4	40	60	100	3
Fibre Analysis		1	1	25		25	Practical exam.
Yarn Manufacturing Technology I	2	1	3	30	45	75	2.5
Fabric Manufacturing Technology I	2	1	3	30	45	75	2.5
Wet Processing I	2	2	4	40	60	100	3
Textile Chemistry (dyestuff & Auxiliaries)	2	1	3	30	45	75	2.5
Textile Raw Materials II (chemical fibres)	2		2	20	30	50	1
TOTALS	24	12	36	375	525	900	26

3rd YEAR: B.Sc. IN TEXTILE TECHNOLOGY

COURSE	HOURS PER WEEK			MARKS			HOURS FOR FINAL EXAMINATION
	LECTURES	TRAINING	TOTAL	CONTINUOUS ASSESSMENT	FINAL WRITTEN EXAMINATION	TOTAL	
Yarn Manufacturing Technology II	4	2	6	60	90	150	2 x 2
Fabric Manufacturing Technology II	4	2	6	60	90	150	2 x 2
Wet Processing Technology II (dyeing & finishing)	4	2	6	60	90	150	2 x 2
Textile Physics & Testing (yarn & fabric Physics)	3	2	5	50	75	125	3
Textile Statistics II & Quality Control	3	2	5	50	75	125	3
Weaving Preparation	1	1	2	20	30	50	2
Fabric Structure & Design (woven & knitted structures	3	1	4	40	60	100	3
Textile Engineering Services	1	1	2	20	30	50	2
TOTALS	23	13	36	360	540	900	25

4TH YEAR B.Sc. IN TEXTILE TECHNOLOGY

ADVANCED YARN MANUFACTURING

COURSE	HOURS PER WEEK			MARKS				HOURS FOR FINAL EXAMINATION
	LECTURES	TRAINING	TOTAL	CONTINUOUS ASSESSMENT	ORAL & PRACTICAL EXAMINATION	FINAL WRITTEN EXAMINATION	TOTAL	
Yarn Manufacturing III	6	4	10	50	50	150	250	2 x 2
Special Yarn Manufacturing	2	1	3	30		45	75	1.5
Spinning Mill Organisation	2	1	3	30		45	75	1.5
Industrial Management & Administration	2		2	20		30	50	1
Textile Application of Computer Science	3	2	5	50		75	125	2.5
Marketing & Economics of Textile Mills	3	1	4	40		60	100	2
Machine Technology (Maintenance & repairs)	2	1	3	30		45	75	1.5
Clothing Technology	3	1	4	40		60	100	2
B.Sc. Spinning Project		2	2 *				350	
TOTALS	23	13	36	290	50	510	1200	16

* The 2 hours per week are for Supervision of the Project, which preferably takes place in Industry.
The Supervisor should make at least 3 visits to each student during the Project period of 2 months between 3rd and 4th years.

4TH YEAR B.Sc. IN TEXTILE TECHNOLOGY

ADVANCED FABRIC MANUFACTURING.

COURSE	HOURS PER WEEK			MARKS				HOURS FOR FINAL EXAMINATION
	LECTURES	TRAINING	TOTAL	CONTINUOUS ASSESSMENT	ORAL & PRACTICAL EXAMINATION	FINAL WRITTEN EXAMINATION	TOTAL	
Fabric Manufacturing Technology III	6	4	10	50	50	150	250	2 x 2
Advanced Fabric Structure	2	1	1	30		45	75	1.5
Weaving Mill Organisation	2	1	3	30		45	75	1.5
Industrial Management & Administration	2		2	20		30	50	1
Textile Application of Computer Science	3	2	5	50		75	125	2.5
Marketing & Economics of Textile Mills	3	1	4	40		60	100	2
Machine Technology (Maintenance & Repairs)	2	1	3	30		45	75	1.5
Clothing Technology	3	1	4	40		60	100	2
B.Sc. Fabric Manufacturing Project		2	2 *				350	
TOTALS	23	13	36	290	50	510	1200	16

* The 2 hours per week are for Supervision of the Project, which preferably takes place in Industry.

4TH YEAR B.Sc. IN TEXTILE TECHNOLOGY

ADVANCED WET PROCESSING TECHNOLOGY.

COURSE	HOURS PER WEEK			MARKS				HOURS FOR FINAL EXAMINATION
	LECTURES	TRAINING	TOTAL	CONTINUOUS ASSESSMENT	ORAL & PRACTICAL EXAMINATION	FINAL WRITTEN EXAMINATION	TOTAL	
Wet Processing Technology III	6	4	10	50	50	150	250	2 x 2
Dyeing theories & Colour Matching	2	1	3	30		45	75	1.5
Dyeing & Finishing Mill Organisation	2	1	3	30		45	75	1.5
Industrial Management & Administration	2		2	20		30	50	1
Textile Application of Computer Science	3	2	5	50		75	125	2.5
Marketing & Economics of Textile Mills	3	1	4	40		60	100	2
Machine Technology (Maintenance & Repairs)	2	1	3	30		45	75	1.5
Clothing Technology	3	1	4	40		60	100	2
B.Sc. Wet Processing Project		2	2 *				350	
TOTALS	23	13	36	290	50	510	1200	16

* The 2 hours per week are for Supervision of the Project, which preferably takes place in Industry.
The Supervisor should make at least 3 visits to each student during the Project period of 2 months between 3rd and 4th years.

CURRICULUM AND SYLLABUS

FOR

B.Sc. IN TEXTILE TECHNOLOGY COURSE

OF

THE UNIVERSITY OF DHAKA

B.SC. IN TEXTILE TECHNOLOGY PART- I

Subjects	Hours Per Week			Marks						
	Theory	Pract/ Tuto-rial	Total	Theory			Practical			Grand Total
				A* 20%	B* 80%	Total	A* 40%	B* 60%	Total	
101. Mathematics - I	2	1	3	15	60	75	-	-	-	75
102. Mathematics-II	2	1	3	15	60	75	-	-	-	75
103. Physics - I	2	2	4	15	60	75	10	15	25	100
104. Physics - II	2	2	4	15	60	75	10	15	25	100
105. Chemistry - I	2	2	4	15	60	75	10	15	25	100
106. Chemistry - II	2	2	4	15	60	75	10	15	25	100
107. Textile Raw Materials - I	2	-	2	15	60	75	-	-	-	75
108. Polymer Science	2	-	2	10	40	50	-	-	-	50
109. Engineering Mater--ials & Practices	2	2	4	10	40	50	10	15	25	75
110. Engineering Drawing	-	4	4	-	-	-	20	30	50	50
111. English Language	2	-	2	10	40	50	-	-	-	50
	20	16	36			675			175	850

*A - Continous Assessment
*B - Examination

B.SC. IN TEXTILE TECHNOLOGY PART-II

Subjects	Hours Per Week			Marks						
	Theory	Pract.	Total	Theory			Practical			
				A* 20%	B* 80%	Total	A* 40%	B* 60%	Total	Grand Total
201. Yarn Manufacturing Technology -I	3	2	5	20	80	100	10	15	25	125
202. Fabric Manufacturing Technology - I	3	2	5	20	80	100	10	15	25	125
203. Wet Processing Technology - I	3	2	5	20	80	100	10	15	25	125
204. Garments Technology-I	3	2	5	20	80	100	10	15	25	125
205. Textile Raw Materials-II	2	-	2	15	60	75	-	-	-	75
206. Textile Physics-I	2	-	2	10	40	50	-	-	-	50
207. Textile Testing & Quality Control-I	2	2	4	15	60	75	10	15	25	100
208. Statistics	2	-	2	15	60	75	-	-	-	75
209. Elements of Electrical & Mechanical Engineering.	3	2	5	20	80	100	10	15	25	125
210. Elements of Machine Design	2	-	2	15	60	75	-	-	-	75
211. Computer Science	-	2	2	-	-	-	20	30	50	50
	25	14	39	-	-	850	-	-	175	1050

*A- Continous Assessment
*B- Examination

B.SC. IN TEXTILE TECHNOLOGY PART-III

Subjects	Hours Per Week			Marks						
				Theory			Practical			
	Theory	Pract.	Total	A* 20%	B* 80%	Total	A* 40%	B* 60%	Total	Grand Total
301. Yarn Manufacuring Technology-II	3	2	5	20	80	100	10	15	25	125
302. Fabric Manufacturing Technology -II	3	2	5	20	80	100	10	15	25	125
303. Wet Processing Technology -II	3	2	5	20	80	100	10	15	25	125
304. Garments Technology-II	3	2	5	20	80	100	10	15	25	125
305. Textile Physics-II	2	-	2	10	40	50	-	-	-	50
306. Textile Testing & Quality Control-II	2	2	4	15	60	75	10	15	25	100
307. Fabric Structure & Design	2	2	4	15	60	75	10	15	25	100
308. Application of Computer in Textiles	3	2	5	20	80	100	10	15	25	125
309. Industrial Management	3	-	3	20	80	100	-	-	-	100
	24	14	38	-	-	800	-	-	175	975

*A - Continous Assessment
*B - Examination

B.SC. IN TEXTILE TECHNOLOGY PART-IV

Subjects	Hours Per Week			Marks						
	Theory	Pract.	Total	Theory			Practical			Grand Total
				A* 20%	B* 80%	Total	A* 40%	B* 60%	Total	
401. Yarn/Fabric/Wet Processing/ Garmants Technology-III	3	4	7	20	80	100	20	30	50	150
402. Yarn/ Fabric/Wet Processing/ Garments Technology-IV	3	4	7	20	80	100	20	30	50	150
403. Special Yarn/ Fabric/Wet Processes/Garments Production.	2	-	2	10	40	50	-	-	-	50
404. Machine Technology & Maintenance of Textile Machinery	2	2	4	15	60	75	10	15	25	100
405. +Production Planning and Control	2	-	2	15	60	75	-	-	-	75
406. +Testing & Quality Control-III	2	2	4	15	60	75	10	15	25	100
407. +Accounting & Marketing	3	-	3	20	80	100	-	-	-	100
408. Project	-	6	6	-	-	-	50	25	75	75
409. ++Industrial Attachment	-	-	-	-	-	-	50	25	75	75
410. Comprehensive Viva	-	-	-	-	-	-	-	-	50	50
	17	20	37			575			375	925

+ Comnmon Subjects.
++Two Months Industrial Attachment.

*A- Continous Assessment
*B- Examination

B.Sc. IN TEXTILE TECHNOLOGY, PART-I

101 MATHEMATICS - I

MARKS : 75

Algebra :

Determinants. Matrix. Rank of Matrix. Convergency and Divergency.

Trigonometry :

Demoivre's Theorem, Deductions from Demoivre's Theorem, Complex Quantities, Gregory's Series, Summation of Series, Hyperbolic Functions.

Three Dimensional Geometry :

Co-ordinates : Direction Cosines, Projections, The Plane, The Straight Line, Sphere.

Differential Calculus :

Functions, Limits, Continuity, Simple Differentiation, Successive. Differentiation, Expansion of Functions, Rolle's Theorem, Mean Value Theorem, Taylor's Series, Maclaurin's Series, Partial Differentiation Indeterminant Forms, Maxima and Minima.

102. MATHEMATICS - II

MARKS : 75

Integral Calculus :

Methods of Integration, Integration by Parts, Integration of Rational Fraction, Special Types of Integration.

Differential Equations :

Variables Separable, Homogeneous Equation, Exact Differential Equations, Linear Equations, Equations of First Order and First Degree, Eqn. Solvable for Y, Eqn. Solvable for X, Clairant's form, Linear Equation with Constant Coefficients, Inverse Operators. $F(D)Y=X$, $F(D)X = E^{ax}$, $F(D)Y = \text{Sinax or Cosax}$. Particulars Integrals. Homogeneous Linear Equations, Orthogonal Trajectories.

Vector Analysis :

Introduction of Vector Analysis, Scalar Product or Dot Product. Vector Product or Cross Product, Solution of Vector Equations. Applications of Vectors in Geometry.

Mathematical Methods :

Fourier Series and Fourier Integral, Vector Calculus, Vector Function of Scaler Variables, Differentiation of Vector Function, Partial Derivatives of Vectors, Gradient, Divergence and Curl, Vector Integration, The Line Integral, The Surface Integral, The Volume Integral, Green's theorem, Gauss's Divergence Theorem, Beta and Gamma Functions.

103 PHYSICS-I

THEORY : MARKS : 75

Properties of Matter :

Friction - Laws of Friction, Co-efficient of Friction, Angle of Friction, Equilibrium of a body on an inclined surface, advantages due to friction.

Elasticity - Elastic and Plastic Bodies, Stress, Strain, Elastic Limit, Behaviour of a strained wire, Hooke's Law, Elastic constants. Experimental determination of young's modulus and rigidity modulus, Twisting of a cylinder, Torsional pendulum, Poisson's ratio, Limits of poisson's ratio, Compressibility, Relation between elastic constants, Energy in a strained body, Variation of elasticity with temperature.

Moment of Inertia - Moment of inertia and its theorems, Moment of inertia of simple cases (uniform rod, Solid cylinder, Sphere, Fly wheel), Determination of moment of inertia of a body.

Surface Tension - Molecular theory of surface tension, Demonstration of surface tension, Phenomena due to surface tension, Total surface energy. Surface energy in curved surfaces. Capillarity, angle of contact, Determination of surface tension of

water, Effect of temperature on surface tension.
Viscosity - Viscosity and its Co-efficient. Poiseuille's equation. Determination of the co-efficient of viscosity. Variation of viscosity with temperature. Relation between viscosity and friction, Importance of knowledge of viscosity.

Light :
Wave theory, Huyghens's principle, Rectilinear propagation of light, Interpretation of laws of reflection and refraction by huyghens's principle, Interference, Young's experiment, Determination of wave length of light by bi-prism, Newton's ring, Colours of thin films. Diffraction. Diffraction grating and its use. Zone plate, X-ray diffraction, Polarization, Polarization by reflection, Brewster's law, Double refraction, Nicol's prism, Polarimeter.

PRACTICAL — MARKS : 25

Determination of : Elastic Constants by various methods,'g' by compound pendulum, Moment of inertia of a wheel, Density of water at various temperature, Surface tension of water and mercury, Focal length of convex and concave lens by various methods, Refractive index of water by using plain mirror and convex lens, Angle of the prism by spectrometer, Wave length of light. Specific rotation of different solutions by means of polarimeter, Viscosity of water by capillary tube method.

104 PHYSICS-II

THEORY : — MARKS : 75

Electricity and Magnetism :
Static Electricity - Electric Potential. Field. Intensity. Electrostatic induction. Gauss's theorem and its application.

Condensers & capacity of condensers.

Current Electricity - Growth and decay of the current, charging and discharge of the condenser. Equations of alternating current and voltage. Peak, R.M.S and average value of alternating current and voltage. Power in A.C. Circuit. Flow of alternating current through inductance, Capacitance and resistance in series. Resonance in parallel circuit.

Magnetism - Intensity of magnetisation. Permeability. Susceptibility. characteristics of diamagnetic. Paramagnetic and ferromagnetic substances.

Heat and thermodynamics :

Temperature and its measurements - Gas thermometers. Platinum resistance thermometer. Nature of heat. Specific heats of gases and their measurements. Kinetic theory of gases, Deviation of gas laws and vander waal's equation. Isothermal and adiabatic changes.

