

Vocational Higher Secondary

Education, Kerala

Teachers Sourcebook

Textile Dyeing and Printing



**State Council of
Educational Research and Training (SCERT)
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Director

Preface

Dear teachers,

The children admitted in standard XI are coming with a different kind of learning experience. They have been learned constructively and evaluated continuously in their high school classes according to a paradigm named 'constructivist, learner centred and process oriented pedagogy'. The paradigm applied to those children in their secondary classes is to be continued in Higher Secondary level also, but we know that most of the present higher secondary teachers are not familiar with this paradigm. Hence for the first time we are introducing Sourcebooks for all the subjects included in the Higher Secondary curriculum.

The Sourcebook for 'Textile Dyeing and Printing' will be helpful to prepare yourself to be competent in the activity oriented pedagogy. It is complementary to the training you have undergone in the beginning of the academic year.

The sourcebook has three parts. Part I gives you the general approach to the teaching learning process of 'Textile Dyeing and Printing'. It also covers the curricular objectives and syllabus of the subject. The term-wise distribution and time schedule of the syllabus will be helpful for proper planning to complete the syllabus in a time bound, but efficient and effective manner. Towards the end of this part, the learning activities that can be applied and narrated and some of them are taken for continuous evaluation as per the directions of Higher Secondary curriculum committee. Evaluation indicators and guidelines for setting questions for written examination are also indicated in this part.

Part II of this book deals with the activities that can be carried out to attain the curricular objectives and are described chapter-wise. The activities specified are tried-out and found apt and time bound. Being the teachers in different school situations, you have the freedom to choose alternate activities, but should ensure the feasibility, students involvement and time limit while selecting activities or strategies. Part III contains sample questions.

Suggestions are invited to improve the quality of the book as well as the teaching-learning process to attain the objectives of the new pedagogy.

With regards,

Thiruvananthapuram
25-11-2005

Dr E. Valsala Kumar
Director
SCERT, Kerala

Part I CONTENTS

1. General Approach	05
2. Subject wise Approach.....	9
3. Teaching – Learning strategies	22
4. Planning	24
5. Syllabus	29
6. Curriculum Objectives	36
7. Evaluation	38

Part II - Unit-wise Learning Activities

Section A (Theory)

1. Classification of Textile Fibers	55
2. General properties of Textile Fibres	59
3. Properties of Cotton	63
4. Best Fibers –Linen and Jute	68
5. Animal Fibers – Wool and Silk	74
6. Semi synthetic and Fully synthetic fibers	81
7. Soaps and Synthetic detergents	89
8. Treatment of Materials Prior to Dyeing of Printing	94
9. Mercerization	103
10. Classification of dyes and soluble groups of dyes	107

Part III

Unit-wise Learning Activities Section B - (Practical)

1. Curriculum Objectives	119
1. Physical and chemical properties of textiles and fibers.	120
2. Pre-treatments and bleaching.	123
3. Direct dyes on cotton and after treatments.	126
4. Direct dyes on wool and silk.	129
5. Basic dyes on cotton, wool and silk.	131
6. Reactive dyes on cotton, wool and silk. Acid dyes on wool	133
7. Mercerisation.	135
• Sample Questions	140

General Approach

Introduction

The ultimate aim of education is human refinement. Education should enable the learner to formulate a positive outlook towards life and to accept a stand which suits the well being of the society and the individual as well.

The attitude and potential to 'to work' has determined the destiny, progress and cultural development of the human race. As we all are aware, the objective of education to form a society and individuals having a positive work culture. The educational process expected in and outside our formal schools should concentrate upon inculcating concepts, abilities, attitudes and values in tune with these 'work culture.' Hence vocationalised education cannot be isolated from the main stream of education. In another sense, every educational process should be vocationalised. However, due to our inability to utilise the resources wisely, scarcity of job

opportunities is a severe issue of the present society. For overcoming this deep crisis, emergent techniques have to be sorted out and appropriate researches have to be seriously carried out. It is in the sense that the content and methodology of vocational Higher Secondary Education have to be approached.

The Vocational Higher Secondary course was envisaged as a part of the National Policy on Education with the noble idea of securing a job along with education. The relevance of Vocational education is very great in this age of unemployment. This education system, which ensures a job along with higher education, stands aloof from other systems of education.

A learning environment which ensures vocational aptitude, vocational training, basic life skills, competencies related to different subjects, appropriate values and attitudes and existential readiness has to be provided here.

The curriculum should be one which recognises the specific personality of the learner and should develop it in a desirable way. It should provide opportunity to imbibe novel ideas to follow a critical approach and for learning through experiences.

The competency to transform one's own resources for the betterment of the society and the individual is to be ensured in each individual. Training in the sense of equality, democratic sense, environmental consciousness and devotion to the constitution is an inseparable factor of the curriculum.

The need of a systematic curriculum is prevailing in vocational subjects. A scientifically structured curriculum incorporating the unique features and peculiarity of Kerala ensuring the possibility of higher education and utilising the national and international possibilities of employment is required.

The new curriculum should be capable of assimilating the life skills, scientific temper, attitude of co-existence, leadership qualities and mental health to face the challenges of life. It should be capable of strengthening the competencies imbibed by the learners up to the tenth class.

A curriculum for selecting vocational areas according to the aptitude of the students, learning it in depth, acquire general awareness in the basic areas and to secure jobs has become the social need of the day. A learner centred, process

oriented, need based vocational curriculum is envisaged.

What is learning?

- Learning is construction of knowledge and so it is a live and continuous mental process.
- Learning is a process of advancement through adding and correcting in the light of comparing the new issue with the previously learned concepts.
- Learning takes place as a part of the effort to solve problems.
- Learning takes place by assimilating bits of knowledge into one's own cognitive structure.
- Learning is not a linear process. It is a spiral process growing deeper and wider.
- Learning is an intellectual process rather than the mere memorisation of facts. Learning is a conglomeration of a variety of activities like problem analysis, elucidation, critical thinking, rational thinking, finding out co-relations, prediction, arriving at conclusions, applications, grouping for other possibilities and extracting the crux. When opportunities are provided for intellectual processes learning will become effective and intellectual ability will get strengthened.

Theoretical foundations of learning

Education is the best device that can be

adopted for creation of a new society. It should be democratic in content and process and should acknowledge the rights of the learner. It should also provide opportunity for better citizenship training. The concept of equality at all areas should get recognition in theory and practice.

There should be conscious programme of action to develop nationality, humanness and love and against the encroachment of the sectarianism of caste and religion.

The learner should be able to take firm steps and deferred against the social crisis like privatisation, liberalisation, globalisation etc and against all kinds of dominations.

They should develop a discrimination to use the acquired learning as a liberative weapon.

They should be able to view education and life with the perspective of social well being.

They should get opportunity to recognise that co-operation is better than competition and that co-operation is the key to social life and culture.

A basic awareness of all the subjects needed for life essential for all students.

The remnants of perspectives formed in us during the colonial period still influence our educational philosophy. The solution to the present day perplexities of the society which approaches education on the basis of competitions and marketisation is only a comprehensive view of life.

It is high time that education was recognised on the basis of the philosophy of human education. The human approach to education has to reflect in its content, learning process and outlook. The perspective of 'learning to be' and learning to live together as expressed by the UNESCO and the concepts of existentialist intelligence intrapersonal and interpersonal intelligence.

The basis of new approaches on curriculum, teaching- learning process are derived from the developments place in the east and west of the world.

When we begin to see the learner at the centre of the learning process, the teaching process has to be changed timely. It is the result of the rapid growth and development of Science and Technology and Pedagogy. If we want to undergo the changing process, we have to imbibe the modern hypothesis regarding learner, they have;

- Great curiosity
- Good imagination
- Numerous other qualities and interests
- Independent individuality
- Interest in free thinking and working in a fearless atmosphere.
- Have interest in enquiring and questioning.
- Ability to reach conclusions after logical thinking.

- ability for manifest and establish freely the conclusions arrived at.
- Interest for recognition in the society.
- Determination to face the interference of society and make components which is a part of social life.
-

When we consider the learning system, the domains to be stressed in education according to the modern development becomes relevant.

The **knowledge** domain consists of

- Facts
- Ideas
- Laws
- The temporary conclusions and principles used presently by scientists.

The learning is a process. The continuous procedures we undergo to reach a particular goal is process. The skills which are parts of the process to analyse the collected ideas and proofs and come to a conclusion is called *process skills*. Some important **process skills** are,

the skills;

- To observe
- To collect data and record
- To classify
- To measure and prepare charts

- To experiment
- To predict
- To recognise and control the variables
- To raise questions
- To generalise
- To form a hypothesis and check.
- To conclude
- To communicate
- To predict and infer
- To use tools.

- **Observation** is the process of acquiring knowledge through the senses. It is purely objective oriented. Learning experiences which provide the opportunity to use all the senses may be used.

*The process of grouping is known as **classifying**. Starting from simple groupings of data, it can extend to the level of classification into minute sub-groups.*

In addition to this, consider the skills related to **creative domain** also, they are skills:

- To visualize
- To connect facts and ideas in new ways
- To findout new and uncommon uses of objects

- To fantasize
- To dream
- To develop creative isolated thoughts
- **Creativity** is an essential component of process and activities. The element of creativity is involved in finding out problems, formation of hypothesis, finding 'solutions' to problems etc. Through activity oriented learning experiences, opportunities to express creativity can be created.
- take the help of scientific process to solve the problems of daily life.
- choose a scientific life style
- connect the ideas acquired with other subjects.
- integrate the subjects with other subjects.

Some basic stands have to be taken on the new scientific knowledge about intelligence learning and teaching. When such basic concepts are accepted changes are required in the following factors.

Again, the following factors consisting in the **Attitudinal domain** are also important as;

- Self confidence
- Love for scientific knowledge
- Attitude to know and value history
- Respect human emotions
- Decide with reasonable present problems
- Take logical decisions regarding personal values
- The vision, approach, structure and content of the curriculum.
- The vision, approach, structure and content of the textbooks.
- Role of the teacher and the learner.
- Learner atmosphere, learning materials and learning techniques.

Some scientific perspectives accepted by modern world in educational psychology are given below.

Constructivism

This approach puts forward the concept that the learner constructs knowledge. New knowledge is constructed when ideas are examined and practiced in new situations relating them with the previously acquired knowledge and experience. That is assimilated into the cognitive structure of one's knowledge. This method which

As regards the **application domain** the important factors are the ability to:

- observe in daily life examples of ideas acquired.

gives priority to critical thinking and problem solving provides opportunity for self-motivated learning.

Social Constructivism

Social constructivism is a sub-section of constructivism. Knowledge is formed, spread and imbibed and it becomes relevant in a social environment. Interactive learning, group learning, co-operative participatory learning, all these are concepts put forward by social constructivism.

The main propounders of constructivism are Piaget, Vygotsky and Bruner.

Discovery learning and interactive learning have prime importance. Learning takes place as a part of the attempt for problem solving. The activities of a learner who confronts cognitive disequilibrium in a learning situation when he tries to overcome it lead to the renewal of cognitive structure. It is through this process of construction of new knowledge and the assimilation of them that learning takes place. Observation and enquiry are unavoidable factors. The learner advances towards new areas of acquisition of knowledge where he tries to compare his new findings with the existing conceptions.