Heat and work - The first law of thermodynamics. Reversible and irreversible processes, enthalpy and heat capacity. The carnot cycle, The second law of thermodynamics, Entropy, Absolute temperature scale, Engines, Entropy and disorder. Clausius Clapeyron Equation. Refrigerator. Radiation and black body radiation and compton's effect. Thermodynamic functions, Helmholtz and gibbs functions.

PRACTICAL MARKS : 25

Determination of (a) Co-efficient of linear expansion of solid. (b) sp. Heat of solid and liquid (c) Thermal conductivity of metals. (d) Measurement of high temperature by means thermocouple and Potentiometer.

Determination of (a) Resistance of a wire by P.O. Box (b) Specific resistance by meter bridge (c) Resistance of a galvanometer by half deflection method (d) E.C.E. Of copper (e) Value of 'J' by electrical method.

105 CHEMISTRY-I

THEORY : MARKS : 75

General and Inorganic Chemistry :

Mass - Conversion of mass into energy, Mass number, Atomic mass unit, mass defects. Decay of mass. Radioactivity. Half-life of radioactive elements, Binding energy.

Atomic Structure - Dalton's theory. Rutherford's atomic model. Bohr's atomic model. Quantum number. Pauli exclusion principle. Spectra.

Chemical Bond - Electronic theory of valency. Electrovalency. Co-valency. Co-ordinate Co-valency. Valence-bond theory. Molecular orbital theory. Co-ordination complexes. Chelate complexes.

Periodic Table - Periodic law. Classification of elements. Defects of periodic table. Application of periodic table. Oxidation number. Electro-negativity.

Metals and Non-metals - Difference between metals and non-metals. Principles of metallurgy. Methods for extraction of metals.

Acids, Bases and Salts - Modern theories of Acids & Bases. Bleacing powder, H_2O_2, HOCl, NaOCl, $NaClO_2$ SO_2, PH, Buffer solution Indicators.

Chemical Reactions - Isomeric transformation. Condensation-Polymerisation. Association. Dissociation. Decomposition. Synthesis. Metathesis. Neutralization. Hydrolysis. Aminolysis. Addition reaction. Pyrolysis. Chain reaction. Photo-chemical reaction. Exothermic reaction. Endothermic reaction. Electrophilic and nucleophilic reactions. Catalytic and induced reactions, Redox reactions.

Physical chemistry :

Kinetic theory of gases - Vander waal's forces and equation.

Thermodynamics - 1st Law and 2nd Law of thermodynamics, Thermo-chemistry.

Chemistry of Dilute Solutions - Osmotic pressure, Van't Hoff's theory of dilute solution. Raoult's law of vapour pressure lowering. Elevation of boiling point and depression of freezing point.

Homogeneous Equilibrium - Law of mass action. Thermodynamic derivation of law of mass action. Application of law of mass of action to chemical reactions. Heterogeneous equillibrium.
Chemical Kinetics - 1st and 2nd order of reactions. Mathematical formulation of the 1st and 2nd order reactions. Methods of determination of the order of reaction.
Colloids - Classification. Preparation. Properties and importance of colloids.

PRACTICAL : MARKS : 25

Qualıtative analysis of inorganic mixtures containing not less than three radicals including insoluble and interfering radicals : Volumetric Analysis :- (i) Acidimetry and alkalimetry viz. Preparation of approximate 1M. HCl. M/2 H_2SO_4 & 1M CH_3COOH solutions and their standardization. (ii) Preparation of standard alkali solution; analysis of oils and fats for (a) Acid value (b) Saponification value. (c) Iodine value and flash point.

106 CHEMISTRY-II

THEORY : MARKS : 75

Organic Chemistry:
Bonding Properties of Carbon - Tetra-covalency of Carbon, Hybridization of atomic orbitals of carbon.
Isomerism - Structural Isomerism, Chain isomerism, Positional isomerism, Functional group isomerism; Stereo-isomerism like geometrical isomerism and optical isomerism;
Aliphatic Hydrocarbons - Alkanes, Alkenes and Alkynes.
Derivatives of Aliphatic Hydrocarbons - General methods of preparation and important reactions of Alkylhalides, Mono. Di. and Tri-hydric Alcohols. Aldehydes. Ketones. Amines. Mono-Carboxylic acids and their halides. Esters. Anhydrides and Amides.

Aromatic Hydrocarbons - Kekule's structure of benzene. Orbital theory. Isomers and nomenclature. Orientation in benzene derivatives. Electrophilic Aryl Substitution. Aromaticity.
Derivatives of Aromatic Hydro-Carbons - General methods of preparation and important reactions of Aromatic Amines & Amides. aromatic sulphonic acids. Aromatic Aldehydes. Ketones. Phenols. Carboxylic acids.
Carbohydrates - Mono. Di. and Polysaccharides.
Proteins - Classification and Properties of Amino acdis.

PRACTICAL **MARKS : 25**

Detection of Elements - Carbon. Sulphur. Hydrogen. Nitrogen. Halogens. Oxygen in Organic compounds.
Identification of Organic compounds containing one functional group out of the following - Methyl Alcohol. Ethyl Alcohol. Isopropyl Alcohol. Tert-butyl Alcohol. Acetophenone. Acetaldehyde. Formaldehyde. Formic Acid. Acetic Acid. Oxalic Acid. Benzoic Acid. Acetone. Benzophenone. Aniline. Nitro-benzene. Chloro-benzene. Phenols. Picric Acid etc. (Analysis should include the following: (i) Physical Examination. (ii) Physical Constants. (iii) Elemental Analysis of Detectable Elements. (iv) Solubility group with the following solvents only (a) Water, (b) 5% $NaHCO_3$ solution/NaOH, (c) Conc.H_2SO_4. (v) Classification Tests. (vi) Any specific tests for the above class of compounds).
Oxidation and Reduction Titration Involving : (a) Preparation and Standardization of $KMnO_4$ solution with Oxalic Acid or Sodium Oxalate. (b) Determination of Ferrous Iron with Standard $KMnO_4$ solution. (c) Preparation of standard $K_2Cr_2O_7$ solution and Determination of Ferrous Iron by using internal indicators. (d) Determination of available Chlorine in Bleaching Powder. (e) Determination of the Na_2CO_3 content of Washing Soda. (f) Determination of strength of H_2O_2.

107 TEXTILE RAW MATERIALS - I

MARKS : 75

Definition of textile fibre. Classification of fibres with examples.

Study of cellulosic fibres :

Cotton - Cultivation and harvesting. Growth, composition, physical and chemical structure and properties. Geographical distribution. Ginning, grading and classification. End uses.

Bast fibres - Cultivation and harvesting of different types of bast fibres with special reference to Jute. Growth, composition, physical and chemical structure and properties. Retting, study of fibre ultimates, sorting, grading and classification. End uses.

Brief study of other types of cellulosic fibres such as leaf and fruit fibres.

Study of Protein fibres :

Wool - Growth, composition, physical and chemical structure and properties. Geographical distribution of main wool producing countries. Shearing, classing and sorting. End uses.

Sources and types of animal hair fibres.

Silk - Growth, composition, physical and chemical structure and properties. Sericulture and methods of production. Geographical distribution. End uses.

108. POLYMER SCIENCE

THEORY : MARKS : 50

Definition and types of Polymers - Linear, Branched and Cross-linked Polymers, Homopolymers/copolymers; Repeat unit; Degree of Polymerization; Number average Molecular Weight, Weight average Molecular weight and their measurements, Distribution of Molecular weight and its measurements. Viscosity, End-groups, Polymerization

and its Classification, Chemical modification. Technology of Polymerisation. Tacticity, Conformation of Polymers chains, Order in Polymers, Crystallization and Melting of Polymers. Glass Transition temperature and Melting temperature, Entropy elasticity. Depolymerisation, Polymer degradation. Criteria of fibre forming polymers.

109 ENGINEERING MATERIALS & PRACTICES

THEORY : **MARKS : 50**

Definition of stress and strain. Various types of stresses and Strain - tensile, compressive, shear, Calculation of various stresses. Mohr's circle of stresses.

Hook's law of elasticity. Definition of modules of elasticity and rigidity. Analysis of typical tensile strain curve for a ductile material showing yield points, breaking point, yield stress and ultimate stress, Poison's ratio.

Springs, Types of spring, closely coiled spring, spring subjected to axial loads and axial twist, open coiled spring.

Columns and strut. Buckling of column, Euler's column theory, Euler's crippling load for column. Ranking's crippling load for Column. Eccentric loading on column.

Mechanical properties of iron and steel; strain, energy and resilience. breaking energy and toughness; repeated loads and fatigue; hysteresis, and endurance limit, time effect, creep and relaxation of stresses. hardness and its methods of measuring. Structure and properties of wood. Alloys of metals and their properties. Material in hostile environment (high temp., sub-normal temp. and corrosion).

PRACTICAL : MARKS : 25

Identification and use of handtools and measuring instruments; reamers, taps and dies, bench vice and carpentry tools, makings of models.
Identification, use and practices on Lathe, Drill, Grinder, Shaper, Planner, Circular saw and milling machine.
Sheet metal work - Cutting of sheet material to make some useful objects.
Metal joining processes - Soldering, Brazing, riveting, gas welding and electric arc welding.
Heat treatment of steel such as annealing, normalizing, quenching tempering and surface hardening. Sand moulds, core moulding, pattern for casting, sand casting.

110 : ENGINEERING DRAWING

PRACTICAL : MARKS : 50

Planning of drawing sheet, lettering, diemensioning, projection and its types.
Development of surfaces such as right circular cone, cylinder, prism, pyramid, cycloids, epi-cycloid, hypo-cycloids and involute of a circle.
Isometric projection of simple solids and its components. Pictorial projection in oblique and axillary plane.
First and third angle projection of elementary machine parts, models or pictorial.
Assembly drawing from orthographic projection and pictorial views. Sectional views.
Drawing of gear tooth profile, cam profile. Freehand drawing of different textile machinery parts, drawing of assemblies of textile machinery parts from given details.

111. ENGLISH LANGUAGE

MARKS : 50

Language; its function as a Primary means of Communication to the Technologist; Writing, Speaking, Listening and Reading;
Differences between Written and Spoken language. Language appropriate to task.
Writing; Planning-format, Paragraph headings, Context, Language and Vocabulary
Writing for a purpose; Technical and Industrial reports, Proposals, e.g. For new equipment, Increasing Production, Description of visits, Experiments, Commercial writing such as business letters, Internal memos, Abstracts.
Speaking and Listening; Effective Communication between Speaker and Listener, Techniques of Description, use of Visual Aids.
Explaining Process-explaining, Complaining, Reporting damage.
Reading and Understanding; Technical Literature, Books, Magazines, Scientific Journals.

B.Sc. TEXTILE TECHNOLOGY PART-II

201 YARN MANUFACTURING TECHNOLOGY-I

THEORY : **MARKS : 100**

Short Staple :

Characteristics of Fibre considered by a spinner. Flow chart for the production of carded and combed yarns. Importance of mixing and blending.

Blow Room - Principles of Opening and Cleaning,Study of blow room Machines for Blending, Opening, Cleaning and control of regularity of mass per unit length, Extraction and control of waste, Settings for waste, Blow Room lines for different purposes, use of suitable sequences of machines, Production of scutcher laps, Advantages and disadvantages of chute feeding to cards, Safety; Prevention of fires, methods of extraction of metal objects, Main settings, Speeds, Production.

Carding - Principles and objects of carding; Detailed study of the revolving flat card; Types and care of wire, Stripping and Grinding, Doffing mechanism. Extraction and control of waste and dust, Can coiling. Speeds, Productions, Settings, Cleaning efficiency, Control of nep and Fibre damage, Variation in sliver mass per unit length.

Draw Frame - Principles of roller drafting; Drafting forces; Fibre control; Drafting wave and effect of short fibres and fibres with hooked ends created in carding. Mechanical faults causing periodic variation

Minimum theoretical variation, Effects of doubling and drafting Study of draw frame, Drafting systems, Stop mechanisms, Cancoiling, Roller setting, Production, Introduction to auto levellers.

Long staple :

Flow charts for production of yarns from bast fibres, Woolen and worsted and silk.

Processing of Jute; Importance and methods of batching and batch selection.

Emulsion preparation and application, Softening technique and machinery.

Treatment of cuttings

Carding - Principles and objects of Jute card; Detailed study of carding systems and machinery, Methods of spreading, Differences in treatment on breaker and finisher cards, Pinning. Control of opening and waste, Cleaning efficiency, Settings, Speeds and productions.

PRACTICAL : MARKS : 25

Detailed practical study of Mixing, Blowroom, Carding and Drawframe of Cotton Sppinning.

Detailed practical study of batching, softener, Spreader, Breaker card and finisher card of Jute spinning.

202 FABRIC MANUFACTURING TECHNOLOGY-I

THEORY : MARKS : 100

Weaving Preparation :

Introduction and historical background of fabric manufacture. Flow chart for weaving.Introduction to yarn preparation.

Winding - Winding requirements. Different winding machines & for both cotton & jute yarn methods of driving the packages. Precision & non-precision winding. Yarn tensioning Devices, stop motions and other controlling devices of winding m/c. Pirn and cop winding mechanisms. Winding efficiency. Winding defects & remedies.

Warping - Techniques of warping - Direct warping of cotton & jute and sectional warping. Essential parts of warping machines & their functions, Faults in warping & their remedies.

Sizing - Introduction to sizing : Ingredients of a size mixture &

their functions. Chemistry of sizing & technological changes due to sizing.

Typical recipes, Choice of size ingredients. Size cooking. Short description of different techniques of sizing, Methods of drying. Dressing of jute yarn. Warp sizing & weaving efficiency, Mechanism of size take up, Defects in sizing & their remedies. Calculations relted to winding, warping and sizing.

Weaving mechanism:

Basic principle of weaving. Classification and brief description of looms. Classification and definition of motions of loom. Study of primitive, pit, frame fly shuttle, chittaranjan and Hattersley looms. Study of Hessian and sacking loom. Relevant calculations.

Knitting :

Introduction and historical background of knitting Technology. Hosiery yarns.

General terms and principles of knitting Technology, Knitting action of latch, bearded and compound needle. Basic mechanical principles of knitting Technology, Elements of knitted loop structure, Warping. Plain circular latch needle machine - Description, knitting action, Cam system, Sinker timing.

Circular Rib machine - Description, knitting action, needle timing, etc.

Circular Interlock machine - Description, knitting action, interlock cam system, etc.

Purl knitting machine - Description, purl needle transfer action. Use of dividing cams, use of spring loaded cams. Characteristic features of the knitted fabric. Hosiery machine drive, control mechanism and sequences.

Hosiery machines - Mechanism for welts, heels and toe production. Hosiery stitch control mechanism.

PRACTICAL : MARKS : 25

Weaving : Practical study of the process and machinery involved. Visits to manufacturing plants. Operation of machinery.

Knitting : Practical study of the machinery involved. Understanding of the principles of loop formation in different circular, flat and warp knitting machine.

203 WET PROCESSING TECHNOLOGY-I

THEORY : MARKS : 100

Applied Chemistry :

Water and its importance in wet processing (hydrogen bonding, Cluster formation, Heat of evaporation, Dissolving ability), General concepts of Soaps, Classification of detergents, Detergency (Mono molecular layer, Micelle formation, Surface and interface tension, Wetting and dispersing).

Pretreatment and Bleaching :

Flow-chart of wet processing, Chemistry of various impurities in fibres and their removals; Singeing, Desizing, Scouring of cotton, Jute, Wool and silk fibres. Methods of bleaching of cotton, Jute, wool and silk fibres.