Learning is a live mental process. Rather than the ability for memorisation of facts, cognitive process has to be given emphasis. The process of problem analysis, elucidation, critical thinking, rational thinking, finding out co-relation, prediction, hypothesis formation, application,

probing for other possibilities, extracting the crux and other processes are of critical importance in learning.

Constructivism gives greater predominance to co-operative learning. Social and cultural factors influence learning. Sharing of knowledge and experience among learners, collective enquiry, assessment and improvement, group activity and collaborative learning, by sharing responsibilities with the objective of public activity, provide opportunity for effective learning.

In learning internal motivation is more important than external motivation. The learner should have interest and initiative in learning. Learning situation should be capable of forming a sense of ownership in the learner regarding the learning process.

Learning is not a linear process. It progresses in a spiralled way, advancing deeper and wider.

Learner-his nature and features

The learners in standard XI have undergone a learner-centered and process-oriented learning experience up to X standard. He is adequately competent to select vocational subjects according to his aptitude and interest and to acquire higher education and profession as he wishes. The aspirations about future life are framed in this particular age, foreseeing national and international job opportunities. Some of the peculiarities of the learner at this stage are:

- Physical, intellectual and emotional planes are intensive changes during this age and their reflections can be observed.
 - Ability to enquire, discover and establish cause-effect relationship between phenomena.
 - Readiness to undertake challenges.
 - Capacity to shoulder leadership roles.
 - Attempt to interpret oneself.
 - Susceptibility to different pressures.
 - Doubts, anxieties and eagerness about sex.
 - Longing for social recognition.
- Sharer of responsibilities
 - Collects information
 - Takes leadership
 - Involves in group work
 - Acts as a co-participant
 - Observes his environment
 - Experiments and realises
 - Makes interpretations and draws inferences.

Needs of the learner

- To make acquaintance with a job through vocational education.
 - To acquire more knowledge in the concerned area through higher education.
 - To recognise and encourage the peculiar personality of the later adolescent period.
 - To enable him to defend against the unfavourable circumstances without any help
- consider the 'Stress and strain' of the teenagers
 - understand the socio-economic and cultural background of the students.
 - promote and motivate the students to construct knowledge.
 - arrange proper situations to interact in and outside of the classroom.
 - guide the students by explanations, demonstrations etc.
 - promote opportunity for co-operative learning and collaborative learning.
 - facilitate interpersonal and intra-personal interactions.
 - act as a democratic leader.
 - act as a problem solver

Role of the Learner

- Active participant in the learning process.
- Acts as a researcher
- Sharer of information

- effectively guide the students for the selection and conduct of various continuous evaluation elements.
- continuously evaluate the progress of the learners.
- gives scaffolding/support wherever necessary.
- motivate for learning
- promote divergent thinking.
- act as a democratic group leader.
- act as a co-learner
- gives variety of learning experiences.
- be a constant student
- facilitate for reference/data collection
- have a clear understanding about the age, needs, peculiarities, abilities, nature, aptitude etc. of the learner.
- have the ability to motivate the learner in order to acquire and enrich their knowledge.
- be a guide to the learner in developing insights and creating responses on current affairs.
- be capable to lead the learner into a variety of learning methods and process based on curricular objectives.
- be a link between school and community.
- be a good organiser, guide, friend, philosopher and co-learner.
- have an inter disciplinary approach in learning activities.
- be able to guide the learner in his/her career prospects based on his interest aptitude and ability.
- be impartial and democratic.
- provide ample experiences to attain the basic values and objectives of the curriculum.

New Concepts of Learning

1. Discovery Learning-

The teacher has to create a motivating atmosphere for the learner to discover concepts and facts, instead of listening always. Creating occasion to progress towards discovery is preferred. Instead of telling everything before and compelling to initiate the models, situations are to be created to help the children act models as themselves.

2. Learning by discussion

That discussion leads to learning is Burner's theory. Here discussion is not opposing each other. It is a sharing on the plane of ideas. New ideas are arrived at by seeking explanations, by mutual giving and taking of ideas and by problem solving.

3. Problem solving and learning

Only when the learner feels that some thing is a problem to be solved that he takes the responsibility of learning it. It is an inborn tendency to act to solve a problem that causes cognitive disequilibrium in a particular area. It is also needed to have confidence that one is capable of doing it. The problems are to be presented in consideration of the ability and level of attainment of the learner.

4. Collaborative learning

This is the learning in which the responsibilities are distributed among the members of the group keeping common learning objectives. The common responsibility of the group will be successful only if each member discharges his duties. All the members will reach a stage of sharing the result of learning, equally through the activity with mutual understanding. The teachers who arrange collaborative learning will have to make clear the responsibilities to be discharged. This is possible through the discussion with the learners. Collaborative learning will help to avoid the situations of one person working for the whole group.

5. Co-operative learning

This is the learning in which the learners help one another. Those who have more knowledge, experience and competency, will help others. By this exchange of resources the learners develop

a plane of social system in learning also. As there are no high ups and low ones according to status among the learners they can ask the fellow students doubts and for helps without any hesitation or in hesitation Care should be taken not to lead this seeking of help to mechanical copying. It should be on the basis of actual needs. So even while encouraging this exchange of ideas among the members of the group cautions acceptance is to be observed as a convention. There should be an understanding that satisfactory responses should come from each member and that the achievement of the group will be assessed on the basis of the achievement of all the members

6 Zone of Proximal Development

Vygotsky observes that these is a stage of achievement where a learner can reach by himself and another higher zone where he can reach with the help of his teachers and peers and elders. Even though some can fulfil the learning activity by themselves there is the possibility of a higher excellence. If appropriate help is forth covering every learner can better himself.

7 Scaffolding

It is natural that the learner may not be able to complete his work if he does not get support at the proper time. The learner may require the help of the teacher in several learning activities. Here helping means to make the learner complete

the activity taking responsibility by himself. The teacher has to keep in mind the objective of enabling the learner to take the responsibility and to make it successful.

8 Learning: a live mental process

Learning is a cognitive process, only a teacher who has an awareness as to what the cognitive process is alone can arrange learning situations to the learner to involve in it. Learning can be made effectively and intellectual sharpness can be improved by giving opportunity for the cognitive processes like reminding, recognising, compromising, co-relating, comparing, guessing, summarising and so on. How is cognitive process considered in language learning? Take guessing and prediction for example.

- Guessing the meaning from the context.
- Guessing the content from the heading.
- Predicting the end of the story.
- Guessing the incident, story from the picture.
- Guessing the facts from indications.
- and other such activities can be given the following activities can be given for the cognitive process of summarisation.
- Preparation of blue print.
- Preparation of list.
- Preparation of flow chart.

- Epitomising in one word.
- Giving titles and so on.
- Symbols, performance of characters indications, lines of a poem, tables, pictures, concepts, actions, body language and such things can be given for interpretation. Process based language given for interpretation. Process based language learning has to give prime importance to the cognitive process.

9 Internal motivation

Internal motivation is given more importance than external motivation. The teacher has to arouse the internal motivation of the learner, A person internally motivated like this alone can immerse in learning and own its responsibility. How motivating is each of the activities is to be assessed.

10 Multiple intelligence

The Theory of Multiple Intelligence put forward by Howard Gardener has created a turning point in the field of education. The National curriculum document has recommended that the curriculum is to be designed taking into consideration of this theory.

Main factors of the intellect :

1. Verbal/linguistic Intelligence -

Ability to read and write, making linguistic creations, ability to lecture competence effective

a communication , all these come under this . This can be developed by engaging in language games and by teaching others.

2. Logical /mathematical Intelligence

Thinking rationally with causes and effect relation and finding out patterns and relations come under this area, finding out relations and explaining things sequential and arithmetical calculations are capable of developing this area of intelligence.

3. Visual /spatial Intelligence

In those who are able to visualise models and bringing what is in the imagination into visual form and in philosophers, designers and sculptors this area of intelligence is developed. The activities like modelling using clay and pulp, making of art equipments, sculpture, and giving illustrations to stories can help the development of this ability.

4 Bodily Kinaesthetic Intelligence

The activities using body language come under this. This area of intelligence is more developed in dancers and actors who are able to express ideas through body movements and in experts in sports, gymnastics etc.

5 Musical Intelligence

This is an area of intelligence which is highly developed in those who are able to recognise the different elements of music in musicians and in those who can here and enjoy songs. Playing

musical instruments, initiating the songs of musicians, listening silently to the rhythms and activities like this are capable of developing this area of intelligence.

6 Interpersonal Intelligence

Those in whom this area of intelligence is developed show qualities of leadership and behave with others in a noble manner. They are capable of understanding the thought of others and carrying on activities like discussion successfully.

7 Intrapersonal Intelligence

This is the ability to understand oneself. These people can recognise their own abilities and disabilities. Writing diaries truthfully and in an analysing way and assessing the ideas and activities of others will help developing this areas of intelligence

8 Naturalistic Intelligence

A great interest in the flora and fauna of the nature, love towards fellow beings interest in spiritual and natural factors will be capable of developing this area.

9. Existential Intelligence

The ability to see and distinguish ours own existence as a part of the universe, ability to distinguish the meaning and meaninglessness of life, the ability to realise the ultimate nature of mental and physical existences, all these are the

peculiarities of this faculty of intelligence.

Emotional Intelligence

The concept of emotional intelligence put forward by **Daniel Golman** was used in framing the new curriculum. The fact that one's **Emotional Quotient (E.Q)** is the greatest factor affecting success in life is now widely accepted. The teacher who aims to focus on improving the emotional intelligence of students need to concentrate on the following.

i) Ability to take decisions

Rather than imposing decision on students while planning and executing activities, the students may be allowed to take part in the decision making process. Taking decisions through open discussion in the class, inviting students suggestions on common problems etc. are habits to be cultivated.

ii) Ability to reach consensus

- When different opinions, ideas and positions arise the students may be given the responsibility to reach a consensus.
- Imaging what would be the course of action in some situations, allowing to intervene in a healthy way in problems between individuals.

iii) Problem solving

- Developing the idea that there is reason and solution to any problem.

- Training in finding reasons for problems.
- Suggesting solutions through individual or group efforts.
- Discussing social problems.
- Analysing the shortcomings in methods to solve problems.

Whether plastic can be banned within school premises can be given as a problem. Group discussion will provide reasons and solutions. Problems which can influence classroom learning and for which the learner can actively contribute solutions need to be posed.

- Self criticism, evaluation
- Ability to face problem-situation in life
- Thinking what one would do if placed in the situation of others, how one would respond to certain experiences of others - All these foster the growth of emotional intelligence.

iv) Life skills

Life skills need to be given a prominent place in education. W.H.O. has listed ten skills required for success in life.

- Self awareness
- Empathy
- Inter personal relations
- Communication

- Critical thinking
- Creative thinking
- Decision making
- Problem solving
- Copying with emotion
- Copying with stress

The new curriculum addresses these areas.

Knowing the characteristics of the learner, role of the teacher and how to use the teachers handbook help the teacher to plan and effectively implement learning activities.

Objectives of the Vocational Higher Secondary Curriculum.

- To facilitate higher education while giving opportunity to enter in the field of employment.
 - To develop environmental awareness, sense of national integration, tolerance and human values so as to ensure social and cultural improvement.
 - To enable the learner to find on his own employment.
 - To inculcate mental courage in the learner to face unfavourable situations.
 - To make human resource development possible.
 - To enable the learner to understand social problems and to react appropriately.
- To develop the learner to identify and develop his own competencies.
 - To develop vocational aptitude, work culture and attitude in the learner so as to provide useful products and services to the society.
 - To create an awareness about mental and physical health.
 - To acquire awareness about different job areas and to provide backgrounds for acquiring higher level training in subjects of interest.
 - To develop possibilities of higher education by creating awareness about common entrance examinations.
 - To provide situation for the encouragement of creative thinking and organising training programmes in each area, creative abilities and to develop artistic talents.

Nature of Approach

The learning device is to be organised in the selected vocational subjects in such a way that adequate practical experience should be given, making use of the modern technology. The development in each area on the basis of information technology is to be brought to the learner. The work experience in the respective fields(OJT, Field trip, Production/Service training, Survey, Workshop, Exhibition, Youth festival, Physical fitness etc.) are to be adjusted

suitable to the learning and evaluation process. The participation and leadership of the students in planning and execution is to be ensured through this kind of activities. Social service is to be made a part of the course.

Approach towards Vocational Higher Secondary Education

The learning methodology has to be organised so as the learning provide adequate practical thinking on the opted vocational subject utilising the new technology. The development of information technology should be made available in each sector. Work experience, OJT, Field trip production, Service cum training centre, Survey, Workshops, Exhibitions, Youth festivals, Physical fitness etc should be systematised well appropriate to learning and evaluation. Learner participation should be ensured in the planning and implementation of these activities. Social service should be a part of the course. If a learner has to change his school, he should be provided an opportunity to continue his studies in the new school. While considering criteria for admission to higher courses, grades of vocational subjects

should also be given due weightage. In tune with the changes in the Vocational Higher Secondary Education changes should be ensured in the field of higher education.

The teachers have to take special care in arranging learning activities for the development of all the faculties of intelligence.

Learning activities and learning atmosphere.

A proper learning atmosphere is essential for the betterment of learning activities.

They are:

- Proper physical environment
- Healthy mental atmosphere
- Suitable social atmosphere
- Active participation of PTA, Local bodies and SRG
- Reference materials and visual media equipments.
- Academic monitoring
- School Resource Group (SRG)

Subject wise Approach

Introduction

Next to Food and Shelter, the most essential requirement for a human being is Cloth to be used as apparel fabrics and furnishings. Textile technology deals with the production, colouring and finishing of textile materials. Textile dyeing and printing deals with the colouring of yarns and fabrics.

The method of colouring was practised in ancient times but at that time, colouring matters extracted from leaves, seeds, fruits, stem etc. of plants were used for imparting colour. Colouring was also practised by squeezing certain insects giving the colouring matter. It was in the year 1856, the first synthetic dyestuff was discovered by the scientist 'Perkin'. This synthetic dyestuff was named as 'mauve'. Following this discovery, a number of synthetic dyestuffs have been developed and at present, there are thousands of colours having different properties.

Textile dyeing and printing can be done on different types of materials like cotton, silk, wool, linen, jute, viscose rayon, acetate rayon, nylon, terylene etc. Dyeing is intended to make a uniform colour while printing is done to produce the required designs in desired colours. The main aim of colouring is to impart attractiveness to the cloth. Another aim is to prevent the soiling of the cloth.

One of the measures used for counting the prosperity of a country is the per capita consumption of cloth. Textile materials have an important role in deciding the economy and social development of the country. In Kerala, there are a number of textile mills. Besides catering the needs of the country, a major part of the products are exported which gives a large earning of foreign exchange. Special mention has to be made for the huge demand of handloom fabrics made from Balaramapuram, Kutheempully and Cannanore

for the artistic designs and fault free durable fabrics.

The influence of textile materials can be seen in all walks of life. Kerala has an important role in the manufacture of dyed and printed fabrics. The course 'Textile Dyeing and Printing' will surely help the students to acquire technical knowledge about the various types of textile materials and their colouring by dyeing and printing. At present, the textile related fields like knitting, garment making, apparel designing and fashion designing are of having a booming nature which require qualified dyers and printers. It is hoped that all the students successfully completing this course of study will find a suitable placement without any delay.

Teaching and Learning Strategies

Learning approach

Learning is the construction of knowledge, and the learning approach of this course is based on learning to know, learning together and learning to deal. Following are the different methods used for the construction of knowledge (i) Discovery learning (ii) Enquiry learning. (iii) Collaborative learning (iv) Co-operative learning. (v) Social culture learning. The learning approach should stimulate the multiple intelligence and EQ of students. Learning should be learner centred and problem related. The role of teacher is to facilitate the learning process, by creating knowledge in the learner.

Need of New Approach:

Student's can develop knowledge to select Textile materials for dyeing and printing, develop skills to handle equipments, machinery, tools, testing instruments etc. required for colouring. Technical aptitude, discovery learning and group working skills of students will be enhanced as detailed below.

- (i) Improve the ability to analyse.
- (ii) Enhance the curiosity.
- (iii) Familiarise to use the tools, equipments, machinery and testing instruments.
- (iv) Provide skills to face technical problems related to the subject.
- (v) Improve the skills for communication and convey the knowledge to the society.

Role of teacher:

Teacher is the person to give motivation to the students. For this, the teacher should be

- (i) A good communicator.
- (ii) A facilitator for learning.
- (iii) A good evaluator.
- (iv) A good organizer.
- (v) Able to understand the limitation of students.
- (vi) A good guide.
- (vii) Able to raise the leadership qualities of students.

- (viii) An authority in the subject.
- (ix) A good observer.
- (x) A resource manager.
- (xi) A systematic record keeper.
- (xii) A good counsellor.
- (xiii) Practically competent.
- (xiv) A self evaluator.
- (xv) Able to create awareness in social problems.
- (xvi) A professional and philosopher.
- (xvii) Able to keep up moral values.
- (xviii) Impartial.
- (xix) Optimistic.
- (iii) Hold discussions, seminars and industrial visits with the active participation of faculty members and subject experts from industries and research institutions.
- (iv) Prepare project reports on selected topics with an aim to start a small scale industry in textile dyeing and printing.

Teaching Aids

- (i) Textbooks, reference books, sourcebooks.
- (ii) Charts, slides, diagram.
- (iii) Teaching notes, observation notes, seminars and project report.
- (iv) Laboratories and workshops.
- (v) Textile, industries, Research institutes, Polytechnics.
- (vi) Study tours, exhibitions.
- (vii) Journals.
- (viii) Library and internet.
- (ix) Discussions, seminars.
- Role of Students:**
 - (i) Data collection from textile industries, research institutes, selling outlets.
 - (ii) Express their views related to the data collected.

Learning Strategies

Important learning strategies are experiments, discussions, debates, seminars, drawings, model preparation, specimen collection, quiz, exhibition and field visits. The overall performance of the students are improved which include the skills, leadership research mentality etc.

Experiments:

It is an important learning strategy. Teacher has to give the guidelines regarding the experiments and demonstrate using the required instruments. Students can be either permitted individually or in groups. Most of the topics in textile dyeing and printing require experiments, which will be conducted simultaneously with the engagement of theory of related topics.

Discussions, debates, seminars.

Particular topics for the above are selected and are held under the guidance of the faculty members and subject experts from outside.

Learner centred seminars guided by experts in textile fields have to be conducted.

Drawings, model preparation, specimen collection

Preparation of drawings and models required for the curriculum are to be prepared. Collection of specimens from selling outlets, industries and research institutions are to be made and the quality particulars are to be noted.

Exhibition, Quiz:

Exhibition of the products manufactured by dyeing and printing has to be done, the manufacturing details to be noted in detail. Individual/group wise quiz will help to check the up-to-date knowledge on selected topics under the guidance of faculty members or subject experts.

Field Visits

It is necessary to conduct a number of local visits to industries related to textile dyeing and printing. One or two study tours are to be conducted to cover the major industries outside the state. Field visits help the students to acquaint with the most modern techniques adopted in textile industries for textile dyeing and printing.

Project Work

Project work help to develop interest in learning and ensure the active participation of the students. Each student should be assigned with a project work either alone or as a group guided by the teacher and the report of work done should be submitted at the end of each year.

The structure of the project report should contain:

1. Project title
2. Name of student/students.
3. Branch/school.
4. Certificate
5. Preface
6. Introduction
7. Survey
8. Need for the project

9. Existing market potentiality
10. Site for the project
11. Plan and layout.
12. Product manufacture
13. Equipments/tools/machinery required.
14. Consumables required.
15. Staff and labour pattern.
16. Manufacturing process
17. Marketing.
18. Profit and loss account.
19. Conclusion

Some of the project works which can be assigned to the textile dyeing and printing students are:

1. Setting up a small-scale screen printing unit.
2. Setting up a small-scale dyeing unit.
3. Production of fancy designs by tie and dye.
4. Production of fancy designs by Batik Printing.
5. Setting up of a cottage unit for bleaching.
6. Setting up of a cottage unit for Mercerising.
7. Setting a textile bleaching/dyeing/printing unit.

IV

Planning

To make Textile Dyeing and Printing education activity based, we have to provide learning experiences that would help to develop process skills and components of multiple intelligence. Whether the activities are conducted in the class or outside, they are to be completed in a time bound manner.

The teacher has to plan the activities necessary to make learning effective, time required, evaluation methods and all other aspects. Teacher must prepare at least three planning documents.

- Year plan
- Unit plan
- Daily plan

1 Year Plan

The year plan will include the total number of units to be transacted through the three terms, units to be covered during each month and the number of periods required for each unit.

A model of year pan is given below.

Year Plan (Theory) (First Year)

Term	Month	Topics/Units	Total Hours	Other Activities
Ist Term	July	1, 2	20	Industry visit
	August	3, 4	20	Seminar, Class test
	September	5, 6	15	Terminal Exam.
IInd Term	October	6, 7	20	Study tour, Assignment
	November	7, 8	20	Industry visit, Project work
	December	8, 9	15	Terminal Exam
IIIrd Term	January	9, 10	20	Sports and Games Assignment
	February	10	10	Seminar
	March	Revision, Model Exam		
		Total	140 Hours	

2 Unit Plan

Teacher may prepare unit plan before the actual transaction of the unit in the classroom. This plan must make clear the curriculum objectives intended, periods required for

transactions of these objectives, instructional strategies to be used and materials required. How the outcomes are to be evaluated may also be spelt out. Unit analysis for each unit given in the source book may be utilized for preparing unit plan. A model of unit plan is given below.

Unit Plan Unit 1 - Classification of Textile Fibres

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	Classify textile fibres through discussion observations and sample collection.	<ul style="list-style-type: none"> • Definition of textile fibres. • Various natural and man made fibres and fabrics. 	<ul style="list-style-type: none"> • Observing • Classifying • Analysing 	<ul style="list-style-type: none"> • Discussion • Observation • Sample collection 	<ul style="list-style-type: none"> • Sample of various textile fibres and fabrics. • Microscopes • Charts • Text books and periodicals 	<ul style="list-style-type: none"> • Notes • Charts • Collection of samples 	<ul style="list-style-type: none"> • Basic knowledge • Co-operation • Participation in discussion. • Presenting ability • Record 	10

3 Daily Plan

The daily plan included curriculum objectives to be transacted during class period, learning activities, learning aids and feedback.