Technology of Dyeing:

Elementary concepts of colour and constitution (Chromophore, Chromogene, Auxochrome, Antiautochrome, Resonance theory) Definition of dyestuffs, Pigments and their classifications. Commercial dyestuff preparations (Powder, Paste, Lump, Solution and presscake).

History of dyeing, Structure and application of direct, Acid, Basic and Vat dyes on different fibres; Dyeing machineries for different types of dyeing processes (for loose Fibres, Yarn, Packages, Fabrics). Continuous, Semicontinuous and discontinuous processes.

Technology of Printing :

Flow chart of Printing, Thickeners (types of Thickeners, Rheology), Mehthods and styles of Printing; Machineries used for printing; Printing processes for different fibres with Direct, Acid, Basic and Vat dyes.

PRACTICAL : MARKS : 25

Study on wet processing Machineries: Preparation for dyeing and Printing - Desizing, Scouring and bleaching of cotton, Jute, Wool and Silk fibres. Practical application of direct, Acid, Basic and Vat dyes for Dyeing and Printing of Cotton, Jute, Wool and Silk fibres.

204 GARMENTS TECHNOLOGY-I

THEORY : MARKS : 100

Historical development of Garments industry in Bangladesh and other countries of the world.
Garments terms and definitions.
Garments manufacturing sequence
General discussion on pattern making
Sample garments making
Components of shirt, trouser & their types, Standard body measurement for Gents, Standard body measurement for ladies, Principle of pattern making for shirt & trouser, Pattern grading, Marker Making : Definition, marker efficiency, objectives, constraints, method, drawing, duplicating & wastage in marker making.
Fabric Spreading : Requirements, types, Fabric packages, methods, machines and splices.
Fabric Cutting : Requirements, methods, machines, and quality in cutting.

Interlining : Definitions, advantages of fusible interlining, conditions of fusing, properties of fusible interlining, methods of coating, fusing machines, types of fusible interlining. Quality control in fusing, fusing performance analysis.

PRACTICAL : MARKS : 25

Sewing machine handling and adjustments. General sewing practice, Marker Planning & Marker Making, Marker copying, Pattern making for shirt & ladies blouse, Pattern grading, Fabric cutting, Industrial visit.

205 TEXTILE RAW MATERIALS - II

MARKS : 75

Definition and classification of Chemical fibres. Principles of different spinning systems. Different fibre structures and their effects on fibre properties.

Technologies of formation of regenerated fibres. Their properties and uses: Different types of viscose and acetate rayons, derivatives of cellulose, different types of regenerated protein fibres.

Technologies of formation of synthetic fibres, their properties and uses: Polyamides, Polyesters, Polyacrylics, Polypropylenes, PVA, PVC and elastomeric fibres.

Formation of carbon fibres, Bi/Multicomponent fibres, glass fibres and metallic fibres, their properties and uses.

Present trends of chemical fibres production and their economic and social aspects.

206 TEXTILE PHYSICS-I

MARKS : 50

Physical structure of fibres : Crystallinity and orientation. Basic concepts of methods for investigating fibre structure, e.g. X-ray diffraction, optical and electron microscopy infra-red absorption. Relations between fibre properties and structure of fibre.

Detailed study of fibre properties :

Mechanical properties - tensile, flexural and torsional properties, stress/strain relations under various conditions. Modules of elasticity, plasticity, creep and relaxation.

Effects of moisture : Effect of water on fibre e.g. sewlling.

Frictional properties - importance in drafting experimental methods of measurement. Effect of lubricant and dyes. Relationship of frictional properties of knitting, stitching & sewing.

Optional properties - reflection, refraction, scattering, polarization, bire fringence.

Thermal properties - absorption and emission of radiation. Energy changes associated with changes of state including transition temperature of fibres. Moisture content and heat of wetting.

207 TEXTILE TESTING & QUALITY CONTROL-I

THEORY : MARKS : 75

Introduction to Textile Testing, Importance of Textile Testing. Sampling methods for fibre.

Moisture - Moisture content and moisture regain standard moisture regain of different fibres. Relative humidity, measurement of relative humidity, standard conditions for testing importance of moisture regain, methods of measurement of moisture in textiles.

Fibre Testing :

Length, staple length, effective length, span length, fibre length

dispersion. Short fibre percentage, methods of test. Fineness & maturity of cotton. Importance in processing. Relationship between fineness & maturity. Methods of measurement and expressions of results. Maturity ratio, measurement of foreign matters in fibre sample.

Tensile strength - Single fibre & fibre bundle test, comparison of different methods and between single fibre & bundle test.

Yarn Testing :

Measurement of linear density of lap, sliver, roving & yarn. Counting systems, different methods of measurement of yarn count. Twist in yarn. Measurement of twist.

PRACTICAL : MARKS : 25

Determination of Moisture regain and moisture content of cotton, Fibre length and length characteristics. Fibre fineness, Maturity ratio of cotton fibre, Trash content in cotton, Fibre strength by pressley, Strength tester, Hank of sliver and roving, Count of yarn by wrap reel and balance in different counting systems. Connt of yarn by (i) Knowles balance (ii) Beesley's balance (iii) Inadrant balance, Twist of single and double yarn.

208 STATISTICS

MARKS : 75

Historical development of the subject. Collection of data - Primary data and secondary data. Presentation of data - Tabular and diagrammatic.

Frequency distribution - Grouped frequency distribution and their presentation in the form of frequency polygon and Histogram.

Measures of central tendency :

(i) Mean (a) Arithmetic Mean (b) Geometric Mean, (c) Harmonic Mean (ii) Median (iii) Mode. Their definition, computation, Advantage,

Disadvantage and uses.

Measures of dispersion :

(i) Absolute measure. (a) Range (b) Mean deviation (c) Quartile deviation (d) standard deviation. (ii) Relative measure. (a) co-efficient of variation. Their definition, computation and uses.

Moment, skewness and kurtosis - Their definition, computation and uses.

Probability - Simple idea of probability. Different definitions related to probability. Addition law of probability for mutually exclusive and not mutually exclusive events. Multiplication law of probabilities for dependent and independent events.

Calculation of successive probabilities using addition law and multiplication law of probability. Probability distribution (i) Binomial, (ii) Poission, (iii) Simple idea about normal distribution and its probability curve.

Estimation - Simple idea about estimation

Correlation and Regression :

(a) Correlation - Ideas of correlation. Measurement of correlation. Pearsonian correlation co-efficient and spearman's Rank correlation co-efficient.

(b) Multiple correlation

(c) Regression - Ideas about simple regression. Equation of the regression line. Estimation of the parameters of the regression line.

Test of significance - some definitions related to test of significance

(i) t - test. (a) Comparison of a sample mean with a known population mean when S.D. is known and when S.D. is not known.

(b) Comparison of two sample means when S.D. is known and also when it is unknown. (c) Paired t - test, its practical use in Textile Industry.

(ii) X^2 test - Simple application and its practical use in Industry.

Time series - Definition, characteristics and components.

Sampling - Definition of population, sample, parameter, census etc.

(i) Simple Random Sampling, (ii) Stratified random sampling. Their definition, computation, use, advantage & disadvantage.
Design of experiment : Basic principles of experimental design. Ideas about CRD, RBD & LSD.

209 ELEMENTS OF ELECTRICAL & MECHANICAL ENGINEERING

THEORY : MARKS : 100

Electrical Engineering & Electronics :

D.C. Current - D.C. fundamentals, Generators & their charateristics motors & their characteristics, Speed control process.
A.C. Current - A.C. fundamentals, Flow of A.C. through coils, Inductance and resistance in series and in parallel, Flow of A.C. through capacitance. Inductance, resistance and capacitance in series and in parallel. Power in A.C. Circuits, Power Factor and Power Factor Improvement, Resonance circuit, Transformer, Poly phase circuits, Induction motors.
Sub-station - Its purpose, Substation equipments (HT. LT Switch gear etc.), Distribution board and sub-distribution board.
System net work - Typical distribution circuits, cables and wiring systems and their selection.
System protection - Types of faults, (transformer & motor) principles of protection, Protective devices - circuit breaker, Switches, starter.
Electrical hazards - Protection against shock and fire, earthing and its importance, procedure to be adopted when a person is in contact with a live contact.

Electronics :

Amplifiers, Rectifiers, and Transsistors Diodes and their uses Voltage amplification, Power amplification, Photo Sensor & Transducer, Integrated Circuits (I.C.)

Mechanical Engineering

Fundamental concepts and definitions. Revision of gas laws; properties of perfect gas and steam, laws of thermodynamics; thermodynamic processes and cycles. Vapour power cycles-Rankine, Reheat.

Different modes of heat transfer - conduction, convention, and radiation. One dimensional steady state conduction of heat in solid plane wall. Radiation heat transfer, the laws of black-body radiation.

Hydraulics - Properties of fluids, pressure head of a liquid, pressure gawges, flow of fluids, Bernoule's equation, General energy equation for steady flow. Laminar flow and turbulent flow, head loss due to friction in a pipe, flow through circular orifices.

Compressed air - general discussion, textile applications and safety .

Pumps - Characteristics and application of reciprocating and centrifugal pumps.

Boilers, steam engine, Diesel and petrol engine, gas turbine.

PRACTICAL : (Electrical Engg. & Electronics) MARKS : 25

Study On - D.C. Circuits, A.C. Circuits, D.C. motors, Induction Motor, A.C & D.C. Generators, Single Phase transformer, 3-Phase transformer, Star-Delta Starter, Half-Wave and full-wave rectifier, Transister amplifier circuit, Transducer and sensor application circuts.

Application of I.C's in every day & industrial use.

House wiring and layout of a factory (Electrical)

210 ELEMENTS OF MACHINE DESIGN

Theory of Machine : **MARKS : 75**

Friction - Limiting Friction and coefficient of friction. Screw friction, efficiency of screw jack. Friction in Journal bearing. Friction clutches, rolling resistances.

Mechanism - Crank connecting rod mechanism, Quick return mechanism, links, kinematic pairs.

Transmission of motion and power - by belts, ropes, chains, and gears; geartrains

Conversion of motion - Shedding tappets and Cams

Shearing force and bending moment,

Impact of forces, momentum, torque, torsion, moment of forces and its application in textile machines. Methods of finding radius of gyration of revolving or oscillating bodies.

Machine Design

Tolerances and allowances, variable loads and stress concentration. Design of screw joints, riveted joints,; Spring; Columns; Keys and couplings; Journal, ball and roller bearings; pressure vessels.

211. COMPUTER SCIENCE

PRACTICAL : **MARKS : 50**

Types of computer, Functional units of computer, Typical input & output devices, Auxiliary storage devices, Commonly used DOS commands, Programming techniques, Writing Algorithm & drawing Flowchart, Use of different commands of BASIC/FORTRAN/PASCAL/C (variables, operators & formulas, input-output statements, branching & looping, library functions, defining functions & subroutines, arrays & subscripted variables, sequential & random data files, use of colours & sound, microcomputer graphics), numerical methods in solving problems applied in Textile Technology.

B.Sc. IN TEXTIEL TECHNOLOGY, PART-III

301. YARN MANUFACTURING TECHNOLOGY-II

THEORY : **MARKS : 100**

Short Staple :

Comber - Objects of the combing process. Methods of comber lap preparation and importance of arrangement of fibre in card sliver. Principles of comber, Cycle of operations. Comber waste and waste control. Main comber settings, effect of change of settings on sliver quality, waste quality and percentage extraction. Methods of waste removal. Drafting systems; sliver coiling system.

Speed frame - Objects of speed frames. Detailed study of types of drafting systems, amount and distribution of draft. Twisting and amounts of twist for different materials, use of false twist. Winding and Bobbin Building, Drives to Bobbins, Bobbins rail and Spindles. Object and action of cone drum drive and differential motion, alternative methods of bobbin drive. Builder mechanism. Setting, speeds and productions.

Ring frame - Function of ring spinning process, description of main working parts. Drafting systems, types of spindle, ring and travellers. Yarn tensions and forces acting on the traveller. Winding, building mechanism. Settings, speeds and production. End breaks.

Study of doubling and twisting machines, different systems of doubling. Reeling, building, baling. Brief outline of modern spinning systems.

Long Staple :

Objects and functions of jute drawing. Detailed study of jute drawing frames, drafting systems. Suitable drafts and roller settings.

Objects and functions of flyer & other spinning machines, types of drafting systems. Twisting and winding. Bobbin building mechanisms. Amount of twist necessary in jute yarns. Brief outline of modern spinning Systems for Jute Yarns.

PRACTICAL : **MARKS : 25**

Practical study of Comber, Speed frame, Ring frame, Doubling, Reeling machine of cotton spinning. Practical study of Drawing frame, of Spinning frames of jute spinning.

302 FABRIC MANUFACTURE TECHNOLOGY-II

THEORY : **MARKS : 100**

Weaving:

Chronological Development of looms. Loom drive and brakes. Different types of sheds.
Shedding - Tappet shedding, Construction of shedding Tappet.
Dobby Shedding - Scope & classification, Negative, positive & cross-border dobby, Peg-plan. Timing & dwell of dobby.
Jacquard shedding - Scope, Types and Basic principle of Jacquard shedding.
Picking - Classification, over picking & under picking mechanisms, Construction of picking tappet, picking faults.
Beating - Principle of crank & crank arm beating, Effect of crank arm & crank length, Sley eccentricity and its effects, Forces involved in beating action.

Take-up and let-off mechanisms. Calculation of take-up constant, picks/cm and rate of let off. Automation in weaving. Production of various stripe and check fabrics. Necessary calculations.

Knitting :

Study on weft knitting machines - Fabric machine, Garment length machine.
Stitches produced by varying the timing of the needle, loop intermeshing
Straight bar frame - Development, Fully fashioned article, knitting action of straight bar and plain straight bar frame, Rib to plain machines
Double cylinder hosiery machine, Closed toe hosiery machine, Knitting Argyle designs on circular half hose machine, Fish net, stockings and panty hose production.
Basic warp knitting principles - Terminology mechanism & Classes of warp knitting machinery, Tricot and Raschel machines, knitting cycle of bearded needle Tricot and single needle bar Raschel machines. Compound needle warp knitting machine, Crochet machine, warping.
Tricot two full set guide bar m/c and its product. Rules for locknit, Tricot, Sharkskin etc. fabric production.
Surface interset, relief and open work fabrics
Calculations related to weft and warp knitting.

PRACTICAL:

MARKS : 25

Weaving :

Practical study of involved machinery. Dismentling and reassembling of various parts, operation of machinery. Visit to manufacturing plants.

Knitting : Practical study of different mechanisms - feeding, drawing-off, winding and receiving, driving, & stopping mechanisms. Operational technique of knitting machinery. Detection of fabric specification from given samples.

303. WET PROCESSING TECHNOLOGY-II

THEORY : MARKS : 100

Technology of Dyeing:

Structure and application of Sulphur, Azoic, Reactive and Disperse dyestuffs on different fibres; Stripping.

Technology of Printing:

Printing processes for different fibres with reactive, Azoic and Disperse dyestuffs. Assistants used in printing operations and their functions; Structure of Pigments, Pigment printing.

Technology of Finishing:

Definition and classification of finishing; Physical and Mechanical Finishing of Cotton, Jute, Wool and Silk fabrics; Shearing and Cropping, different types of calendering, measuring and cutting, making up of different jute goods. Hoop-length and dead weight measurement calculations, raising, beetling, breaking, folding sanforising; chemical finishing; mercerisation and parchmentisation, resin finishing, water repellency, flame retardancy.