Model of daily plan is given below :

Daily Lesson Plan for Classification of Textile Fibers

Date :

Class :

Curriculum Objective : Classify Textile Fibers.

Objectives : Through discussion, observation and sample collection.

Duration Hour	Activity	Discussion Points	Required learning materials	Learner Participation	Teacher Supplement	Remarks/ Value points
2	Discussion and Observation	<ul style="list-style-type: none"> • Textile fibers • Natural fibers • Artificial fibers 	<ul style="list-style-type: none"> • Students uniform dress • Casuals • Furnis-hings • Samples of cotton, wool, silk, linen, viscose rayon, acetate rayon, nylon, terylene etc. 	Learners Participation	Teacher Supplement	Remarks/ Value points
1½	Sample Collection	<ul style="list-style-type: none"> • Samples of fabrics and yarns of different textile materials. 	<ul style="list-style-type: none"> • Students uniform dress • Casuals • Furnis-hings • Samples of cotton, wool, silk, linen, viscose rayon, acetate rayon, nylon, terylene etc. 	Learners Participation	Teacher Supplement	Remarks/ Value points

Signature of Principal

Signature of Teacher

TIME SCHEDULE

Theory 140 Hours

Unit No	Name of Unit	Hours
1.	Classification of Textile Fibers	10
2.	General properties of textile Fibers	10
3.	Properties of Cotton	10
4.	Bast fibers –Linen and jute	10
5.	Animal Fibers – Wool and Silk	10
6.	Semi Synthetic and Fully Synthetic Fibers	20
7.	Soaps and Synthetic Detergents	10
8.	Treatment of materials prior to dyeing and printing	25
9.	Mercerisation	10
10.	Classification of dyes and soluble group of dyes	25
	Total	140 hrs.

Syllabus

Unit 1

Classification of Textile Fibers

Classification based on origin. Natural, semi synthetic and fully synthetic. Natural fibers vegetable, animal and mineral fibres – examples for each class. Classification of synthetic fibres semi synthetic and fully synthetic. Cellulose and protein based semi synthetic fibres. Fully synthetic fibres – poly amides and polyesters with examples for each type. 10 Hours.

Unit II

General properties of Textile Fibres:

Properties required for a textile fibre. Essential and desirable properties. Tensile strength, staple length, spinning power and elasticity. Desirable properties – lustre, cohesiveness, moisture regain, commercial availability. 10 hours

Unit III

Properties of Cotton:

Physical properties – structure of cotton fibre composition, action of heat and light. Longitudinal and cross sectional views of raw cotton fibre. Action of cold and hot dilute and concentrated solution of sulphuric acid, hydrochloric acid, nitric acid, acetic acid, sodium carbonate, sodium hydroxide, potassium hydroxide, potassium permanganate, hydrogen peroxide, calcium hypo-chlorite, sodium hypo-chlorite and sulphur dioxide. Formation of mildew. Action of dyestuffs. - 10 Hours

Unit IV

Bast Fibers – Linen and Jute

Method of separation of linen and jute fibres from the plants. Harvesting, retting, rippling, scutching and hackling. Different methods of retting – water retting, dew retting and chemical

retting. Physical properties of linen and jute – action of heat, light, longitudinal and cross sectional views. Action of mineral acids – hydrochloric, nitric and sulphuric acid. Action of oxidizing agents – hydrogen peroxide, calcium hypo-chlorite, sodium hypo-chlorite and potassium permanganate. Action of Basic dyes.
- 10 hrs.

Unit V

Animal Fibres. Wool and silk.

Shearing, sorting classification and grading of wool.

Physical properties – longitudinal and cross sectional views – action of heat and light. Composition of wool – action of acids and alkalies. Carbonisation and chlorination. Dyestuffs used for colouring wool.

Silk – sericulture, life cycle of silk worm. Silk reeling, throwing and doubling. Different types of silk yarn and its various uses. Composition of raw silk - Microscopical appearances – longitudinal and cross sectional views. Action of bleaching agents, acids and alkalies. Degumming and weighting of silk. Composition of silk. Colours used for dyeing and printing of silk.
- 10 hrs.

VI. Semi synthetic and fully synthetic fibres

Difference between semi synthetic and fully synthetic fibres. Cellulose based semi synthetic

fibres – viscose and acetate rayons. Viscose – sequence of operations involved in manufacturing – steeping, shredding, ageing, xanthation, preparation of spinning solution, ripening, filtering, spinning, coagulation and regeneration of cellulose, purification. Microscopical appearances, action of acids, alkalies and dye stuffs. Acetate rayon-steps involving in manufacture – Acetylation, partial hydrolysis, precipitation, preparation of spinning solution, spinning and drawing of filaments. Physical and chemical properties.

Fully synthetic fibres – Polyamides and polyesters. Chemicals required for nylon – 6 and nylon – 66.

Manufacture – Flow sheet – polymerisation reaction – Nylon spinning unit.

Terylene – chemicals required – conditions of polymerisation – spinning method. Important physical and chemical properties of Nylon and terylene. (20 hrs.)

Unit VII

Soaps and detergents

Soaps – definition – different methods of manufacture – chemicals required – hard and soft soap – action of acids. Detergents – definition – difference between detergents and soaps – effect of hard and soft water on soaps and detergents. Turkey Red Oil-preparation – wetting and detergent action. (10 hrs.)

Unit VIII**Treatment of material prior to dyeing and printing**

Different types of materials used for textile purposes – cotton, wool, silk, linen, jute, viscose, acetate, nylon and terylene. Impurities present in the above fibres – natural, added and adhered singeing impurities. Pretreatment of cotton. Singeing – definition, plate, roller and gas singeing machines – sketch and description – merits and demerits of different types of singeing machines. Desizing – objects – different methods employed – oxidative method and reduction method. Oxidative method – chlorine, chlorite and bromite process. Enzymatic desizing. Kier boiling – objects – chemicals required, chemical changes taking place – vertical and horizontal kiers. Defects in scouring preventive measures. Grey souring – object. Bleaching – definition – classification of bleaching agents – oxidizing and reducing – examples for each type. Bleaching of cotton using hydrogen peroxide, bleaching powder and sodium hypo-chlorite. Continuous J-box scouring and bleaching. Impurities present in Linen and jute – treatments done to remove the impurities. Bleaching of linen and jute. Silk – de-gumming and bleaching with hydrogen peroxide. Wool – carbonization – scouring – bleaching with sulphur dioxide. Removal of added and adhering impurities, from viscose, acetate, nylon and terylene. (25 hrs.)

Unit IX**Mercerisation**

Definition – chemicals used – important changes taking place – method of mercerizing cotton hanks and cloth using machines. Longitudinal and cross sectional views of mercerized cotton. (10 hrs.)

Unit X**Classification of dyes and soluble group of dyes.**

Classification of dye stuffs according to their method of application – Direct, acid, basic, reactive, sulphur, vat, mordant, naphthol, oxidized, mineral and dispersed dyes. Direct dyes – properties – solubility – fibres coloured – assistants required, sodium carbonate and sodium chloride – function of assistants – procedure of application on cotton, wool and silk. After treatments – objects – important after treatments given to improve light, washing and perspiration fastness. Topping with basic dyes – objects. Factors affecting the depth of colour – salt, concentration, time and temperature factors.

Acid dyes – properties – method of application on wool and silk. Function of acids. Basic dyes – characteristic properties – high brilliancy and colouring power, application on cotton after mordanting and fixing. Application on silk and wool using acetic acid and boiled-off liquor.

Reactive dyes – Reason for reactivity – of reactive dyes – cold and hot brands.
reactive end groups present in dye stuffs and Differences between direct and reactive colours.
fibres. Reactive agents required, different types Fibres coloured with reactive dyes. Method of
application on cotton, wool and silk. (25 hrs.)

Textile Dyeing and Printing (Practicals) **First Year**

Practicals Time Scheduled 420 hrs

Unit	Name of Unit	Hours
1.	Physical and chemical properties of textile fibres	40
2.	Pretreatments and bleaching	60
3.	Direct dyes on cotton and after treatments	80
4.	Direct dyes on wool and silk	60
5.	Basic dyes on cotton, wool and silk	80
6.	Reactive dyes on cotton, wool, silk and acid dyes on wool	60
7.	Mergerisation	40
	Total	420 hrs

Year Plan (Practical)
Textile Dyeing and Printing
First Year

Month	Units	Hours	Other Activities
July	1, 2	50	Industry visit
August	2, 3	60	
September	3	40	Assignment, test
October	3, 4	60	Study tour
November	4, 5	70	Industry visit
December	5	40	Assignment, test
January	6	60	
February, March	7	40	Assignment, Revision, Text
Total			420 Hours

List of experiments to be done

Unit I

Physical and chemical properties of textile fibres.

- 1.1 Action of heat and light on textile fibres.
- 1.2 Longitudinal and cross sectional views of textile fibres.
- 1.3 Action of dilute and concentrated acids.
- 1.4 Action of alkalies.
- 1.5 Bleaching of cotton, linen, jute, silk and wool.

- 1.6 Identification of textile fibres by burning test, microscopical appearances, staining test and solubility tests. (40 hrs.)

Unit II

Pretreatments and bleaching.

- 2.1 Singeing, desizing, kier boiling of cotton fabric and singeing and kier boiling of cotton yarn.
- 2.2 Degumming of silk.
- 2.3 Carbonisation of wool.
- 2.4 Bleaching of cotton using bleaching powder, sodium hypochlorite and hydrogen peroxide.

2.5 Bleaching of linen and jute using sodium hypo-chlorite.

2.6 Silk bleaching with hydrogen peroxide.

2.7 Bleaching of wool with sulphur dioxide.
(60 hrs.)

Unit III

Direct dyes on cotton and after treatments

3.1 Method of application of direct yellow, orange, red, blue, green, violet, brown and black.

3.2 After treatment with copper sulphate, potassium dichromate and formaldehyde.

3.3 Topping with basic colours.

3.4 Salt factor and concentration factor.
(80 hrs.)

Unit IV

Direct dyes on wool and silk

4.1 Application of direct colours, red, yellow, blue, green, violet and black on wool and silk using acid as assistant.

4.2 Dyeing of silk with direct pink, brown, yellow and red with boiled – off liquor as assistant.
(60 hrs.)

Unit V

Basic dyes on cotton, wool and silk.

1.1 Mordanting, fixing and dyeing of cotton with Auramine, Rhodamine, Methylene violet,

Methylene blue, Malachite green and Bismarck brown.

1.2 Application of basic colours on wool and silk with Auramine, Rhodamine, Methyl violet and Malachite green. (80 hrs.)

Unit VI

Reactive dyes on cotton, wool, silk and acid dyes on wool.

6.1 Application of metanil yellow, Kiton red, Kiton blue, Kiton brown and Kiton black on cotton

6.2 Application of reactive yellow, blue and red on cotton, wool and silk. (60 hrs.)

Unit VII

Mercerisation

7.1 Hank mercerizing with and without tension.

7.2 Cloth mercersing under tension and without tension. (40 hrs.)

General Instructions to Teachers

1. Though the curriculum objectives are prepared separately for theory and practical, both should be conducted simultaneously.
2. The facilitator has to note down the objectives of both theory and practical for a topic in a particular unit in their teaching manual and plan the activities accordingly.
3. Record book should be maintained by the learner, the experiments done should be

- recorded and the products of practical work should be affixed.
4. Sketches are to be drawn wherever necessary.
 5. Single record book is sufficient for keeping the records of I and II year.
 6. Clear cut separation of first and second year practical should be made in the record book.
 7. Evaluation of the record book should be done at the end of first and second year.
 8. Assignments and class tests should be given as a part of continuous evaluation.