PRACTICAL : MARKS : 25

Dyeing of various fibres with sulphur, Azoic, Reactive and Disperse dyestuffs. Printing of different fabrics with sulphur, Azoic, Reactive and Disperse dyestuffs. Pigment printing, Production of water repellent and flame retardant effects on different fabrics.

304 GARMENTS TECHNOLOGY-II

THEORY : **MARKS : 100**

Sewing :

Seam properties, types & usages; Stitch types, properties & usages; Principle of lock stitch & chain stitch formation; Sewing machine-feed mechanism, needles, Sewing thread, Sewing problem and remedies, Sewing machines, Work aids in sewing, Simple automatic machines.

Alternative methods of joining fabrics - Welding, adhesives, Fusing, Moulding and their comparison.

Trimmings - Discussion on label and motifs, Chain, Buttons, lining, Hook & loop fastening, shoulder pad, lace braid & elastic, performance of trimmings.

Pressing and finishing - objects, types, methods, & International care labelling codes.

Folding & Packing - Types, methods, equipments, symbol and markings.

PRACTICAL : **MARKS : 25**

Production of different types of stitches. Production of different types of seams. Pattern making for trouser, Pattern grading, Manufacturing problems & their correction, Fusing of garments parts, Test of fuse quality, Industrial visits.

305. TEXTILE PHYSICS-II

THEORY : **MARKS : 50**

Electrical properties - Electronic properties of solids, conductors & insulators, capacitance, di-electric constant,effect of moisture. Measurement of di-electric constants of fibres, yarns and fabrics.

Static electricity formation: Theories of static electrification, measurement of static charge, explanation of the phenomenon of static electrification in textile, its effect and remedies in textile processes.

Engineering approach to fibre structure. Mechanics of simple yarn structure, effects of fibre properties and yarn twist on torsional and flexwal rigidity. Effect of fibre length, fineness, strength and moisture on yarn strength.

Yarn geometry, effect of yarn twist on yarn strength (obliquity effect) lustre, yarn diameter and handle.

Fibre migration, theory and causes of migration of fibres to surface or core of yarn.

Geometry of plain woven fabrics, calculation knowing crimp ratio and thread spacing, Geometry of jamped conditions, crimp interchange, effect of yarn flattening, deformation of fabric.

Application of coth geometry, Tensile testing, geometrical change during extension of fabrics.

Fabric buckling, shear and drape. Geometry of plain knitted structure.

Engineering design of fabric to meet specific mechanical properties.

Prediction of tensile properties of fabrics

306 TEXTILE TESTING AND QUALITY CONTROL-II

THEORY : MARKS : 75

Yarn Testing - Sampling methods, zoning, stratified samples, Measurement of tensile strength of yarn; single thread, skein or lea strength and ballistic test; comparison of results, CRT, CRE, and CRL machines and methods of loading.

Sliver, roving and yarn irregularity; measurement by cutting and weighing methods, thickness under compression, capacitance and other methods; length variance curves. Use of spectrogram for

analysis of periodic, random and drafting wave variation, Measurement of imperfections. Comparison of results with Uster statistics.

Measurement of yarn hairiness.

Fabric Testing -

Fabric dimensions, measurement of length, width, thickness; ends and picks per unit length in woven fabric; courses and wales per unit length in knitted fabric. Crimp of yarn in woven and knitted fabric.

Methods of measurement for tensile, tearing, ballistic and bursting tests. Relationship of fibre, yarn and fabric strength.

Measurement of fabric stiffness and its relation to handle and drape.

Measurement of air, water permeability/retention, water pressure; crease recovery. Serviceability, wear and abrasion tests, pilling of fabrics. Flame retardant/flame resistance tests.

Measurement of fastness to light, washing and rubbing. Estimation of damage to materials caused by physical & chemical treatments viz. Singeing securin, bleaching, Determination of size and filling.

Carpet testing:- carpet thickness, compression and durability. Identification of fibres.

PRACTICAL : MARKS : 25

Determination of (i) Single yarn strength by single strength tester (ii) Lea strength and C.S.P of yarn (iii) Irregularity of sliver, roving & yarn (iv) Imperfections Analysis of spectogram.

Determination of (i) Woven and Knitted fabric dimensions (ii) Fabric weight/unit area (iii) Cloth thickness (iv) Size percentage in fabric (v) Porosity of fabric (vi) Fabric strength (tensile, tearing, ballistic and bursting) (vii) Abrasion resistance of fabric (viii) Fabric crease recovery (ix) Water repellency, water absorption. Carpet testing. Identification of fibres from a given smaple (single or blended).

307. FABRIC STRUCTURE AND DESIGN

THEORY : MARKS : 75

Woven Fabric Structure:

Introduction : Classification of woven fabrics, Plain weave fabric and its representation, Factors affecting the fabric structure,

Plain Weave Fabrics : Derivatives of plain weave and their characteristic. Ornamention of plain weave fabrics by varying set, yarn linear density, crimp, twist and material.

Twill weaves : Definition of the terms balanced, warp-faced and weft-faced twill weaves. Developed twill weaves, i.e. waved, herringbone, diamond and elongated.

Relative firmness of twill weave. Large twills influence of the twist of the yarns. Angle of inclination of twill weaves.

Satin and sateen weaves, Drafts, denting and pegging plans,

Fancy designs of fabrics : Characteristic, appearance and texture of simple fancy weaves (viz. mock leno including distorted thread effects), huckaback honeycomb, basic crepe weaves and Bedford cord structures

Stripe and check effects using basic and simple fancy weaves,

Colour in combination with weave effects, i.e. pinstripe, crowfoot, dog's tooth, shepherds check.

Designs of fabrics figured with extra warp, extra weft and extra warp & weft.

Designing of double width, tubular, multiply and stitched double cloth, designing of double equal plain fabrics figured by inter change.

Knitted Fabric Structure:

Structure of 1 x 1 rib and 1 x 1 purl weft knitted fabrics and their representation on design paper. Comparison of the properties of plain, 1 x 1 rib and 1 x 1 purl weft knitted fabrics.

Structures of simple, tuck & miss stitches and their representation using loop diagrams.

Representation using conventional notation 1 x 1 straight lock, 1

x 1 cross lock, half-cardigan, full-cardigan, 1 x 1 weft locknit and 2 x 1 weft locknit structures.

PRACTICAL : MARKS : 25

General procedure for the analysis of woven and knitted fabric. Determination of specifications for the reproduction of fabric samples of all types. Practical setting of sample and compund structures. Calculations relavent to woven & knitted fabric strucrture.

308. APPLICATIONS OF COMPUTER IN TEXTILE

THEORY : MARKS : 100

Use of computer in Textile Manufacture (Machine/process control, dye receipe formulation, quality control, colour matching, mixing ratio formaulation etc.) General programming principles used in developing business and Textile applications of computers (Payroll, stock control, whole saling, retailing etc.) Series of lecture on C-language.

Principles - System analysis, system design, documentation, and planning.

Applications - Critical path analysis, linnear programming, accounting, forecasting etc. use of available textile related software.

PRACTICAL : MARKS : 25

Practical application and practice of the above topics.

309 INDUSTRIAL MANAGEMENT

MARKS : 100

Management & Organization :

Definition, Function and role of management, Nature and scope of business, Direction and Communication, Controlling-budgetary control; Organization-structure, Type of structure, Work measurement and Wage plan operational research, Span of Supervision, Motivation, Leadership, Nature of Behaviour, Personality, Psychology of labour/management reactions from different types of companies.

Personnel Management :

Concepts, Policy, Structure and Functions of personnel department. Line and staff organization, Recruitment, Training, Job evaluation. Methods of remuneration, Organization of employers and work people, ILO. Trade union organization, Collective Bargaining, Labour Welfare, Disputes, Jop specifications, Job descriptions, discrplinary actions showcauge, chargesheet etc. Health, Safty and working conditions.

Production Economics

Basic concepts in economics - utility of goods, wealth, value, price and want. Theory of utility of supply and demand. Elasticity of supply and demand. Problems of allocation and investment study capital.

Production - factors of production - division of labour,, location of industries, specialization. The economics of scale small and large scale production. Producers curves and production function.

Investment decisions

Feasibility studies to set up a new Mill - Economic, Market, Financial and Technical feasibility studies. Economic evaluation and comparison of alternative investments - Capital budgeting technique. Project Management through CPM/PERT.

B.Sc. IN TEXTILE TECHNOLOGY PART-IV

401 YARN MANUFACTURING TECHNOLOGY III (OPTIONAL)

THEORY : **MARKS : 100**

Short Staple :

Assessment, Calculation and Control of Mixing Cost and Quality. Study of modern trends and development in a ring spinning mill from blowroom to baling. Automation in all sector of spinning industry for Creeling, Doffing, Piecing, Cleaning, Materials handling and linking of machines. Data processing. Relationship of automation with quality and productivity and its relevance in the Bangladesh Textile Industry.

Processing pavameters such as hanks, Speeds, Settings, Waste, Cleaning efficiencies, Nep content, Productions and CV% for mass per unit length at all stages of processing. Setting of suitable values for the material processed and machine conditions.

Waste control at all stages of manufacture, centralized waste collection. Dust filtration bags and setting chambers. Theoretical considerations of fibre disentanglement during carding and formation of fibre hooked ends. Reduction of fibre hooks during drafting.

Theory of ring spinning and ballooning, causes of end breaks. Evaluation of properties and characteristics of spun yarns. Processing of soft waste, hard waste and rags into condenser spin yarn. Comparison of methods of spinning waste yarns.

Long Staple :

Study of modern trends and developments of batching, Softening, Carding, Drawing, Drafting Systems and flyer spinning. Processing parameters of different qualities and counts of jute yarns. Yarn faults, causes of end Breakages. Waste recovery, dust extraction and utilization of waste. Evaluation of properties and characteristics of jute yarns.

PRACTICAL : MARKS : 50

Practical processing of different counts of cotton & jute yarns and analysis of yarn specimens.

401 FABRIC MANUFACTURING TECHNOLOGY - III (Optional)

THEORY : MARKS : 100

Weaving :

Features of automatic looms. Weft replenishment, Methods of weft patterning, Warp protector motion. Side & centre weft fork motion. Warp stop motions.

Jacquard Weaving : Classification of Jacquards. S.L.S.C., D.L.S.C. & D.L.D.C. Open shed, centre shed fine pitch & cross border Jacquard shedding. Systems of harness mounting. Methods of increasing the figuring capacity of Jacquard costing out. Card cutting & lacing. Jacquard calculations.

Study of broad (C.B.C) loom. Time studies in weaving & calculation of weaver's load. Cloth costing. Causes of warp & weft breakage in weaving. Cloth faults and their remedies. Factors controlling loom efficiency & means of increasing loom efficiency. Relevant calculations.

Knitting :

Coloured stitch designs in weft knitting - weft knitted jacquard e.g. single jersey Jacquard, Rib Jacquard. Pattern and selection devices - Butt length, Butt position, Multistep butt set-out, Element selection Full Jacquard mechanical and electronic needle selection, Pattern wheel, Pattern area calculations. Production of weft knitted fabrics - Simple Tuck and float stitch single jersey fabrics non jacquard double jersey fabrics. Double Jersey inlay. Loop transfer stitches - plain loop, fancy lacing, Rib loop,

eyelet. Welts, Garment sequences and knitting to shape calculation of fashioning frequencies. Flat knitting principles and structures. Laying in warp knitting - General rules, Fall plate patterning, Full width weft insertion, Cut presser and Miss-press structures. Aspects of knitting science - loop shape and loop length control, yarn let-off, welt knitted fabric relaxation, knitted fabric geometry, Tightness factor, Robbing back.
Multiple guide bar warp knitting machines and their product. Fabric control mechanism - Run-in, yarn feeding and tension control, Fabric take up and batching mechanisms. Specialty weft knitted fabrics and machines - loop wheel frame, production of fleecy on sinker top m/c, Fleecy interlock, sinker wheel m/c, plush in sinker top latch needle m/c sliver or high pile knitting. Knitted fabric faults and their remedies.

PRACTICAL : MARKS : 50

Weaving :
Detailed study of relevant mechanisms and machinery. Dismantling and reassembling of parts. Operation of machinery. Visit to manufacturing plants study of fabric defects.
Knitting :
Delailed practical study of mechanisms and machinery. Dismentting and reassembling of different parts of machinery. Production of knitted fabric samples containing basic structures.

401. WET PROCESSING TECHNOLOGY-III (OPTIONAL)

THEORY : MARKS : 100

Applied Chemistry:
Water treatment (Estimation and Removal of Hardness). Different types of surface active agents (Synthesis, Effects, Degradability); Chemistry, properties and uses of various Acids, Alkalies, Salts, Oxidizing Agents and Reducing Agents in Textile Wet Processing.

Dyeing:

Dye Aggregation; interaction of dyes and fibres. Mechanism of Dyeing, Dyeing Kinetics, (Diffusion, Pore Model, Free volume model). Thermodynamics of dyeing (Dyeing Isotherms, Affinity/ Standard Chemical Potential difference)

Structure and application of Mordant dyes, Pigments and Mineral colorants on different fibres.

Printing:

Special types of thickeners (Synthetic Polymers, Emulsion thickeners); methods of screen and roler preparation; detailed study on screen printing technology.

Finishing:

softening agents (different types, applications. Special finishing treatments (rot-proofing, mildew proofing, insect and bactericidal finishes, soil lease finishes).

PRACTICAL : MARKS : 50

Determination of hardness of water. Removal of hardness by different methods. Dyeing of different fibres with mordent dyes & pigments. Preparation of screen and printing of different fabrics by flat bed and rotary printing machines. Production of crease resistant cotton fabrics with different types of cross-linking agents.

401 GARMENTS TECHNOLOGY-III (Optional)

THEORY : MARKS : 100

Discussion on garments washing, dyeing and drying machines.

Garments washing: Concept of washing, requirements of washing, different types of washes - Caustic wash, bleach wash, pigment wash, Enzyme wash, stone wash, Acid wash, Super white wash.

Garments Dyeing: Concept of swatch making and garments dyeing,

Garments dyeing with reactive and other dyes. Problems associated with garments dyeing.

Garments inspection and quality control: Raw material and finished garments inspection, In-precess inspection, Final inspection, Product quality audit, Comparability test.

Garments costing: Systems of garments costing, determination of fabric consumption, thread consumption and trimmings. Analysis of fabric requirements in relation to garments costing. Determination of costs.

Factorial study of seam strength, Mechanism of seam slippage, seam strength prediction, seam strength testing, Fabric sewability assessment. Selection & setting of machines per lien for the production of shirt/trouser & T-shirt.

PRACTICAL : MARKS : 50

Swatch making and reproduction of swatch. Different types of garments washing. Different types of garments dyeing. Seam strength analysis. Fabric sewability analysis. Industrial visits.

402 YARN MANUFACTURING TECHNOLOGY-IV (OPTIONAL)

THEORY : MARKS 100

Short Staple :

Detailed study of processing chemical staple fibres, viz. Viscose Rayon, Polyester, Acrylic and their blends with cotton on cotton processing machines, Differences in machine speeds, Settings and Productions. Properties of blended yarns. Analysis of blends, Effects of length, Fineness, and Surface characteristics of fibres on yarn properties.

In depth study of rotor spinning and other modern short staple spinning methods. Comparison of methods, yarn quality, productions and economics, with ring spinning.