Curriculum Objectives

1. Classify textile fibres through discussion, observation and sample collection.
2. Find out the general properties of textile fibres through discussion, observation and listing.
3. Analyse the physical properties of cotton through discussion, observation and experimentation.
4. Find out the chemical properties of cotton through discussion,, observation, and assignments.
5. To explore the method of separation of linen fibre from basts, physical and chemical properties through observation, discussion and experimentation.
6. Find out the method of extraction of Jute Fibre, physical and chemical properties through observation, discussion and experimentation.
7. Find out the method of shearing and collection of wool, production of clean wool from raw wool, physical and chemical properties, uses through observation, discussion and experimentation.
8. Find out the production of silk from silk worms, physical and chemical properties of silk through observation, discussion and experimentation.
9. Classify synthetic fibres into semi-synthetic and fully synthetic fibres through observation, discussion and experimentation.
10. Familiarise the process of manufacture of viscose rayon, acetate rayon, their properties through observation, discussion and flowchart preparation.
11. Identify the process of manufacture of nylon and terylene and their properties through

- observation, discussion and flow chart preparation.
12. Find out the method of manufacture and properties of soaps, detergents and Turkey Red Oil through discussion, observation and demonstration.
 13. Find out the detergent and wetting action of soaps, detergents and turkey red oil through discussion, observation and demonstration.
 14. Differentiate between hard soap and soft soap through discussion, observation and demonstration.
 15. Classify bleaching agents, identify the properties of bleaching agents through observation, discussion and experimentation.
 16. Find out the pre-treatments and the method of bleaching cotton, linen, jute, silk, and wool through observation, discussion and experimentation.
 17. Identify the removal of added and adhering impurities from viscose, acetate, nylon and terylene through observation and discussion.
 18. Explore the objects, chemical reactions, factors affecting and properties achieved by mercerisation through discussion and experimentation.
 19. Identify Hank and cloth mercerizing machines through discussion and experimentation.
 20. Classify dyes according to the method of application through discussion, experimentation and observation.
 21. Find out the method of application of direct, acid and basic dyes on cotton, wool and silk including after treatments required and various factors affecting the depth of shade through discussion, experimentation and demonstration.
 22. Find out the properties of reactive dyes, method of application on cotton, wool, silk and viscose through discussion, experimentation and demonstration.

Evaluation

It is the process of scientific assessment of achievements by the students in relation to the curriculum objectives. Learning being a continuous process, evaluation should also be continuous. It should be comprehensive and students should be graded on the basis of their knowledge and skills. Evaluations can be done in many ways like.

(i) Continuous evaluation

The multi dimensional competencies of the students can be evaluated through

- | | |
|----------------|---------------|
| 1. Seminar | 2. Project |
| 3. Assignment | 4. Lab work |
| 5. Collections | 6. Class test |

How to evaluate CE items?

The table showing the CE items, their indicators, weightage and score.

CE Items	Evaluation Indicators	Score 4/3/2/1	Total Score
Seminar	1. Ability to plan and organise (time, topic, sources of data, method of presentation etc.)	4/3/2/1	20
	2. Skill in the collections of data (relevance, authenticity, variety of sources etc.)	4/3/2/1	
	3. Awareness of the content (presentation of the paper, participation in discussion, ability to substantiate his own ideas and views)	4/3/2/1	
	4. Ability to prepare the report (sequence in the presentation of the concepts, authenticity and clarity of ideas/views/concepts)	4/3/2/1	
	5. Skill in communication (presentation of the paper, participation in discussion)	4/3/2/1	

CE Items	Evaluation Indicators	Score 4/3/2/1	Total Score
Project	<p>1 Ability to plan</p> <ul style="list-style-type: none"> • ability to select suitable learning method for solving the problem • ability to develop suitable tools • ability to plan the duration of study, and the various activities to be carried out in each stage <p>2 Ability to collect data</p> <ul style="list-style-type: none"> • ability to collect sufficient and relevant data • ability to classify and arrange data for analysis • reliability and authenticity of the collected data (this can be assessed based on their recording in the project diary) <p>3 Ability to analyse the data and arrive at conclusions/inference</p> <ul style="list-style-type: none"> • ability to analyse the data • ability to draw inference based on the analysis of data • ability to give suitable suggestions based on the inferences. <p>4 Ability to prepare the project report</p> <ul style="list-style-type: none"> • ability to prepare the project report reflecting the process skills involved. • communicability of the report • authenticity of the report • relation with the project diary • time bound completion <p>5. Viva - Voce (Knowledge of the content and processes)</p> <ul style="list-style-type: none"> • ability to analyse the data • ability to justify the inference • ability to explain the strategies and methods adopted and communicate the findings 	<p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p>	<p>20</p>

CE Items	Evaluation Indicators	Score 4/3/2/1	Total Score
Assignment	<ol style="list-style-type: none"> 1. Awareness of the content 2. Comprehensiveness of the content (coverage of content) 3. Systematic and sequential arrangement (clarity, structure, language) 4. Own observations/suggestions/views/judgement/evaluation 5. Timely submission 	<p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p>	20
Lab Work	<ol style="list-style-type: none"> 1.Preparation for the work (procedure, apparatus needed, knowledge of the concepts or principles) 2.Skill in handling the apparatus 3.Accuracy and specificity in carrying out the experiment (controlling variables, measurement, recording.) 4.Analysis of data and arriving at conclusion 5.Recording of the work and timely submission 	<p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p>	20
Collections	<ol style="list-style-type: none"> 1 Relevance 2 Variety 3 Uniqueness 4 Systematic recording 5 Neatness and timely submission 	<p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p> <p>4/3/2/1</p>	20
Class Test	<p>For the year end evaluation the best score out of two class test should be considered for the continuous evaluation. But with in a term, class tests may be conducted after the completion of each unit. Therefore within a term various class tests may be conducted for diagnostic purpose and the average score of them should be taken and recorded in the evaluation profile. The features of a class test for diagnostic purpose are as follows:-</p>		20

CE Items	Evaluation Indicators	Score
Class Test	<ul style="list-style-type: none"> • It is a tool used to find out and to solve the learning problems faced by pupils. • It may be used as a tool to collect feedback from pupils during the learning process. • Class test need not be a written test. It can also be organised as a performance test. • After completing a unit, it can be in the form of a unit test. • It may not be a test including more than one unit. • Attendance of all pupils may be ensured during class test. • Class test may be carried out by the teacher handling the subject. • Questions may be prepared in school by following the directions of school examination board. • Class test should be informal. No time table or printed question paper is required. No need of blue print. • Questions should be suitable for subject approach. • Should be completed in one period. • Arrange more remedial activities to solve the problems identified through the class test after discussing it with pupils. • Discussion of value points with pupils and peer evaluation and self evaluation may be used. <p style="text-align: center;">(Average marks of all tests is converted in to 20.)</p>	

- Out of the above 6 CE items class test is compulsory. Consider any other two CE items for evaluation and recording.

Summary of Methods

2. Project	Feeling the problem
	Formulating Hypothesis
	Data collection
	Analysis
	Drawing conclusion
	Report Writing
	Presentation

1. Seminar	Planning
	Data Collection
	Presentation of paper
	Completion

4. Lab work	Planning
	Execution
	Completion
4. Assignment	Sharing Phase
	Completion phase

5. Collection	Sharing in the class room
	Interim evaluation
6. Class test	Completion phase

Distribution of scores for year end evaluation

For year end evaluation both theory and practical test will be conducted

	Score
Theory-written test (external)	80
Continous evaluation (internal)	20
Total	100

Grading

Continuous evaluating is necessary for activity based learning process. But the skills achieved by the students cannot be completely measures in terms of Marking system. Marking System failed in recording the growth and development of individual students both in scholastic and co-scholastic learning outcomes. Classification of students in terms of marks were both unjust and indefensive. It also creates mental stress and strain among the students. To overcome this limitation, a popular mode of evaluating students' performance known as grading system has been evolved. It is quite extensively used all over the world. In the Higher Secondary stage, it is desirable to use a 9 point scale absolute grading to consolidate and record the evaluation. After giving the score, they are changed into percentages and appropriate letter grades are awarded corresponding to each percentage. This system is termed as absolute grading.

The Score percentage and Corresponding Grade is given below

Score in percentage	Grade
90-100	A+
80-89	A
70-79	B+
60-69	B
50-59	C+
40-49	C
30-39	D+
20-29	D
Below 20	E

Test items of Termed Evaluation (TE) and year end evaluation

- Class tests, term end evaluation and year end evaluation should be justifiable to new approach.
- Questions should not lead to mugging up of content.
- Questions should consider the learning process and subject approach.
- It should help to analyse the result with a research mind.
- Test items for different cognitive levels may be provided.

- Allow chances for pupils to attempt multilevel questions

Selection of COs

- Care should be given to select items from areas where more activities are possible
- Stress should be given for the higher level thinking/mental process of pupils.
- Learning by heart and knowledge not relating to real life need not be encouraged.
- Cluster of more than one CO can be used.

Question Text

- Questions should be in tune with the approach to technological learning.
- Stress should be given to apply the innate thinking/mental abilities of pupils
- Importance may be given to both the process as well as product.
- More than one possible answers to the same question need not be discouraged.
- Questions should be clear and hints may be given wherever needed.
- Life related questions should be included.
- Language of the questions must be simple and direct.
- When formulating questions and fixing scores, time required to read, think, understand and write answers may be taken into consideration

- To avoid blind guessing, multiple choice and supply type questions may be mixed.
- The questions may be of such type that make it possible for students of different ability levels to interact.

Consolidated Statement of C.E.

Sl. No.	Name	Seminar 20	Assignment 20	Class Test 20	Total Score 60	Score reduced to 20 $\frac{\text{Score obtained} \times 20}{60}$
1.	Vinitha	10	8	14	32	10.75
2.	Rema	12	13	15	40	13
3.	Nitha	14	9	10	33	11

Consolidated Statement of T.E. and C.E.

Sl. No.	Name	T.E. 80	C.E. 20	Total Score 100	Grade
1.	Vinitha	55	10.75	66	B
2.	Rema	68	13	81	A
3.	Nitha	42	11	53	C+

Vocational Subject Evaluation

Vocational subject evaluation is used to evaluate the skills of the learner in the concerned subject. The facilitator has to make learning in print production techniques activity based, product based, student centered and society bound.

Practical Evaluation (PE)

In practical evaluation, the learner's capability on basic workshop skills and proficiency in operating machines and equipment for print production skills are to be examined. Questions are framed in such a way that it should evaluate working skills and knowledge in print production.

Part II Vocational Subject**Evaluation of First year**

	CE	TE	PE	IE	Total	Minimum
VT	20	80	-	-	100	30%
VP	-	-	150	-	150	40%
VCE	-	-	-	50	-	30%

No minimum for CE

Practical Evaluation (PE)

The following general indicators are identified for PE.

Identification	-	15 Scores
Record	-	15 Scores
Procedure writing for practicals-		35 Scores
Handling of equipments	-	10 Scores
Observation/Tabulation	-	30 Scores
Interpretation/Inference	-	15 Scores
Result	-	15 Scores
Viva	-	15 Scores
Total	-	150 Scores

Note : The subject wise details for each vocational subject will be attached to the concerned subject approach. PE should be done before the end of each term so as to.

III. Vocational Competency Evaluation (VCE)

Being a vocational course a system to judiciously evaluate the required value addition and consignment capacity building in the selected vocational subject in highly essential. as the other evaluation components like CE, PE and TE cannot amen the vocational competancies and

professional skills required by teh students, an Internship Evaluation (IE) component has been introduced to meet this requirement.

Internship Evaluation should be done based on the following components.

I. Regularity and Punctuality

A regular presence and habit of task is a must for time bound completion of task is a must for attaining maximum efficiency.

II. Field Visit/Survey

The experiences gained through field visits and survey increased the level of interinsic motivation and positive attitude towards the vocational field and there by ***** his valve as a skilled semi-professional.

III. Simulated experiment / OJT

Perofrmance - Comp/Exhibition/clinic

Performance - Production/Service cum Training Centre

These components enable The students to practice th eacquired skills in the real situation and there by increasing self confidance and promoting self reliance.

I. Regularity and Punctuality can be evaluated by 5 point grading system.

Rating Scale

Sl. No.		1	2	3	4	5
1.	Regularity	Never Regular	Often Regular	Usually Regular	Most of the time Regular	Always Regular
2.	Punctuality	Never Punctual	Often Punctual	Usually Punctual	Most of the time Punctual	Always Punctual

Regularity and punctuality can be amassed by using attendance of the student and time bound completion of tasks.

II. Indicators for field visit

- Attitude and readiness towards the task.
- Capacity for observation.
- Data collection.
- Application of ideas.
- Documentation/Recording.

Survey

- Planning
- Data collection
- Consolidation of data and analysis
- Drawing inference
- Reporting

III. Simulated Experiment/OJT

- Evolvment/participation
- Skills in doing work/communicates skill
- Time bound action

- Capacity for observation, analysis and innovation.
- Documentation, recording and display.

Performance - clinic/Camp/exhibition

- Ability for planning and organisation.
- Mastery of subject
- Ability fro communication.
- Innovation.
- Involvement/social commitment.

Performance - Production/Service cum Training Centre (PSCT)

- Mastery of Voc. skills.
- Managerial capacity.
- Promoting self confidence.
- Innovative approach.
- Promoting self-reliance.

Vocational Higher Secondary School - I Year (Theory)

Note: VC

Items	Score
• Regularity and Punctuality	10
• Field visit/survey (any one)	20
• Simulated experiment/OJT Performance - clinic/caup/exhibition Performance - PSCT (Any one)	20
Total	50 Scores

A minimum of 80% attendance is required for promotion to the second year. Those who have shortage of attendance should repeat first year. Those who have 80% attendance but failed to achieve 30% of internship valuation will be promoted to the second year. He has to improve the component in which he performed poor. He has to attain the minimum by improving the particular component to get eligible for appearing second year public examination.

Detailed format for Vocational Competency Evaluation (VCE)

VCE Item	Evaluation Indicators	Score	Total Score
1. Regularity and Punctuality	1. Attendance 2. Discipline and Obedience	5 5	10
2. Value addition	Field Visit 1. Attitude and readiness towards the task. 2. Capacity for observation. 3. Data collection. 4. Application of ideas. 5. Documentation/ recording. OR Survey 1. Planning. 2. Data collection. 3. Consolidation of data and analysis. 4. Drawing inference. 5. Reporting.	4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1	20
3. Capacity building	OJT/ Simulated Experiment 1. Involvement/ Participation. 2. Skills in doing work/ Communication skill. 3. Time bound action. 4. Capacity for observation, analysis and innovation. 5. Documentation, Recording and display.	4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1	20

VCE Item	Evaluation Indicators	Score	Total Score
	<p style="text-align: center;">OR</p> <p>Performance in camp/ Exhibition</p> <p>1. Ability for planning and organising. 4/3/2/1</p> <p>2. Mastery of subject. 4/3/2/1</p> <p>3. Ability for communication. 4/3/2/1</p> <p>4. Innovation. 4/3/2/1</p> <p>5. Involvement/Social commitment. 4/3/2/1</p> <p style="text-align: center;">OR</p> <p>Performance in production/ service cum training centre (PSCTC)</p> <p>1. Mastery of vocational skills. 4/3/2/1</p> <p>2. Managerial capacity. 4/3/2/1</p> <p>3. Promoting self confidence. 4/3/2/1</p> <p>4. Innovative approach. 4/3/2/1</p> <p>5. Promoting self - reliance. 4/3/2/1</p>		

Government of Kerala

Board of Vocational Higher Secondary Examinations

Thiruvananthapuram

Reg: No. _____

Dated : _____

Evaluation Sheet

Sri./Smt. _____ is awarded Scores/
grade as detailed below in the First Year Vocational Higher Secondary Examination held in

Name of School : _____ Admission No : _____

Name of Vocational Course : _____

Subject	Score Obtained					Positional Grade	Grade in words
	CE 20	TE 80	PE 150	IE 50	Total		
Part- I							
English			—	—			
General Foundation Course			—	—			
Part- II Vocational Subjects							
Vocational Theory			—	—			
Vocational Practical	—	—		—			
Vocational Competency	—	—	—				
Part- III Optional Subjects							
	20	60	20				
Physics				—			
Chemistry				—			
	20	80					
Mathematics			—	—			

CE- Continuous Evaluation, TE- Term End Evaluation, PE- Practical Evaluation, IE- Internship Evaluation.

Grades	A+	90% and Above	Outstanding	A	80- 89%	Excellent.
	B+	70 - 79%	Very Good	B	60- 69%	Good
	C+	50 - 59%	Above Average	C	40- 49%	Average
	D+	30 - 39%	Marginal	D	20- 29%	Need improvement
	E	Below 20%	Need improvement			

Marks Entered by _____

Marks checked by _____

Supdt/ T. O _____

SECRETARY

Part II - Unit-wise Learning Activities

Section A (Theory)

1. Classification of Textile Fibers	42
2. General properties of Textile Fibres	46
3. Properties of Cotton.....	50
4. Best Fibers –Linen and Jute	55
5. Animal Fibers – Wool and Silk	61
6. Semi synthetic and Fully synthetic fibers	68
7. Soaps and Synthetic detergents	76
8. Treatment of Materials Prior to Dyeing of Printing	81
9. Mercerization.....	90
10. Classification of dyes and soluble groups of dyes	98

Unit 1 - Classification of Textile Fibres

Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	Classify textile fibres through discussion and observations and sample collection.	<ul style="list-style-type: none"> • Definition of textile fibres. • Various natural and man made fibres and fabrics. 	<ul style="list-style-type: none"> • Observing • Classifying • Analysing 	<ul style="list-style-type: none"> • Discussion • Observation • Sample collection 	<ul style="list-style-type: none"> • Sample of various textile fibres and fabrics. • Microscopes • Charts • Text books and periodicals 	<ul style="list-style-type: none"> • Notes • Charts • Collection of samples 	<ul style="list-style-type: none"> • Basic knowledge • Co-operation • Participation in discussion. • Presenting ability • Record 	10

Unit I

Classification of Textile Fibres

Introduction

The fundamental units of different types of textile materials are textile fibres like cotton, silk, wool, viscose rayon, acetate rayon, nylon, terylene etc. In this unit, the learners understand the classification of textile fibres according to their origin. Students will be able to acquire the classification of textile fibres by various methods.

Curriculum Objectives

Classify textile fibres through discussion, observations and sample collection.

Syllabus

Classification based on origin – Natural, Semi Synthetic and fully synthetic, Natural fibres vegetable, animal and mineral fibres – examples for each class; classification of synthetic fibres semi synthetic and fully synthetic fibres, cellulose and protein based semi synthetic fibres polyamides and polyesters with examples for each type.

Pre-requisites

Knowledge about the materials used to manufacture commonly used apparels and household textile materials.

Activity

1. Name – types of fibers

Activity : Observation and discussion.

Materials – Uniform dress, casuals and furnishings.

Process

Let the learners try to identify the materials of

- Pants
- Shirts
- Churidhar top
- Churidhar bottom
- Kerchief

- Window curtains
- Table cloth

Cloth	Materials
Pants	_____
Shirts	_____
Churidhar top	_____
Churidhar bottom	_____
Kerchief	_____
Window curtains	_____
Table cloth	_____

Consolidation – The teacher consolidates the table.

Cloth	Materials
Pants	Cotton/Tery cotton/coats wood/poly viscose
Shirts	Cotton/Tery cotton/polyester
Churidhar top	Cotton/Tery cotton/polyester/ silk
Churidar bottom	Cotton/Terycotton/polyester/ silk
Window curtans	Cotton/blended materials
Table cloth	Cotton/blended materials
Kerchief	Cotton

Product – Filled up table in the subject chart.

Activity – 2

Name – Textile materials

Activity – Observations

Materials – Cotton, wool, silk, linen, viscose rayon, acetate rayon, nylon, terylene etc.

Process :

- Divide the pupils into five groups.
- Supply the materials.
- Burn a part of each sample.
- Note the type of smoke and smell.

Sample	Finding	Materials
a	-----	-----
b	-----	-----
c	-----	-----
d	-----	-----
e	-----	-----
f	-----	-----
g	-----	-----
h	-----	-----
i	-----	-----
j	-----	-----

Consolidation

Characteristics of fibres

- Cotton, linen, jute, viscose : Burns with a smell of burning paper.
- Silk : Burns with smell of burning feather.
- Wool : Melts with smell of burning hair.
- Acetate rayon : Burns with a smell of acetic acid.
- Nylon and Polyester : Melts with the formation of beads and with black flames.

Product : the filled up table in the subject chart.

Activity 3

Name – Textile materials

Activity – Sample collection

Materials : Samples from Tailoring shops, selling outlets, other sources and remaining materials in the previous part.

Process : Instruct the students to burn a part of sample.

- Identify the properties.
- Prepare a chart/table.

Consolidation:

Natural Fibre	Artificial fibre
Cotton, Linen, Jute, wool and silk	Viscose, Acetate rayon, Nylon, Polyester

Product : Record book using the samples (Mention the classification.)

Unit 2 - General Properties of Textile Fibers

Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	Find out the general properties of textile fibers through discussion observation.	<ul style="list-style-type: none"> • Definition of filament fibres and staple fibres. • Staple fibre filament fibres, fabric and yarn. 	<ul style="list-style-type: none"> • Observing • Classifying • Analysing 	<ul style="list-style-type: none"> • Discussion • Observation 	<ul style="list-style-type: none"> • Samples of various textile fibres. • Reference books and periodicals • Chart 	<ul style="list-style-type: none"> • Chart • Subject diary 	<ul style="list-style-type: none"> • Observing Ability • Basic knowledge • Participation in discussion 	10

Unit II

General Properties of Textile Fibres

In order to make the fibres into a continuous yarn and further into a fabric, the textile fibres must possess certain properties. On completion of this unit, the learners will be able to understand the essential properties like tensile strength, staple length, fineness, uniformity, spinning ability and the desirable properties by discussion and lab work.