Long staple :

Manufacture of jute blended yarns using different spinning systems. Properties and end-uses of blended yarns.
Detailed study of modern long staple spinning systems such as Repco, Spin-gard, Wrap Spun, Core spun and Twistless spinning.
Lectures on recently published Research and Development work in spinning industries in Bangladesh and in other countries for short and long staple materials.

PRACTICAL : MARKS : 50

Procesing of Manmade staple fibre & their blends. Detailed study of Rotor and other modern short & long staple spinning machines.

402 FABRIC MANUFACTURING TECHNOLOGY-IV (Optional)

THEORY : MARKS : 100

Weaving:

Study of interrelationships between winding parameters. Uniform build of the cone. Introduction to ballon theory & tension variation during unwinding Relationship between size & angle of creel the distance between creel & headstock, and warp width. Sizing of blended and synthetic yarns. Comparative study of different techniques of sizing, Disadvantages of sizing, desizing & recycling. Analysis of weaving performance of sized yarn. Description of attempts to substitute sizing operation. Factors influencing the drying efficiency of a sizing machine. Comparison of different methods of drying. Means of uniform drying. Eccentricity and Acceleration of sley, Differences between conventional & un-con-versional looms. Factors involved in warp & weft strain & calculation of warp strain. Variations in pick spacing.

Conventional & various unconventional selvedges & calculation of weft waste percent. Shirley picking & take-up mechanism.
Detailed study of projectile, Rapier, jet and Multiphase weaving machines.
Standard commercial fabrics (Jute/Cotton/Synthetic) Fabric properties and comfortable clothing. Factors to be considered in choosing a fabric for particular end use condition. Current issues in weaving.
Relevant calculations of weaving machinery allocation, production management, project balancing and modernization.

Knitting :

Production of high quality cotton knit goods. Production of knitgoods from yarns containing man made fibre. Study on linear and non linear cams in weft knitting. Kinetics and economics of weft knitting. Automation in knitting industry. Multi-axial knitted fabric construction. Multi-axial Raschel machine. Uses of multi-axial fabrics. Recent Research & developments in knitting.

Nonwoven :

Definition and classification. Methods of web formation. Conventional method of nonwoven fabric formation. Modern techniques for the production of nonwovens. Properties and uses of nonwoven fabrics. Fault and remedies of nonwoven fabrics. Environmental problems caused by nonwoven fabrics.

PRACTICAL : MARKS : 50

Weaving :
Practical study of the relevant machinery. Dismantling and reassembling of various parts. Operation of machinery. Visit to manufacturing plants etc.

Knitting :

Production of knitted samples with given specificatins and study of their dimensional behavior. Ajustment of the machine for the production of fabrics of different GSM.

402. WET PROCESSING TECHNOLOGY (OPTIONAL)

THEORY : **MARKS : 100**

Pretreatment :

Special scouring processes (solvent scouring and Vapour-loc scouring); Estimation of scouring, Bleaching and mercerizing effects; Estimation of available chlorine in bleaching powder. Faults and damages in bleaching.

Dyeing:

Additive and substractive colour mixing. Colour measurements, CIE and Lab Systems of Colour Measurement. Spectophotometers. Colour fastness. Assessment of colour-fastness with grey scale. Faults in dyeing and their remedies. Dyeing of blended fibres and fabrics.

Printing:

Special printing methods (Transfer Printing, Jet printing, Flock printing, Burn-out printing). Faults in printing and their remedies.

Finishing:

Removal of excess water and various drying systems in wet processing. Low-wet pick-up finishing and its Importance, application of optical brightening agents. Lectures on recently published research and developments in wet processing.

PRACTICAL : **MARKS : 50**

Identification of dyestuffs. Colour fastness tests of different dyeings. Dyeing of blended fabrics with appropriate dyes. Colour matching by production of combination shade. Practical estimation

of Scouring, Bleaching and Mercerizing effects. Printing of blended fabrics with appropriate dyestuffs. Transfer printing.

402 GARMENTS TECHNOLOGY IV (OPTIONAL)

THEORY : **MARKS : 100**

Production planning, Production control and Production management. Line balancing, Production systems.

Tools of planning: Work measurements, time study motion study and method study.

Material handling and transportation system of garments components advance study on scheduling in cutting room

Material Management in the Clothing Production: Principles of purchasing, Marker utilization variation, Fabric loss outside marker, Fabric loss outside marker, Fabric utilization variation, control of material wastage, Manufacturing resource planning.

Production engineering

Cost control

Total quality control

Quality from design to dispatch

Production and people

Training

Discussion on category and quota, Merchendizing in the garment factory.

Detailed study of garments design. Lecture on latest trend in garments manufacturing. Lecture on recently published research & development works.

PRACTICAL : **MARKS : 50**

Production of Suits, Jacket, Jogging suit, Ladies dresses, Childrens wear, Knight dress.

403 SPECIAL YARN PRODUCTION (OPTIONAL)

MARKS : 50

Study of two-fold, manifold, cabled and core yarns for particular end uses. Twisting and doubling machines including up-twisters and 2-for-1 twisters.
Effects of amount and direction of twist at each twisting stage on strength, elongation, lustre and balanced twist. Twist setting.
Manufacture of fancy yarns.
Top-to-tow conversion manufacture.
Methods of producing textured filament yarn. Effect of process variables on characteristics of textured yarns. Production of twines and ropes.

403 SPECIAL FABRIC PRODUCTION (OPTIONAL)

MARKS : 50

Definition, Structure, Production, Properties, End-uses, etc. of Laminate, Tape, Belt, Label, Braid, Lappet swivel; velvets & velveteen Carpet; Terry Towel; Geotextiles; Medical Textile; Triaxial Fabrics; Coated & filter fabrics.

403. SPECIAL WET PROCESSING (OPTIONAL)

MARKS : 50

Foam technology in wet processing (foam generation, application, advantages and disadvantages); Solvent dyeing, Dyeing under hypercritical conditions; Computer assisted recipe calculations. Human colour vision, Metamerism. Trichromatic theory of colour vision and colour matching equations. Effluents in wet processing, their effects on environment, various types of effluent treatment and disposal systems.

403 SPECIAL GARMENTS PRODUCTION (OPTIONAL)

MARKS : 50

Brief description of fashion house in Europe and USA, the conversion of fashion design to the ready made clothing industry. Fashion trends in different countries: traditional including modifications to ethnic designs. Modern trends in relation to the following: length, silhouette, exposure, colour, cloth texture and cloth design. Modern trends of fashion & design. Physiological process of maintaining constant "Core" temperature of human body Mechanism of heat transfer from human body. Concept of apparel design, heat transfer amd comfort. Detail study on thermal underwear, wind proof garments, Breathable fabrics and garments, fire proof garments, Rain coats, Racing drivers garments, protective clothing, & safely item gogging suit, space suits & divers suit.

404 MACHINE TECHNOLOGY & MAINTENANCE OF TEXTILE MACHINERY

THEORY : MARKS : 75

Maintenance : Types of maintenance, planning and organizing maintenance, repair cycle, maintenance stages, lubrication and lubricants, Inspection.

Inventory Management : Types of inventory, cost analysis of inventory, inventory control, economic order quantity (EOQ), economic lot size, lead time, Mean absolute deviation (MAD), Re-order level.

Material handling : Conveyors used in textile mill - belt conveyor, chain conveyer, hydraulic press and lift, truck hoist.

Air conditioning : Comfort condition, psychometric chart, Heating, cooling, dehumidification, humidification. Ventilation, filtration. Mill illumination.

Ergonomics : Definition, importance and application of ergonomics to work place and layout.

Machine erection : Floor preparation, foundation, machine fixation, levelling etc.

Safety in textile mill : Industrial hazards, safety rules, factory act, first aid and pollution control.

PRACTICAL : MARKS : 25

(I) MAINTENANCE OF YARN MANUFACTIRUNG MACHINERY (OPTIONAL)

Safety : Drives to any machines on which maintenance is being carried out should be isolated and machine unable to be switched on. Safety must be stressed, in particular, maintenance of guards, guard door solenoids and position of emergency stop buttons. All maintenance should be related to the quality of product from each machine.

Examination of all gearing for wear and correct depth of setting; also flat belt, V-velt, Tape, Rope and Chain drives for Wear, correct settings and slippage where appropriate. Positions of oiling and greasing points; schedules for cleaning , Oiling and Greasing, Scouring and re-setting schedules.

Blowroom - Inspection for wear and settings of beaters, beater bars, lattices, regulating and lap forming mechanisms.

Cards - Examination and core of card and taker-in wire, stripping and grinding, Checking and adjusting all settings, can coiling.

Drawframes - Maintenance of drafting systems, stop mechanisms. Comber check cylinder half laps, top combs and brushes for wear, check and adjust all settings, care of drafting system.

Speedframes - Maintenance of drafting system, building mechanism, drives to spinals bobbin rail and bobbins.

Ringframes - Care and maintenance of drafting systems, Rings and Travellers, Spindles, drive to ring rail.

Rotors spinning frame - Maintenance of opening foller rotor driving systems, suction unit.

(II) MAINTENANCE OF FABRIC MANUFACTURING MACHINERY (OPTIONAL)

Thorough understanding of different preparatory and fabric manufacturing machinery.
To become familiar with various parts of the machines.
To become familiar with the maintenance tools and their functions.
Cleaning, oiling/lubricating and greasing of various machine parts.
Understanding the basic principle of tightening and loosening of nut bolt, screw, belt etc and skill development thereof.
Proper meshing of the gears,putting on and putting off the belts, etc.
Locking/fixing of cam, cone, pulley, toothed gear etc.
Fitting of bush, bearing collar and bracket.
System of dismentling and re-assembling of machine parts.
Changing and setting of various machine parts and observing their effects on changing
Overhauling and erecting of preparatory and fabric manufacturing machinery.

(JII) MAINTENANCE OF WET PROCESSING MACHINERY (OPTIONAL)

Preparatory Machineries:
Maintenance of singeing, Kier boiler, J-box, Rope washing machines, Boilers.
Dyeing Machineries
Maintenance of Jigger dyeing, Winch dyeing, HTHP dyeing, Hank dyeing machineries.
Finishing Machineries:
Maintenance of different padding mazles, Drying machineries, Stenter, Mercerizing machines, Calendaring and Folding machines.
Printing Machineries:
Maintenance of different Roller printing and Screen printing machineries.
Laboratory Machineries:
Maintenance of different Laboratory Machineries.

(IV) MAINTENANCE GARMENTS MANUFACTURING MACHINERY (OPTIONAL)

Repair, Maintenance, Setting and Replacement of different parts of Rotary knife, Straight knife, Band knife, Die cutting machine, Notcher and Drill machines. Repair, Maintenance, Setting and Replacement of different parts of lockstitch, Blindstitch, Chain stitch, Overedge stitch and Flat lock sewing machines. Repair, Maintenance and Setting of Fusing machines and Pressing machines.

405 PRODUCTION PLANNING & CONTROL

MARKS 100

Functions and types of production; production life cycle; capacity planning, process planning; process design; PPC functions - Forecasting, Loading, scheduling, despateching, order control; Line balancing; plant layout; Plant location factors; Inventory control, Purchasing principles - make or buy decisions Quality control in production life cycle, Maintenance and productivity.

Work Study:

Method study, Purpose and Techniques used; Procedure of select, Record, Examine, Develop, Instal and Maintain.
Precautions when introducing new methods. Relationship with work measurement.
Work measurement, purpose and techniques used, Rating, Elements, Break points, Basic time. Use of allowances.
Activity sampling. Definition, purpose and procedures, use of pilot study, Interpretation of results.

Production studies. Machine utilization and operator performances. Hok (operator hours per 100kg production). Machine interference. Materials handling. Mechanical and static handling.

406 TESTING AND QUALITY CONTROL-III

THEORY : MARKS : 75

Definition and purpose of Q.C., S.Q.C, Q.A, T.Q.M.
Introduction to and Administration of Quality Control Department.
Duties and responsibilities of quality control officers. Use of standards BSTI, ISO, ASTMS, British, Pakistan and Indian standards.
Quality Control and Inspection Planning
Quality control charts use of charts and setting of limits.
Analysis of variance, acceptance sampling, correlation analysis to determine relationship between various factor, tests of significance.
Acceptance tests and inspection of raw materials for each sector of the industry.
Yarn manufacturing-raw cotton/jute/chemical fibres
fabric manufacturing-yarns
Wet processing-yarn and fabric, Dyes and auxiliaries
Garment manufacturing finish fabric, sewing thread.
Process and finished goods control for each sector of the industry.
Effects of process control on costs and quality.
Parameters measured, Sample sizes, Tests made, Results expected at each stage of processing from fibre to finished garment production.

PRACTICAL : MARKS : 25

Quality control practices for yarn, Grey fabrics, finished fabrics and garments including use of control charts. Industrial visits.

407 ACCOUNTING & MARKETING

MARKS : 100

Principles and practice of book-keeping, single entry and double entry system, journal, ledger, cash book, trial balance, partnership, shares joint stock company, sole tradership, manufacturing. Trading and profit and loss accounts. Balance sheet, consignments, forms of sales consignments, consignee proforma invoice, bill of exchange. Description of Assets & Equipment.

Function and advantage of costing. Methods of cost accountancy. Elements of cost accounting, direct and indirect expenditures, cost overhead and cost accounts & financial accounts for firms. Standard cost preparation of cost sheets and statements, break even analysis, stock taking and control of stock and stores, pay roll. Dummy worker on pay-roll

Marketing

Concept, Sope and Functions of marketing tools, product concept, types and product development, types of markets, market segmentations, approaches of marketing. Sales promotion and advertisement, export marketing. Distribution channel and pricing of product for local and export markets. Export Marketing and documentation methods of market study. Elementary marketing research.

VISITS TO INDUSTRY

Dates Visited	Organisations & Business	Persons seen & Positions	Number of Graduates Employed and Comments		
			Number	College/College Graduates	Planning Requirements
1992/93 Nov 23 Mar 1	U.C.E.P. Technician Training	R. Flaherty Consultant	3	Graduates poor in workshop practice U.C.E.P. used as 'stepping stone' to industry.	Similar to present
Dec 30	Dewan Textiles Bleaching & Dyeing	Amirul Huque Manager	4		
Dec 30	Sun Textiles Dyeing, Printing & Finishing	M.A. Karim Manager	5	More emphasise on workshop practice/ mill training, also computers & engineering	More graduates will be required, number not known.
Dec 31	Sidex Ltd. Bleaching & Dyeing	Sirajul Islam Manager	12		More graduates required when spinning plant is ready.
Jan 12	B.T.M.C. Spinning, weaving Finishing.	M. Akhtaruzzaman Director of Operations	150		No planning, future uncertain
Jan 12 Jan 30	B.T.M.C. Quality Control.	Dr. Anwar Hassan Noor . Director	1	Should be more on management, also stronger relations with College are desired.	No plans, uncertainty about future of B.T.M.C.
Jan 19 Mar 10 Apr. 1	T.I.D.C. Development & Training Centre	Dr. Uddin Hossain Chowdhury, Principal M. Mohiuddin Head of Q.C.	7	Workshop practice considered poor. Management, especially communications should be improved.	If T.I.D.C. becomes national centre, more graduates required
Jan 28 Mar 14	Padma Textile Mills. Spinning	Shah Alam G.M. Abul Hashem Manager.	35	More engineering and practical work desired.	Graduates required for future developments.
Feb 25	B.J.M.C. Jute Industry	A.S.M. Shaheed Director of Research & Q.C.	few	No graduates employed recently	Uncertain future for B.J.M.C.
Mar 5	Prime Textile Spinning Mills	Mahbub E Rabbani G.M.	72	Industrial training should be six months and include project.	More graduates required upon expansion.