Curriculum Objectives

1. To know the general properties of textile fibres through discussion, observation and listing.

Syllabus

General properties of textile fibres – Properties required for a textile fibre – Essential and Desirable properties. Tensile strength, staple length, spinning power and elasticity. Desirable properties lusture, cohesiveness, moisture regain, commercial availability.

Pre-requisites

Knowledge about textile and non-textile fibers. Awareness about fabrics and furnishings.

Activity 1

Name – Properties of Fibers

Activity – Discussion

Materials – Very short and normal fibers of cotton, silk, wool.

Process :

- Group the pupils in 7 batches.
- Distribute the materials among them.
- Try to make it in a continuous form (yarn)

Consolidation – The teacher consolidates the properties.

General properties

- Length

- Fineness
- Elasticity
- Spinn ability

Product – The subject diary noted by the learners.

Activity – 2

Name – General properties.

Activity – Observations and table preparation.

Materials – Fibers of cotton, linen, jute, wool, silk, rayons, nylon, polyester, silk cotton, human hair, pineapple fibre, coir etc.

Process

- Divide the pupils into 5 groups.
- Supply the materials.
- Measure the dimensions.
- Find-out the breaking strength and elasticity.
- Try to twist the fibre.
- Prepare the table.

Product – The filled up table in the subject chart.

Name of fibre	Approximate length in cm	Strength (Good/medium/poor)	Spin ability (Yes/No)	Fineness (Fine/Coarse)
Cotton	-----	-----	-----	-----
Linen	-----	-----	-----	-----
Jute	-----	-----	-----	-----
Wool	-----	-----	-----	-----
Silk	-----	-----	-----	-----
Rayon	-----	-----	-----	-----
Nylon	-----	-----	-----	-----
Polyester	-----	-----	-----	-----
Silk cotton	-----	-----	-----	-----
Coir	-----	-----	-----	-----
Human hair	-----	-----	-----	-----
Pineapple fibre	-----	-----	-----	-----

Consolidation

Name of fibre	Approximate length in cm	Strength (good/medium/poor)	Spinn ability (Yes/No)	Fineness (Fine/coarse)
Cotton	2 – 6	Medium	Yes	Fine
Linen	44 – 75	Medium	Yes	Fine
Jute	150 – 300	Poor	Yes	Fine
Wool	3 – 7	Medium	Yes	Fine
Silk	Continuous	Medium	Yes	Fine
Rayon	Continuous	Medium/good	Yes	Fine
Nylon	Continuous	Good	Yes	Fine
Polyester	Continuous	Good	Yes	Fine
Silkcotton	1 - 2	Medium	No	Fine
Coir	5 - 15	Good	Yes	Coarse
Human hair	Continuous	Good	No	Fine
Pinapple fibre	15 - 30	Good	Yes	Coarse

Activity 3

Name – General properties of textile fibers.

Activity – Listing

Materials – Fibers of cotton, linen, jute, wool, silk, rayons, nylon, polyester, silk cotton, human hair, pineapple fiber, coir etc.

Process:

- Divide the pupils into 5 groups.
- Supply the materials.
- Instruct them to select and note
 - (a) Textile fiber
 - (b) Non-textile fibers

- List the properties of textile fibers.

Consolidation – Teacher consolidates that all the above mentioned fibers except human hair and silk cotton are textile fibers.

General Properties

- Staple length
- Strength
- Fineness
- Elasticity

Product – The subject diary noted by the students.

Unit 3 - Properties of Cotton

Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	Analyse the physical properties of cotton through discussion, observation and experimentation	<ul style="list-style-type: none"> • Cotton fibres, yarns, fabrics, properties, physical. Microscopical appearances action of heat and light. 	<ul style="list-style-type: none"> • Observation • Analysis • Measuring • Handling of microscope 	<ul style="list-style-type: none"> • Discussion • Observation • Experimentation 	<ul style="list-style-type: none"> • Microscope • Slides • Charts • Fibres • Textbooks 	<ul style="list-style-type: none"> • Diagrams • Charts • Subject diary 	<ul style="list-style-type: none"> • Drawing skill • Participation in discussion • Subject knowledge 	4
2.	Find out chemical properties of cotton through discussion, observation and assignments.	<ul style="list-style-type: none"> • Action of cotton fibres towards chemical reagents like acids, alkalis oxidizing and reducing agents. 	<ul style="list-style-type: none"> • Observing • Analysing • Measuring • Handling of microscope 	<ul style="list-style-type: none"> • Discussion • Observation • Assignment 	<ul style="list-style-type: none"> • Chemicals • Charts • Fibres • Reference books 	<ul style="list-style-type: none"> • Diagrams • Charts • Subject diary • Assignments 	<ul style="list-style-type: none"> • Participation in discussion • Observing ability • Basic ideas of chemicals 	6

Unit III

Properties of Cotton

Introduction

Cotton is the most important textile fibre. It is obtained from the seeds of cotton plants. Students will have awareness about the physical and chemical properties of cotton. The learners have a general idea about the general properties required for a textile fibre from unit II.

Curriculum Objectives

1. To know the physical properties of cotton through discussion, observation and experimentation.
2. To know the chemical properties of cotton through discussion, observation and assignments.

Syllabus

Properties of cotton – Physical properties – structure of cotton fiber, action of heat and light. Longitudinal and cross sectional views of raw

cotton fibres. Action of dilute and concentrated solution of sulphuric acid, hydrochloric acid, nitric acid, acetic acid, sodium carbonate, sodium hydroxide, potassium hydroxide, potassium permanganate, hydrogen peroxide, calcium hypochlorite, sodium hypochlorite and sulphur dioxide, formation of mildew – action of dye stuffs.

Pre-requisites

- Awareness of acids, alkalies, oxidizing agents and reducing agents.
- Knowledge to handle microscopes.

Activity – 1

Name – Physical properties of cotton.

Activity – Discussion.

Material – Cotton sample

Process

- Distribute the samples among the pupils.
- Try to identify the physical characters.
- Note the characteristics.

Consolidation

Physical properties

Tensile strength
Staple length
Elasticity
Spin ability
Uniformity
Fineness

Product – The subject diary.

Activity II

Name – Physical properties

Activity – observation

Materials – Cotton fibre

Process

- Divide the pupils into 5 groups.
 - Supply the materials.
 - Check the physical properties.
 - Note the properties
- 1) Length - cm
 - 2) Strength (weak/average/good)
 - 3) Elasticity (elastic or not)
 - 4) Moisture absorption (Yes or No)

5) Fineness – (Fine/medium/coarse)

6) Colour

Consolidation

Staple length	– 20 to 50 mm
Strength	– 2.5 gpd.
Elongation at break	– 10%
Moisture regain	– 8%
Fineness	– 3 to 6 mgms/inch
Colour	– Cream

Product – Chart prepared by the students.

Activity III

Name – Physical properties

Activity – Experimentation

Materials – Cotton fibre, Microscope.

Process

- Distribute the samples to each student.
- Prepare the slide for longitudinal view.
- Prepare the slide for cross sectional view.
- Examine the views in microscope
- Sketch the view.

Consolidation

- Longitudinal view – Spirally twisted tube with rough surface.
- Cross sectional view – Collapsed lumen running parallel to the axis of the fibre.

Product – Diagram.	Activity	–	Observation
Activity IV	Material	–	Cotton fibre and yarn, sodium carbonate, sodium hydroxide, sulphuric acid, hydrochloric acid, Nitric acid, acetic acid, bleaching powder, hydrogen peroxide, potassium permanganate.
Name – Chemical properties of cotton.			
Activity – Discussion			
Process			
Discussion Points			
<ul style="list-style-type: none">• Acids• Alkalies• Oxidising agents• Reducing agents• Dyes			
List the important chemicals.			
Consolidation – The teacher consolidates the action of important chemical reagents mentioned in syllabus on cotton.			
Product – Subject diary.			
Composition of Cotton			
<ul style="list-style-type: none">• Cellulose - 85.5%• Moisture - 8%• Protein, pectose, and pectin - 5.0%• Oils and wax - 0.5%• Minerals - 1%			
Activity V			
Name	-	Chemical properties of cotton.	Process <ul style="list-style-type: none">• Divide the pupils into 7 groups.• Supply the fibres and yarn of cotton.• Supply dilute acids, alkalies, oxidizing agents and reducing agents.• Instruct to treat a part of cotton with the above chemicals separately in cold and boiling condition.• Note the reactions.• Supply concentrated acids, alkalies, oxidizing agents and reducing agents in cold and boiling condition.• Instruct to treat a part of cotton with the above chemicals separately.• Note the reactions.• The teacher collects the response of the pupil.

Consolidation	–	The teacher consolidates the reactions of the above chemical reagents on cotton.	<ul style="list-style-type: none"> • Reactions of con: alkalies on cotton in cold and hot condition. • Reactions of dilute oxidising agents on cotton in cold and hot condition.
Product	–	Subject diary.	<ul style="list-style-type: none"> • Reactions of con: oxidising agents on cotton in cold and hot condition.
Activity VI			
Name	–	chemical properties of cotton.	<ul style="list-style-type: none"> • Reactions of dilute reducing agents on cotton in cold and hot condition.
Activity	–	Assignment	<ul style="list-style-type: none"> • Reactions of con: reducing agents on cotton in cold and hot condition. • Action of micro organisms.
		Prepare a table showing the	Consolidate – The teacher should consolidate the major findings of the report.
		<ul style="list-style-type: none"> • Reactions of dilute mineral acids on cotton cold and hot condition. • Reactions of con: mineral acids on cotton in cold and hot condition. • Reactions of dilute alkalies on cotton in cold and hot condition. 	Product – The assignment report.
			A seminar on ‘Saris in India’ to be conducted at the end of the unit.

Unit 4 - Bast Fibers - Linen and Jute Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	To explore the method of separation of linen fiber, physical and chemical properties through observation, discussion and experimentation.	<ul style="list-style-type: none"> • Linen fibre and fabric. • Various steps involved in the extraction. • Properties physical and chemical 	<ul style="list-style-type: none"> • Observing • Identifying • Analyzing • Measuring 	<ul style="list-style-type: none"> • Discussion • Observation • Experimentation 	<ul style="list-style-type: none"> • Microscope • Slides • Charts • Fibres • Textbooks 	<ul style="list-style-type: none"> • Diagram • Charts • Subject diary 	<ul style="list-style-type: none"> • Participation in discussion • Presenting ability • Observing ability 	4
2.	Find out the method of extraction of jute fiber and their physical and chemical properties through observation, discussion, experimentation.	<ul style="list-style-type: none"> • Jute fiber and cloth. • Various steps involved in the extraction • Properties physical and chemical 	<ul style="list-style-type: none"> • Observing • Identifying • Analyzing • Measuring 	<ul style="list-style-type: none"> • Discussion • Observation • Experimentation 	<ul style="list-style-type: none"> • Chemicals • Slides • Charts • Fibers • Textbooks 	<ul style="list-style-type: none"> • Diagram • Charts • Subject diary 	<ul style="list-style-type: none"> • Participation in discussion • Presenting ability • Observing ability 	4

Unit IV

Bast Fibres Linen and Jute

Introduction

Linen and Jute fibres are separated from the stems or basts of certain plants. This unit deals with the harvesting, method of separation of fibres from the basts, combing and the production of these fibres. The students also get a clear idea about the physical and chemical properties of these fibres.