Dates Visited	Organisations & Business	Persons seen & Positions	Number of Graduates Employed & Comments		
			Number	College/College Graduates	Planning Requirements
Mar 7	Opex Garments Ltd Making up Garments	Lt. Col. Mozibul Islam Khan (retd.) Executive Director	6	Graduates required with knowledge of clothing manufacture.	More expansion shortly and more graduates required.
Mar 7	Friends International. Knitting, Printing, Dyeing & Making up.	Ashrof Uzzman Technologist	?		Some expansion possible but no plans made.
Mar 9	Syntex Printing & Finishing Mills	Md. Jiaul Islam G.M.	4	Workshop practice and industrial training very important.	Further expansion planned but graduate numbers not known.
Mar 9	Megna Mills Ltd Composite Mill of B.T.M.C. Dyeing & Finishing only.		3		Depends upon government policy re B.T.M.C.
Mar 10	B.T.M.A. Employers' Assoc.	Wali ul Islam Chairman	-	Very critical of College graduates. More industrial training required, at least four months including project.	A probable increase in graduate numbers in private sector but no forward plans.
Mar 14	BEXIMCO Conglomerate, owns Padma Mills	A.S.F. Rahman Chairman S.M. Kamal Director Human Res.	-	Course should include preventive and predictive maintenance, management should include forward planning and communications.	See Padma Textile Mills.
Mar 21	Rahim Textile Mills Ltd. Weaving, Dyeing & Finishing.	A.S.M. Sayef Ullah G.M. Md. Joynul Abedin Prod. Man.	?	Graduates should be skilled in theory and practice.	No plans.
Mar 21	Jamuna Knitting & Dyeing Ltd. Conglomerate Knitting, Dyeing, Finishing & Making up	Habib Rahman G.M. (Garments) M.Q. Zaman G.M. (Knitting, Dyeing)	- 5	College should consider more on garment manufacture.	New spinning plant planned & more graduates required.

VISITS TO INDUSTRY

Dates Visited	Organizations & Business	Persons seen & Positions	Number of Graduates Employed and Comments		
			No.	College/College Graduates	Planning Requirements
April 19	Shamsher Jute Mills LTD.	Mr. Mohamed Ali Owner (Chairman of BJGA)	1	Graduates are poor in workshop practice, ready to offer 4 places annually for practical training (6 months including project). New curriculum more engineering oriented.	More graduates required upon the next 5 years. Expansion plan in weaving of pile fabrics on modern shuttleless looms.
May 5	Relain Spinning Mills.	Mr. Mahmoud Khan Manager	3	Industrial training is needed, more engineering, economics and new trends of machinery.	Plans for expansion in air jet looms are ready. 15 graduates are needed soon.
May 29	Latif Bawany Jute Mills LTD.	Ph.D. M. A. Mazid Talukder General Manager	-	Increasing practical training, developing the syllabi to suit new technology, computer, and engineering.	No plans for future due to market difficulties, privatization policy, shortage of financial support.
May 29	Jute Goods Testing Laboratory	Mr. K.M.Sahidul Islam Assistant Director	1	More industrial visits and Training.	No plans in sight.
June 7	Dulamia Cotton Spinning Mills LTD	Mohsin Rezza Khan General Manager Nuruzzaman,(A.G.M.)	3	Necessary for new graduates to have more practical experience.	No more graduates are being considered.
June 16	BSTI	Mr.H.Eldosokey,CTA of UNDP/UNIDO projectDP/BGD/91/006	-	Cooperation among the consultants of the two projects giving some bi-lateral advice in the field of textiles and quality control.	
July 15 July 22	BGTTC	Mrs. E.M.Nordberg CTA of UNDP/ILO	-	Cooperation among the consultants of the two projects giving some lectures in the field of textile technology.	

Programmes of seminars held

Bangladesh College of Textile Technology (BCTT) &
United Nations Industrial Development Organization (UNIDO)

cordially invite students and friends of BCTT
to attend a BASF - seminar on

ACTUAL TOPICS IN TEXTILE CHEMISTRY

to be held in the Textile College
at Tejgaon Industrial Area in Dhaka - 1208
on September 18, 1993 at 3.00 P.M.

Bangladesh College of
Textile Technology
Tel : 314260

UNIDO, Dhaka
Tel : 3103-70/79/89
Fax : 81-1180

(Programme Overleaf)

PROGRAMME

3 : 15 P.M.	Opening	V. Rossbach, UNIDO
3 : 20 P.M.	Degradability of Textile Auxiliaries	K. H. Ruecker, M.D. BASF Bangladesh
3 : 50 P.M.	Waste Water Treatment from Textile Wet Processing - Analysis and Treatment Methods	K.H. Ruecker, M.D. BASF Bangladesh
4 : 20 P.M.	Modern Pigment Printing	T. Islam BASF Bangladesh
4 : 50 P.M.	Scopes of IN-TECHS - Bridge between Students and Professionals	M.A.A.R. Quddus IN - TECHS
4 : 55 P.M.	Scopes of Textile Science and Technology Research Club (TSTRC)	M. M. H. Akonda TSTRC
5 : 00 P.M.	Conclusion	Md. A. Khaleq Prof. and Principal a. i. of BCTT
5 : 05 P.M.	Refreshments sponsored by BASF Bangladesh Ltd.	

United Nations Industrial Development Organization (UNIDO) &
German Cultural Centre Goethe - Institut, Dhaka

cordially invite you to attend a seminar on

TEXTILE COUNTRY GERMANY - FACTS & FIGURES

to be held in the German Cultural Centre
at 23, Dhanmondi R.A., Road - 2, Dhaka - 1205
on December 9, 1993 at 5-30 P.M.

UNIDO, Dhaka
Tel : 3103 - 70/79/89
Fax : 811180

Goethe - Institut
Tel : 501879, 507325
Fax : 863782

(Programme Overleaf)

PROGRAMME

5 : 30 P.M.	Opening	H. Lechner, Director, Goethe - Institut, Dhaka
5 : 35 P.M.	Introduction	M.A. Khaleque, Prof. and Principal a.i. of Bangladesh College of Textile Technology
5 : 40 P.M.	The Innovative German Textile Scene	Dr. V. Rossbach UNIDO, Dhaka
6 : 10 P.M.	Continous textile wet processing - High technology textile machineries	Video film presentation of Ramisch Kleinewefers Krefeld/ Germany and Dornier Friedrichshafen/ Germany
6 : 40 P.M.	Conclusion	Dr. V. Rossbach, UNIDO, Dhaka
6 : 45 P.M.	Refreshments sponsored by Ramisch Kleinewefers and Dornier	

United Nations Industrial Development Organization
জাতিসংঘ শিল্প উন্নয়ন সংস্থা

cordially invite you to attend

the seminar of

Prof. Dr. J. W. S. Hearle

University of Manchester,
Institute of Science and Technology

on

"ADVANCES IN UNDERSTANDING AND APPLICATION OF TEXTILES"

to be held in the Textile College on
January 8, 1994 at 11.30 p.m.

UNDP, BGD/85/132 G. P. O. Box- 224,
Dhaka, Bangladesh.
Tel : 3103-70/79/99 Fax : 81-1180/3196

Bangladesh College of Textile Technology
Tejgong Industrial Area, Dhaka-1208
Tel : 314260

Annex XII-1

Materials given to the library.

Textile Books

1. Books from UNIDO funds
One copy each of the following list of textile books has been brought from the United Kingdom and Germany for the library at the College of Textile Technology, Dhaka, and were funded by UNIDO.
Fibre & Yarn Quality in Jute Spinning - Dr. H.P. Stout
1988 1 870812 09 3

Identification of Textile Materials 7th Edn. - Perry and Farnfield 1985 0900739 14 2

Managing Technological Change
1980 09007739 42 8

Production and Properties of Staple Fibre yarns made by Recently Developed Techniques, L. Hunter 1978

Production of Textured Yarns by the False-Twist Technique
D.K. Wilson & T. Kollu 1991 1 980812 33 6

Rotor Spinning - C.A. Lawrence & K.Z. Chen.
1984 0 900739 68 1

Strengthen & Elongation Testing of Single & Ply Yarns - R. Further
1985 0 900739 78 9

The Textile Institute, Computers in the World of Textiles, Papers presented at the Annual World Conference, Sep 26 - 29, 1984
Hongkong 1984, ISBN 0 0900739 69 x

Winifred Aldrich (ed.), CAD in Clothing and Textiles, Oxford BSP Professional Books, London 1992

L. Miles (ed.) Computers in Textiles, A Buyer's Guide to European Products and Services, The Textile Institute, Manchester, 1989, ISBN 18708121616

In addition to the above, the four quarterly issues of the Journal of the Textile Institute for 1992 were ordered and have been delivered to the College.

Annex XII-2

2. Books from the consultants

A number of books in yarn manufacturing, fabric manufacturing and wet processing have been made available to staff and student.

2.1. Books made available in yarn manufacturing (F. Eckersley)

Practical guide to Opening and Carding - W. Klein 0 900739 932

Practical guide to Combing and Drawing - W. Klein 0 900739 932

Practical guide to Ring Spirning - W. Klein 0 900739 932

Technology of Short Staple Spinning - W. Klein 0 900739 932

The Production of Textures Yarns by Methods other than the False Twist Technique - Wilson and Kollu 0 900739 96 7

Introduction to Clothing Manufacture - G. Cookling 0 632 026618

The Worsted Industry - Briely & Iredale 0 900820 14 4

Woollen Yarn Manufacture - Ross Carnaby, Lappage 0 900739 86 X

Higher Ring-frame Productivity - Ratnan

Norms for Productivity in Spinning - Ratnan & Etal

Personal copies of the following have been given to the library:

Journals of the Textile Institute Vol 84 1993
Textile Horizon Magazines
Textiles 1993
50 years of Polyester 1870812492 Textile Institute

Structural Mechanics of Fibres, Yarns & Fabrics
471 36669. Hearle, Grosberg, Backer

Roget Thesaurus 1 85471 076 1

Annex XII-3

2.2 Books made availabe in fabric manufacturing (E. S. El Helw)

The World Conference On Warp Sizing, Clemson University, South Carolina, USA, May 24 - 28/1982

Wira Collected Papers:-
report No. topic

136 The Hergeth sample warping machine.
137 The Hirschburger yarn length measuring device.
144 The choice and design of warping machinery.
195 The RW8 warper - a descriptive appreciation.

Wira Collected Papers:
report No. topic

6 Winding yarn package of uniform length with special reference to tufting.

43 The effect of winding conditions on yarn hairiness.
73 Measuring the length of running yarns.
81. Yarn tension meters.
99. The constant winding-tension test as an aid to quality control.
189 The Hengstler yarn length counter type 224.

Wira Collected Papers:
report no. topic

100 Calculation of the correct change wheel for warping gear trains.
167 Calculating warp beam capacity.
212 Calculation of the gear train and ramp angle on modern warping machines.

The place of textiles in the economy of a developed country, Shirley Institute Publication S 7

Eric Broudy, The book of looms, Cassell Ltd. 35. Red Lion Square. London WCIR 4SG.

Ultra-Filtration in Textiles- "A Symposium of Textile Institute/Denkendorf and Academy for Research and Technology/Cairo", Egypt, March 1992.

Manual of Standard Fabric Defects in the Textile Industry, Granitville Company, Granitville, South Carolina, USA.

Oldrich Talavasek & Vladimir Svaty, Textile Science and Technology 3, Shuttleless Weaving Machines, Elsevier Scientific Publishing Company, Amsterdam-Oxford-New York 1981

Joseph Noguera, Textile Engineering Experience, Dawson & Goodwell Limited, The Mendip Press, 1978

H.Repenning, Die Mechanische Weberei - Sechste, erweiterte Auflage Technischer Verlag Herbert Berlin 30, 1970.

J. Schneider, Vorbereitungsmaschinen fuer die Weberei - Zweite Auflage, Springer - Verlag, Berlin/Goettingen/Heidelberg.

J. Schneider, Weberei - Verfahren und Maschinen fuer die Gewebeherstellung, Springer - Verlag, Berlin/Goettingen/Heidelberg.

B. Wheatley, Raschel Lace Production, National Knitted Outerwear Association, 51 Madison Avenue, New York, NY 10010.

K. D. Darlington et al. Knitted Fabric Technology, National Knitted Outerwear Association, 51 Madison Avenue, New York, NY 10010.

B.F. Ass, A Practical Programme for Quality Control in Knitwear and Swimwear:- Part I Sewing Room Quality Control, National Knitted Outerwear Association, 51 Madison Avenue, New York, NY 10010.

T.A. Podbereski, A Programme for Quality Control in Knitwear and Swimwear, Part II, National Knitted Outerwear Association, 51 Madison Avenue, New York, NY 10010.

A. Reisfeld et al. Fundamentals of Raschel Knitting, National Knitted Outerwear Association, 51 Madison Avenue, New York, NY 10010.

J.B. Lancashire, Jacquard Design & Knitting, National Knitted Outerwear Association, 51 Madison Avenue, New York, NY 10010.

Harry Wignall, Hosiery Technology,, National Knitted Outerwear Association, 51 Madison Avenue, New York, NY 10010.

A. Reisfeld, Warp Knit Engineering, National Knitted Outerwear Association, 51 Madison Avenue, New York, NY 10010.

Klaus-Peter Weber, An Introduction to the stitch formation in warp knitting, Karl Mayer A.G., 6053 Obertshausen, Germany.

Sizing with Sucker sizing machines (5 issues), Gebrueder Sucker, 4050 Moenchengladbach 1.

Annex XII-5

2.3 Books made available in wet processing, textile chemistry and polymer science (V. Rossbach)

S. V. Kulkarni - Textile Dyeing Operations,
Noyes Publications, Park Ridge, New Jersey, 1986,
ISBN 0-8155-1060-8

Handbook of Fibre Science and Technology, Vol I -
Chemical Processing of Fibres and Fabrics, Fundamentals and
Preparations Pt. A (M. Lewin and S.B. Sello, ed.), New York,
1983, ISBN 0-8247-7010-2; Pt.B. (M. Lewin and S.B. Sello, ed.)
New York, 1984, ISBN 0-8247-7117-6.

R. H. Peters, Textile Chemistry, Vol. III, The Physical
Chemistry of Dyeing, Elsevier, Amsterdan 1975

R.H. Peters, Textile Chemistry, Vol-II, Impurities in Fibres,
Purification of Fibres, Elsevier, Amsterdam 1967.

E. S. Olson Textile Wet Processing, Vol. 1, Pretreatment of
Fibres and Fabrics, Noyes Publications, Park Ridge, New
Jersey, 1983, ISBN 0-8155-0939-1

J. Park, A Practical Introduction to Yarn Dyeing,
The Society of Dyers and Colourists, Bradford 1981, ISBN
0901956287

S.M. Alger, Polymer Science Dictionary,
Elseviers Applied Science, London 1989

K. Venkataraman, The Analytical Chemistry of Synthetic Dyes,
Wiley-Interscience, New York 1988, ISBN 0-471-90575-5

H. Zollinger, Color Chemistry,
VCH Verlagsgesellschaft, Weinheim 1987, ISBN 3-527-26200-8

P.F. Gordon P. Gregory, Organic Chemistry in Colour, Springer-
Verlag, Berlin 1983, ISBN 3-540-11748-2

T.M. Thompson, Dyehouse Laboratory Practice, The Society of
Dyers and Colourists, Bradford, 1983, ISBN 0 901956 295
Textile praxis international, tpi, Textile Auxiliaries Buyers'
Guide THK 1987, Konradin-Verlag, Robert Kohlhammer,
Leinfelden-Echterdingen 1986

Md. Monurul Islam, Master-Thesis, Dept. Textile Industries,
Univ. Leeds, Chemical Finishing of Cotton Fabrics, June 1993

J.A. Brydson, Plastic Materials,
Butterworths, Singapore, 1989, ISBN 0-408-00721-4

C. Earland and D.J. Raven, Experiments in Textile and Fibre
Chemistry, Butterworths, London 1971, ISBN 0-408-70089-0

Annex XII-6

T. Vickerstaff, The Physical Chemistry of Dyeing, Oliver and Boyd, London 1954

Handbook of Fiber Science and Technology: Vol. II, Chemical Processing of Fibres and Fabrics, Functional Finishes (J. Lewin and S.B. Sello), Marcel Dekker; Pt. A. New York 1983, ISBN 0-8247-1716-3; Pt. B. New York 1984, ISBN 0-8247-7118-4

B. Vollmert, Polymer Chemistry, Springer-Verlag, Berlin 1973, ISBN 0-387-05631-9

A. Datyner, Surfactants in Textile Processing, Marcel Dekker, New York 1983, ISBN 0-8247-1812-7

P.F. Gordon, P. Gregory, Organic Chemistry in Colour, Springer-Verlag, Berlin 1983, ISBN 3-540-11748-2

Ullmann's Encyclopedia of Industrial Chemistry, 5th Edition, VCH, Weinheim/Germany

Vol. A 2, p. 355-417, 1985, H.-S. Bien, J. Stawitz, K. Wunderlich
"Antraquinone Dyes and Intermediates"

Vol. A 3, p. 213-238, 1985, R. Raue, "Azine Dyes"

Vol. A 3, p. 245-324, 1985, K. Hunger, P. Mischke, W. Rieper, R. Raue, "Azo Dyes"

Vol. A 3, p. 575-578, 1985, J. Griffiths, "Benzoquinone and Naphthoquinone Dyes"

Vol. A 4, p. 191-199, 1985, H.K. Süss, "Bleaching"

Vol. A 5, p. 369-373, 1986, R. Raue, "Cationic Dyes"

Vol. A 5, p. 375-418, 1986, H- Krässig, J. Schurz, R.G. Steadman, K. Schliefer, W. Albrecht, "Cellulose"

Vol. A 5, p. 438-459, 1985, K. Balser, L. Hoppe, T. Eicher, M. Wandel, H.-J. Astheimer, "Cellulose Esters, especially Cellulose Acetat"

Vol. A 7, p. 369-410, 1986, B. Ilschner, J.K. Lees, A.K. Dhingra, R.L.McCullough "Composite Materials"

Vol. A 8, p. 315-448, 1987, G. Jakobi, A. Löhr, M.J. Schwuger, D. Jung, W.K. Fischer, P. Gerike, K. Künstler, "Detergents"

Vol. A 8, p. 565-575, 1987, K. Leverenz, "Disperse Dyes"

Vol. A 9, p. 49 - 53, 1987, D.C. Tirsell, "Dry Cleaning"

Vol. A 9, p. 73 -124, 1987, G. Booth, H. Zollinger, K. McLaren,
W.G. Sharples, "Dyes, General Survey"

Vol. A 11,p. 279-291, 1988, H. Schwander, P. Hendrix
"Fluorescent Dyes"

Vol. A 12, p. 135-142, 1989, T. Nungesser, "Furs"

Vol. A 14, p. 149-156, 1989, E. Steingruber
"Indigo and Indigo Colorants"

Vol. A 15, p. 299-303, 1990, T. Pink, "Leuco Esters of Vat Dyes"

Vol. A 16, p. 299-333, 1990, K. Grychtol, W. Mennicke
"Metal-Complex Dyes"

Vol. A 16, p. 487-534, 1990, R. Raue "Methine Dyes and Pigments"

Vol. A 17, p. 59 - 65, 1991, S. Haremsa
" Naphtalimide Dyes and Pigments"

Vol. A 17, p. 383-400, 1991, R. Raue, J.F. Corbett
"Nitro and Nitroso Dyes"

Vol. A 17, p. 565-587, 1991, E. Fahrbach, G. Schaut, A. Weghmann
"Nonwoven Fabrics"

Vol. A 22, p. 651-663, 1993, H. Tappe, W. Helmling, P. Mischke,
K. Rebsamen, U. Reiher, W. Russ, L. Schläfer, P. Vermehren,
"Reactive Dyes"

Annex XII-8

Technical bulletins and leaflets, company brochures etc. of different machine manufacturing companies, given to the library of the BCTT (Textile wet processing, V. Rossbach)

Germany

Dornier, Friedrichshafen; Brückner Trockentechnik, Leonberg; Pleva, Empfingen; Schlafhorst, Mönchengladbach; Menschner, Viersen; Then, Schwäbisch Hall; Bitexma, Herbertingen; WeKo, Leinfelden-Echterdingen; Thies, Coesfeld; Max Goller, Schwarzenbach; Monforts, Mönchengladbach; Küsters, Krefeld; Babcock, Seevetal/Hamburg; Krantz, Aachen; Ramisch Kleinewefers, Krefeld; Obermaier, Neustadt; Menzel, Bielefeld; Fleissner, Egelsbach.

Italy

Caber, Bergamo; Reggiani Macchine, Bergamo; Mezzera, Milano; Lafer, Zane/Vicenza; Biancalani, Prato; Monti, Thiene; Arioli, Gerenzano; MCS, Urgnano.

Switzerland

Fritz Buser, Wiler; Benninger, Uzwil; Scholl, Zotingen; Caratsch, Bremgarten.

Netherlands

Brugman, Almelo; Vanwyk, Oldenzaal.

France

Maurice Heliot, La Chapelle St. Luc

Austria

Zimmer, Kufstein

USA

Evac, Spartanburg

Annex XIII

Books ordered for British Council Library

The Technology of Clothing Manufacture	Carrx Lathan
Introduction to Clothing Production Management	Chuter
Fusing Technology	Cooklin
Introduction to Clothing Manufacture	Cooklin
Garment-Dyeing : Read to-wear Fashion from the Dyehouse	Harrison
Textiles: Properties and Behaviour in Clothing Use	Miller
Comfort Properties of Textiles	Slater
CAD in Clothing and Textiles	Aldrich
A Practical Introduction to Fibre & Tow Coloration	Clarke
Colour Physics for Industry	McDonald
Manual of Textile Printing	Storey
Physical Properties of Textile Fibres	Morton & Hearle
Long Vegetables Fibres	Mukharjee & Radha Krishnan
Identification of Textile Materials	Parry & Farnfield
Knitting Clothing Technology	Brackenbury
Ginning : Art and Status	Doraiswamy
Roller Drafting	Lord & Grover
Physical Testing and Quality Control	Slater
Fibre and Yarn Quality in Jute Spinning	Stout
Textile Mechanics Volume I	Slater
Textile Mechanics Volume II	Slater
Principles of Weaving	Marks & Robinson
Cloth Geometry	Pierce & Womersley
Worsted Spinning	Henshaw
The Technology of short-staple spinning	Klein
A Practical Guide to Opening & Carding	"
A Practical Guide to Combing & Drawing	"
A Practical Guide to Ring Spinning	"

Project Number	UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION	Page No. : 1
DP/BGD/85/162	NON-EXPENDABLE PROPERTY CONTROL RECORD	Period Ending : DECEMBER-92

Country : BANGLADESH

Project Title : STRENGTHENING THE COLLEGE OF TEXTILE TECHNOLOGY

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-0-01348	1	SET OF PROJECTILE WEAVING MACHINE P7100B190N1EPD1, MACHINE NO. 119846.	1	62,348.00	1	9	91	G.	1	
15-0-01355	1	RIETER INGOLSTADT DRAWFRAME SB 51 WITH ONE DELIVERY.	1	38,039.00	1	8	91	G.	1	
15-0-01355	2	OE ROTOR SPINNER RU 04.	1	95,444.00	1	8	91	G.	1	
15-0-01355	3	OE BOBBIN TRUCKS.	2	1,211.00	2	8	91	G.	2	
15-0-01355	4	OE TUBE TRUCK.	1	644.00	1	8	91	G.	1	
15-0-01355	5	WASTE TRUCK.	3	1,933.00	3	8	91	G.	3	
15-1-00239	1	AHIBA TURBOCOLOR 1840 ML INCLUDING AHIBA 2000 CONTROL UNIT COMPLETE WITH ACCESSORIES.	1	17,965.00	1	3	91	G.	1	
15-1-00243	1	COLOUR SAMPLING DEVICE TYPE MINI MDR FOR ROTARY SCREEN PRINTING COMPLETE WITH SPARE PARTS.	1	12,154.00	1	10	92	G.	1	
15-1-00243	2	DESIGNED ROTARY SCREENS, STRIPE DESIGN FOR MINI-MDR.	2	1,128.00	2	10	92	G.	2	AMENDMENT A
15-1-00244	1	LABORATORY TRANSFER PRINTING UNIT: TEXIPRESS CHIEF.	1	2,195.00	1	8	92	G.	1	
15-1-00973	1	BOGE SBD 250-2,9/80 3-PH AIR COMPRESSOR UNIT, MACHINE NO. 338394, AIRTANK NO. DB 55129, MOTOR NO. CP 24205.	1	1,312.00	1	11	91	G.	1	
15-1-01213	1	DESIGNED FLAT SCREEN, STRIPE DESIGN FOR MINI MDF/436 FLAT SCREEN PRINTER.	2	1,393.00	2	01	92	G.	2	

Project Number : DP/BGD/85/162

Country : BANGLADESH

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-1-0889Y	1	LIBA WARP KNITTING AUTOMAT COPCENTRA 2/K, S/NO 9318 COMPLETE WITH ACCESSORIES.	1	59,858.00	1	2	92	G.	1	95427
15-1-0889Y	2	SETS OF TRICOT BEAMS.	2	7,851.00	2	2	92	G.	2	95427
15-2-0244Y	1	LAB.PAD MANGLES (ALL PARTS IN CONTACT WITH LIQUID CONSTRUCTED FROM HIGH GRADE STAINLESS STEEL).	2	20,478.00	2	10	92	G.	2	84421
15-2-0244Y	2	LAB.PRINT PASTE MIXER.	1	2,758.00	1	10	92	G.	1	84421
15-2-0244Y	3	ROTARY SAMPLE DYEING MACHINE (10X210ML DYETUBES).	2	13,636.00	2	10	92	G.	2	84421
15-2-0244Y	4	LAB.WINCH DYEING MACHINE.	1	6,676.00	1	10	92	G.	1	84421
15-2-0244Y	5	LAB.STEAM UNIT.	2	14,356.00	2	10	92	G.	2	84421
15-6-00824	1	TOYOTA HIACE DIESEL VAN.	1	8,044.00	1					PURCHASED FOR DP/BGD/84/047, USED BY DP/BGD/84/037 AND DP/BGD/88/051
15-6-01177	1	REX ROTARY ELECTRIC STENCIL DUPLICATOR MODEL RR 790.	1	928.00	1	03	87	G.	1	
15-6-01177	2	REX ROTARY ELECTRONIC STENCIL SCANNER MODEL RR 2150.	1	841.00	1	03	87	G.	1	
15-6-01177	3	OVERHEAD PROJECTOR MODEL RR 3120 INCL. SCREEN 145 X 145.	1	403.00	1	03	87	G.	1	

Project Number : DP/BGD/85/162 | Page No. : 3

Country : BANGLADESH

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-6-01186	1	NASHUA PLAIN PAPER COPIER MODEL 5130 WITH FEEDER AND SORTER.	1	4,440.00	1	03	87	G.	1	1
15-6-01338	1	OLYMPIA MANUAL TYPEWRITER, ENGLISH KEYBOARD, CARRIAGE 18", S/NOS. 5.856.647 AND 5.856.648.	2	1,166.00	2	06	87	G.	2	
15-6-01338	2	OLYMPIA ELECTRONIC TYPEWRITER MODEL MASTER TYPE NO. 524.528.	1	715.00	1	06	87	G.	1	
15-8-00228	1	TOYOTA MB MODEL HI-ACE COMMUTER DIESEL, 12-SEATER. CHASSIS NUMBER ===> LH518-0002332 ENGINE NUMBER ====> 2L-1615778 REGISTRATION NO. => JAS-63-4374	1	12,352.00	1	4	91	G.	1	TRANSFERRED FROM DP/BGD/84/051, MAY 1990
15-9-00186	1	DIAL TENSIONMETER.	1	250.00	1	03	90	G.	1	ENTERD FROM 1990 Y-END INV.
15-9-01756	1	SDL15A SHIRLEY MINIATURE CARDING MACHINE 220V/1/50HZ, 380V/3/50HZ.	1	52,174.00	1	08	90	G.	1	
15-9-01756	2	SDL 15B SHIRLEY MINIATURE DRAWING MACHINE SUITABLE FOR A STAPLE LENGTH RANGE 19 - 32 MM.	1	1.00	1	08	90	G.	1	PRICE INCLUDED IN ITEM 1
15-9-01756	3	SDL15C SHIRLEY MINIATURE RING SPINNING MACHINE.	1	1.00	1	08	90	G.	1	PRICE INCLUDED IN ITEM 1
15-9-01767	1	COLOUR SAMPLING DEVICE TYPE MINI MDF FOR FLAT SCREEN PRINTING.	1	11,336.00	1	03	90	G.	1	

Project Number : DP/BGD/85/162 | Page No. : 4

Country : BANGLADESH

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-9-01770	1	PROTTI HAND FLAT KNITTING MACHINE MODEL 4TL WITH BRIDGE CARRIAGE, 2 DOUBLE YARN CARRIERS GUIDE BARS, 4 YARN CARRIERS, 8 GAUGE WORKING WIDTH 120CM,S/N 9081201 COMPLETE WITH BED AND STANDARD ACCESSORIES.	1	3,873.00	1	05	90		1	
15-9-01771	1	YARN SPEED METER.	1	600.00	1	03	90	G.	1	
15-9-01771	2	HATRA YARN LENGTH COUNTER 0-200M.	1	758.00	1	03	90	G.	1	
15-9-01771	3	QUADRANT TWIST TESTER MODEL 73.	1	1,284.00	1	03	90	G.	1	
15-9-01771	4	WIRA RAPID DRYING UNIT MODEL 121/2.	1	3,953.00	1	03	90	NW	1	Heating element is yet to be replaced.
15-9-01772	1	MATHIS COATING PLATE TYPE SKP, WITH CLAMPING DEVICE, MACH. NO. 3889.	1	2,932.00	1	12	90	G.	1	
15-9-01772	2	MEIER BARS 25/50/75/100/140/180/220 WITH BAR HOLDER.	1	2,370.00	1	12	90	G.	1	
15-9-01773	1	TENSIOMETER TYPE KX8 300 20 - 300 CN.	1	748.00	1	02	90	G.	1	
15-9-01773	2	MOTOR-DRIVEN YARN REEL L 232/1/10/F.	1	6,263.00	1	02	90	G.	1	
15-9-01776	1	SDL4 SHIRLEY CRIMP TESTER.	1	2,226.00	1	05	90	G.	1	
15-9-01776	2	SPIN DRYER - TOP LOADING 2700 RPM 2 KG.	1	258.00	1	05	90	G.	1	
15-9-01776	3	SDL406A LABORATORY SCALE JIG DYEING UNIT 30CM WIDE.	1	5,742.00	1	05	90	G.	1	
15-9-01776	4	SDL210BM SHIRLEY COLOUR MATCHING CABINET INDUSTRIAL SIZE.	1	1,258.00	1	05	90	G.	1	

(UR203F 89-08-04)

*NW = Never worked

UNIDO EDP & OA SERVICES

Project Number : DP/BGD/85/162 | Page No. : 5

Country : BANGLADESH

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-9-01776	5	SDL402 ATMOSPHERIC DYEMASTER SAMPLE DYEING MACHINE WITH 16 TUBE CAPACITY.	1	6,813.00	1	05	90	G.	1	
15-9-01776	6	SDL238A SHIRLEY CROCKMETER RUBBING COLOURFASTNESS TESTER HAND OPERATED GREY SCALE & CROCKING CLOTHS INCL..	1	637.00	1	05	90	G.	1	
15-9-01776	7	SDL215 PRESSLEY FIBRE STRENGTH TESTER.	1	2,548.00	1	05	90	G.	1	
15-9-01776	8	SDL215A SHIRLEY PRECISION TORSION BALANCE.	1	855.00	1	05	90	G.	1	
15-9-01776	9	SDL92 COURTAULDW TETRAPOD WALKER FOR CARPETS (SINGLE DRUM MODEL).	1	5,187.00	1	05	90	G.	1	
15-9-01776	10	SDL9A SHIRLEY COMB SORTER FOR 2" FIBRE LENGTH.	1	2,903.00	1	05	90	G.	1	
15-9-01776	11	VERNIER MICROSCOPE 100MM TRAVEL .1MM READING 50MM OBJECTIVE.	1	508.00	1	05	90	G.	1	
15-9-01776	12	SDL229A BURSTING STRENGTH TESTER (HAND OPERATED MODEL).	1	4,000.00	1	05	90	G.	1	
15-9-01777	1	STROBOSCOPE SD-8 FOR WEAVING AND DS-4C FOR SPINNING.	1	1,909.00	1	06	90	G.	1	
15-9-01777	2	COURSE LENGTH TESTER.	2	1,146.00	2	06	90	G.	2	
15-9-01777	3	PH METER MG-7.	1	955.00	1	06	90	G.	1	
15-9-01777	4	LABORATORY OVEN DH-62.	1	4,890.00	1	06	90	G.	1	
15-9-01777	5	CREASE RECOVERY TESTER.	1	766.00	1	06	90	G.	1	

Project Number : DP/BGD/85/162 | Page No. : 6

Country : BANGLADESH

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-9-01791	1	LABORATORY OVEN.	1	1,984.00	1	07	90	G.	1	
15-9-01791	2	COLORIMETERS.	6	4,461.00	6	07	90	G.	6	
15-9-01791	3	LIGHT FASTNESS TESTER.	2	6,591.00	2	07	90	G.	2	
15-9-01791	4	GRISWOLD CYLINDER AND DIAL KNITTING MACHINE WITH ACCESSORIES.	2	4,353.00	2	12	90	G.	2	
15-9-01819	1	CANON P1252D 12-DIGITS PRINTING AND DISPLAY CALCULATOR AC 220V.	1	120.00	1	02	90	G.	1	
15-9-01819	2	KODAK CAROUSEL S-AV2010 35MM SLIDE PROJECTOR WITH 75-120MM ZOOM LENS.	1	634.00	1	02	90	G.	1	
15-9-01819	3	DA-LITE VERSATOL MAT TRIPOD-TYPE PROJECTION SCREEN, SIZE: 70" X 70".	1	135.00	1	02	90	G.	1	
15-9-01864	1	FE-11 TAST-O-TESTER, NO. 89.155.	1	5,945.00	1	03	90	G.	1	
15-9-01864	2	FE-09 SCOURTESTER, NO. 89004.	1	5,825.00	1	03	90	G.	1	
15-9-01938	1	4.3/4" APRON DRAFT SPINNING FRAME, SERIAL NO. FS25317, HAVING 6 SPINDLES, 4.3/4" PITCH. COMPLETE WITH INDIVIDUAL ELECTRIC DRIVE EQUIPMENT.	1	101,234.00	1	03	91	NW*	1	Minor electrical problem exists.
19-7-05676	1	TYPEWRITER, BENGALI KEYBOARD.	1	400.00	1	06	87	G.	1	LOCAL PURCHASE

*NW= Not working.

Further necessary equipment required for BCTT (technological sections)

Wet processing workshop/Textile Chemistry Laboratory

There are nearly no small items of laboratory equipment for the workshop, although these are necessary for the dyeing and finishing experiments as well as textile chemistry investigations.

Consumable items

Glass beaker
40 x 100 ml
40 x 250 ml
10 x 500 ml
5 x 1l
3 x 5l

Round bottom boiling flasks
10 x 250ml
10 x 500ml
10 x 1l

Graduated flasks
40 x 250ml
10 x 500ml
5 x 1l

Graduated pipettes
20 x 1ml
20 x 2ml
20 x 5ml
20 x 10ml
20 x 25ml

Full pipettes
10 x 1ml

10 x 2ml
10 x 5ml
10 x 10ml
10 x 25ml

4 desiccators
20 watch glasses
10 burettes

filter funnels
100 reagent tubes
5 water cooled condenser for destillatior
5 water cooled reflux condenser
measuring cylinders (plastics)
10 x 50 ml
20 x 100ml
20 x 250 ml
10 x 500 ml

5 Soxhlet extractors with corresponding condensers
plastic stoppers
fubber stoppers
20 thermometers
30 glass bottles + 30 plastic containers (for chemicals and dyestuffs)

Non-consumable items

1 refrigerator
1 washing machine
Laboratory centrifuge with corresponding glasses balances 2 fine balances (down to mg region) 2 rough balances (up to KG)

4 hot plates
10 magnetic stirrer
30 wire nets
20 tube carriers
20 clamps (for round bottom flasks and condenser)
10 pots for water and oil baths
20 clamps (for tube)
5 thermostates
standard capillary viscometer (including various capillaries)
5 heating mantles (correresponding to the round bottom glassess)
1 shaking machine

Testing Laboratory:

Standard testing laboratory conditions of 20°C ± 2°C and 65% R.H. ± 4% for tests such as those for linear density and strength of fibres and yarns. Only one section of the laboratory is required with these conditions.

Testing equipment required:

Uster Evenness Tester, preferably including classimat. Automatic single thread strength testing machine.
Modern instrument such as Fibrograph for measurement of fibre length

Modern method for separation of cotton lint and trash particles.

Microscopes with traversing stage, one with projector screen for fibre examination.

Garment Technology

For the Ministry of Education requirement of a garment technology

specialism, a considerable amount of equipment will be required. These should include:-

A wide range of sewing machines such as industrial backstritch, 3 thread overlockers, 4 thread overlockers, special industrial machines (for button holes, blindstitch, gatherer) and domestic sewing machines.

Circular cutting knife

Pressing units, ironing boards

Cutting tables

Pattern rack

Other accessories including dress stands, rails, coat racks, tables and other items of furniture and for storage.

Annex XVI-1

Further necessary equipment required for BCTT

List of apparatus for Physics Laboratory

Sl. No.	Name of Apparatus	Quantity
1.	Screw - gauge	3 Nos.
2.	Slide Callipers	6 "
3.	Spherometer	3 "
4.	Stop watch	6 "
5.	Searle's app (for Youngs modulus with wire & weights)	1 No.
6.	Vernier app (for Youngs modulus with wire & weights)	1 No.
7.	Modulus of rigidity app (Dynamical method)	2 Nos.
8.	Compound pendulum	2 "
9.	Travelling microscope	5 "
10.	Viscosity apparatus	2 "
11.	Beaker 250cc (Pyrex)	2Dozen
12.	Regnaults apparatus (for specific heat with steam boiler)	2 Nos.
13.	Calorimeter with double walled enclosure	3 "
14.	Optical bench with holders and pins	2 "
15.	Stands with clamps	2Dozen
16.	Newton's ring app with sodium light arrangement	1 No.
17.	Commutator	6 Nos.
18.	Rheostats (5 k ohm)	4 "
19.	Meter bridge	2 "
20.	Mirror galvanometer	4 "
21.	Ammeter (AC/DC) (1-3A)	4 "
22.	Volt meter (AC/DC) (1-3 Volt)	2 "
23.	Joules calorimeter	2 "
24.	Key (one way)	6 "
25.	Polarimeter	1 No.
26.	Physical balance (sensitivity 5mg)	6 Nos.
27.	Copper voltameter	4 "
28.	Adaptor (1-12 Volt)	2Dozen
29.	Asbestos Net (6"x6")	2 "
30.	Measuring cylinder (250 cc) Pyrex	2 Nos.
31.	Flat bottom flask (500 cc) Pyrex	4 "
32.	Steel Almira (6'x3')	3 "
33.	Wall clock	1 No.

Annex XVI-2

Further necessary equipment required for BCTT

List of apparatus for Chemistry Laboratory

Sl. No.	Name of Apparatus with specification	Quantity
1.	Kipp's apparatus (No-19) Hight-14"	6 Nos.
2.	Chemical Balance (Analytical)	12 "
3.	Electrical Balance	3 "
4.	Burette (50 ml) Pyrex	2 Dozen
5.	Pipette (10 ml) Pyrex	3 "
6.	Pipette (20 ml) Pyrex	3 "
7.	Volumetric flask (100 ml)	2 "
8.	Volumetric flask (250 ml)	2 "
9.	Volumetric flask (500 ml)	2 "
10.	Volumetric flask (100 ml)	1 "
11.	Beaker (250 ml) Pyrex	3 "
12.	Beaker (500 ml) Pyrex	2 "
13.	Conical Flask (250 ml)	5 "
14.	Weight Box	12 Nos.
15.	Weighing Bottle	12 "
16.	Thermometer (400 Deg.C.)	1 Dozen
17.	" (Red) (250 Deg C.)	1 "
18.	" (Red) (120 Deg. C.)	1 "
19.	Funnel (Medium)	5 "
20.	Porcelain basin	5 "
21.	Viscometer	6 Nos.
22.	Polarimeter	6 "
23.	Beckmann Thermometer	6 "
24.	Soxhlet apparatus	6 "
25.	Cottrel funnel	6 "
26.	Goose Neck with fittings	24 "
27.	Boiling flask (Pyrex)	12 "
28.	Reagent Bottles (250 ml)	5 Dozen
29.	Morter (China) with pestle	24 Nos.
30.	Bunsen Burner	5 Dozen
31.	Watch Glass	5 "
32.	Distilled water plant	2 Nos.
33.	Platinum wire	12 Inch
34.	Measuring cylinder (1000 ml)	6 Nos.
35.	Measuring cylinder (500 ml)	6 "
36.	Victor Meyer tube	6 "
37.	Wall clock	1 No.

Annex XVII-1

Industrialists met (V. Rossbach, Wet Processing)
(* = on the occasion of students excursions)

Dates Met	Organization & Business	Persons seen & positions
Mar 20	Karl-Ralf Randel KG Garment import to Germany.	Jens Randel, Manager
Apr 14	Moshahid Textile Corporation Ltd. Knitting, Dyeing, Garment make-up (being set up)	G. Q. Chowdhury FCA, Executive Vice President. M.A. Rouf Chowdhury, Chairman.
May 4	Mayer & Cie, Circular Knitting Machines Export to Bangladesh.	Lorenz Friedrich, Marketing Manager.
	Ostasiatische Handelsge- sellschaft W.E. Warning Commercial Representatives for many textile machine producers, Export to Bangladesh.	Ali Reza. Mohammad Kadri, Manager Marketing.
*May 5	Sidtex Limited. Dyeing, Printing & Finishing.	Abdur Rahman Topu, General Manager. Md. Mozaffar Hossain Asst. Production Manager.
*May 15	Jamuna Knitting & Dyeing Ltd. Knitting & Dyeing.	M. Q. Zaman, General Manager.
May 19	Phoenix Textile Mills. (Silpair Textile Mills, Unifill Textile Mills)	Rokanuddin Ahmed, Managing Director.
May 26	Sears, Roebuck and Co. Garment import to the U.S.A.	Rudolf Tiefnig, Country Manager. Md. Sarwardi Mahamood, Quality Inspector.
July 8	Ayman Textile & Hosiery Ltd. Knitting & Dyeing. (being set up)	Dr. Bahauddin Mohammod Yousuf.
July 9	BASF Bangladesh Ltd. Auxiliaries & Dyestuffs)	K.H.Ruecker, Chairman & Managing Director,
July 16	Eu oAsiatic Handels- gesellschaf, J. Bornhöft Commercial representatives for many textile machine producers, Export.	Asif Muhammad Sami.

Annex XVII-2

July 10	Envoy Group. Knitting, Dyeing & Printing. (being set up)	Md. Mosharraf Hossain, Director.
July 23	Ciba-Geigy (Bangladesh) Ltd. Auxiliaries & Dyestuffs	G. Doege, Managing Director.
*Aug 19	Modern Dyeing & Screen Printing Ltd. Dyeing & Printing.	Abdul Matin, Managing Director. Md. Wasek Khandaker, Dyeing Master. Md. Naim Uddin Ahand, Consultant.
*Aug 25	Sun Textile Mills Ltd. Dyeing & Printing.	A.Z.M. Motaharul Karim, Manager Dyeing & Quality Control.
Sept 26	Allied Enterprises PVT. Weaving, Dyeing & Printing. (being set up)	Md. Mahadmudul Hoque, Managing Director.
Dec 22	Monno Group of Industries Composite mill. (being set up)	M. H. Khan, Deputy Managing Director. A.K.M. Musharraf Husain, Chartered Textile Consultant.

Annex XVIII

Video Films

A number of video films in textile wet processing and machniery used for that were given to the college.

Monti, Thieno/Italy

- Calender
- Horizontal Calender
- Stenter
- Tensionless Dryer
- Transfer printing
- Finishing line

Reggiani, Bergamo/Italy

- Flat bed printing
- Continuous terry towels
- Printing with splits
- Rotary screen printing
- Washing on line system

Kleinewefers Ramisch, Krefeld/Germany

- Pretreatment
- Pad batch

Küsters, Krefeld/Germany

- General textile wet processing machinery

Dornier, Friedrichshafer/Germany

- Mercerisation

Henriksen, Sydmarken/Denmark

- General textile wet processing machinery.

Annex XVIX

SUBSTANTIVE OFFICER'S COMMENTS

The report covers the expert's assignment from October 1992 to January 1994 as a textile chemist, attached to the Bangladesh College of Textile Technology (BCTT) in Dhaka.

The author reviews in a candid fashion the College's facilities, staff, the student body and the curricula providing constructive criticism and making practical recommendations.

It is evident from the material presented in the body of the report and in the annexes that the author and his two team members have provided a competent and valuable service to the BCTT under very difficult conditions. Both he and his colleagues have clearly performed with enthusiasm and dedication well beyond their official brief and it is fervently hoped that their recommendations and proposals receive the attention they deserve. Reading between the lines one gets the impression that the author is not altogether confident that will happen in all cases. However, even a partial heeding of the advice given would be a step in the right direction. The report is recommended reading for the teachers and the students alike at the BCTT - not to mention Government authorities concerned.