Curriculum Objectives

1. Know the method of separation of liner fiber, physical and chemical properties through observation, discussion, experimentation.
2. Know the method of extraction of jute fiber, and their physical and chemical properties through observation, discussion and experimentation.

Syllabus

Bast Fibres – Linen and jute

Method of separation of linen and jute fibres from the plants – Harvesting, Retting, rippling, scutching and hackling. Different methods of retting – water retting, dew retting and chemical retting. Physical properties of linen and jute – action of heat, light, longitudinal and cross sectional views. Action of mineral acids – hydrochloric, nitric and sulphuric acid. Action of sodium carbonate and sodium hydroxide. Action of oxidizing agents – hydrogen peroxide, calcium hypo chlorite, sodium hypo chlorite and potassium permanganate – Action of basic dyes.

Pre – requisites

- Knowledge about extraction of coir fiber from of Husk.
- Knowledge of retting and preparation of coir yarn.

Activity I

Name – Linen Fibers

Activity – Discussion

Discussion points

- Retting coconut husk.
- Bast or stem fibers.
- Names of important bast fibers.
- Separation of fibers.
- Note the points.

Consolidation – Teacher consolidates:

- Types of bast fibers : Linen and jute.
- Steps for separation of fibers from bast linen plant.
 - (a) Rippling
 - (b) Retting
 - (c) Scutching
 - (d) Breaking
 - (e) Combing

Product – The subject diary.

Activity – II

Name - Physical properties of linen fibers.

Activity – Observation

Materials – Linen fiber, Microscope.

Process

- Students are grouped into 5 batches.
- Distribute the samples of lines fibre.

- Check the physical properties.
- Note the physical properties.
- Length – cm
- Strength – (weak/average/good)
- Elasticity – (poor, average, good)
- Moisture absorption – (Yes or No)
- Fineness – (Fine/medium/coarse)
- Colour –

Consolidation

Staple length	– 3.25 cm
Strength	– 3.5 g pol
Elongation at break	– 14%
Fine ness	– 4 – 8 mgms/inch
Colour	– light brown
Moisture region	– 11% approx.
Product	– chart prepared by the students.

Activity III

Name – chemical properties of linen.

Activity – Experimentation.

Materials – Linen fiber and same chemicals used in Unit III (Activity II)

Process

- Divide the pupils into 7 groups.
- Supply linen fibers to each group.

- Supply dilute acids, alkalies, oxidizing agents and reducing agents.
- Instruct to treat a part of linen with above chemicals separately in cold and hot bath.
- Note the reaction.
- Supply concentrated acids, alkalies, oxidizing agents and reducing agents.
- Instruct to treat the balance portion of linen fiber with the above chemicals.

Separately in cold and hot bath.

- Note the reactions also.
- Collects the response of the pupil.

Consolidation

The teacher consolidates the reactions of the above chemical reagents on linen product – The subject diary.

Activity IV

Name – Microscopical appearance of linen fiber.

Activity – Observation.

Material – Linen fiber, microscope.

Process

- Distribute the samples to each student.
- Prepare slides for longitudinal and cross sectional views.
- Examine the microscopical views.

- Sketch the views.

Consolidation

- Longitudinal view – Fine lines with occasional swellings like bamboo pole.
- Cross sectional view – Polygonal with rounded corners.

Product – Diagram.

Activity V

Name – Extraction of jute fiber.

Activity – Discussion.

Process

The learners already know the process of separation of fibres from bast.

Discussion point

- Steps of extraction of jute fiber.
- Note the points

Points

-
-
-
-
-
-

Consolidaiton : The teacher consolidates the steps as

Points

- Rippling
- Retting
- Scutching
- Breaking
- Combing

Product – The subject diary.

Activity VI

Name – Physical properties of jute.

Activity – Observation.

Materials – Jute fibre and microscope.

Process

- Students are grouped into 5 batches.
- Distribute the samples of jute fiber.
- Check the physical properties.
- Note the properties.
- Length – cm
- Strength – (Weak/average/good)
- Elasticity - (Poor/average/Good)
- Moisture absorption (Yes or No)
- Fineness – (Fine/Medium/Course)
- Colour –

Consolidation – The teacher should consolidate as

- Length – 7 – 15 cm
- Strength – 5 – 8 g pel.
- Elasticity – 1.7%
- Moisture regain – 13%
- Fineness – 2 – 4 mgms/inch.
- Colour – light brown.

Product – Chart prepared by students.

Activity VII

Name – Chemical properties of jute.

Activity – Experimentation.

Materials – Jute fibre, same chemicals used in Unit III (Activity II) and Basic dyes.

Process:

- Divide the pupils into 7 groups.
- Supply jute fiber to each group.
- Supply dilute acids, alkalies, oxidizing agents and reducing agents.
- Instruct to treat a part of jute fiber with the above chemicals separately in cold and hot bath.
- Note ht reactions.
- Supply con: acids, alkalies, oxidizing agents and reducing agents.
- Instruct to treat portion of linen fiber with the above chemicals separately in cold and hot bath.

- Note the reaction.
- Supply basic dye solution and instruct to treat the jute fiber.
- Note the reaction.
- Collect the response of pupil.

Consolidation – The teacher consolidates the reaction of the above chemical reagents on jute and affinity of basic dyes on jute.

Product – Subject diary.

Activity VIII

Name – Microscopical appearance of jute.

Activity – Observation.

Materials – Jute fiber, microscope.

Process

- Distribute the samples to each student.
- Prepare slides for longitudinal and cross – sectional views.
- Examine the microscopical views.
- Sketch the views.

Consolidation

Longitudinal view - Regular fiber with fine lines.

Cross sectional view – polygonal.

Product – Diagram.

Unit 5 - Animal Fibers - Wool and Silk Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	Find out the method of shearing and collection of wool, production of clean wool from raw wool physical chemical properties and uses of wool through observation, discussion.	<ul style="list-style-type: none"> Wool fibres and fabrics. Preparation of clean wool from raw wool. Properties physical and chemical 	<ul style="list-style-type: none"> Observing Identifying Analyzing 	<ul style="list-style-type: none"> Discussion Observation Experimentation 	<ul style="list-style-type: none"> Microscope Slides Charts Fibres Textbooks 	<ul style="list-style-type: none"> Figures Charts Subject diary 	<ul style="list-style-type: none"> Idea about facts and concepts Presenting ability Observing ability 	5
2.	Find out the production of silk from silk worms – physical and chemical properties of silk through observation, discussion and experiments.	<ul style="list-style-type: none"> Life cycle of silk worm. Preparation of silk from cocoon. Types of various silk yarns and uses. Properties physical and chemical. 	<ul style="list-style-type: none"> Observing Identifying Analyzing 	<ul style="list-style-type: none"> Discussion Observation Experimentation 	<ul style="list-style-type: none"> Microscope Slides Charts Fibres Cocoon and mulberry Textbooks Photographs 	<ul style="list-style-type: none"> Figures Charts Notes 	<ul style="list-style-type: none"> Idea about facts and concepts Presenting ability Observing ability 	5

Unit V**Animals Fibres -
Wool and Silk**

Wool is an animal fibre obtained from sheeps and silk is produced by silk worms. The structure, composition, uses, physical and chemical properties of wool are included in this unit. The method of cultivation of silk, uses, composition, pretreatments required, physical and chemical properties are also included in this unit. The learners understand the preparation of wool and silk, their properties and uses.

Curriculum Objectives

1. Know the method of shearing and collection of wool, production of clean wool from raw wool. Physical and chemical properties of wool through observation, discussion and listing.
2. Know the production of silk from silk worms physical and chemical properties of silk through observation, discussion, experimentation and listing.

Syllabus

Shearing, sorting, classification and grading of wool. Physical properties – longitudinal and cross sectional views – Action of heat and light. Composition of wool – action of acids and alkalies. Carbonisation and chlorination.

Dye stuffs used for colouring wool.

Silk – sericulture, life cycle of silk worm. Silk reeling, throwing and doubling. Different types of silk-yarn and it various uses.

Pre-requisites

- Knowledge about woollen winter garments, blankets and its advantages.
- Knowledge about attractiveness and durability of silk especially wedding sarees.

Activity I

Name – Properties of wool.

Activity – Observation

Materials – wool fiber and fabric, human hair, photographs of sheeps and goats.

Process

- Display the photographs of sheeps and goat.
- Instruct the pupils to distinguish the animal from which fibres are collected.
- Supply wool fiber.
- Identify the properties.
- Note the properties.
- Instrument to write the uses of wool.

Length -

Colour -

Strength -

Fineness -

Spinnability-

- Uses of wool

Consolidation

Staple length – 3 – 7 cm

Strength – 1 – 1.7 gpd.

Elongation at break – 25 to 35%

Diameter - .005 - .0015 m

Colour – Yellowish or brown to black.

Moisture region – 15 – 18%

Uses of wool

- Sweater
- Blankets
- Coating
- Suitings
- Winter garments

Product – Chart prepared by the students.

Activity II

Name – collection of wool.

Activity – Discussion

Discussion points

- Collection of wool from sheep.
- Sorting of fibers.
- Classification.
- Note the points

Consolidation

Collection of wool

- Shearing
- Grading
- Sorting
- Classification

Product – The subject diary

Activity III

Name – Chemical properties of wool.

Activity – Experimentation.

Materials – wool and same chemicals used in Unit III (Activity II)

Process

- Divide pupils into 7 groups.
- Supply dilute acids, alkalies, oxidizing agents and reducing agents.
- Instruct to treat a part of wool with above chemicals separately with cold and hot bath.
- Note the reaction.
- Supply con: acids, alkalies, oxidizing agents and reducing agents.
- Instruct to treat the balance portion of wool fibre with the above chemicals separately with cold and hot bath.
- Note the reactions also.
- Collect the response of the pupil.

Consolidation – The teacher consolidates the reaction of the above chemical reagents on wool.

Product – Subject diary.

Composition of wool

Keratin	–	33%
Suint	–	28%
Burrs	-	26%
Wool fat	–	12%
Minerals	–	1%

Carbonisation : It is the process of removing vegetable impurities form raw wool using acids.

Chlorination : It is the process of treating raw wool with bleaching powder solution to remove the surface scales.

Activity IV

Name – Microscopical appearance of wool

Activity – Observation

Materials – Wool fiber, microscope.

Process

- Distribute wool fibre to each student.
- Prepare slides for longitudinal and cross sectional view.
- Examine the microscopical views.
- Sketch the views.
- Presentation.

Consolidation

Longitudinal view – Rod like with scales on the surface.

Cross – sectional view – oval to circular.

Classes of dyes used.

- Direct dyes.
- Acid dyes
- Basic dyes

Product – Diagram

Activity V

Name – Silk

Activity – Observaion

Materials – Silk filament, fabric, cotton fiber and wool fiber.

Process

- Supply above fiber to each student.
- Instruct them to compare silk with others.
- Note the differences.

Consolidation – Teacher consolidates the comparison of silk with cotton and wool.

Name of fiber	Type of fiber	Strength	Appearance
Cotton	Staple	Medium	Fine
Wool	Staple	Medium	Rough
Silk	Filament	Good	Smooth and fine

Activity VI

Name – Properties of silk.

Activity – Observation.

Materials – Silk filament. Cocoon.

Process

- Supply silk filaments and cocoon, microscope.
- Identify the physical properties.

- Note the properties.
- Identify the uses of silk.
- Instruct to observe the action of light and heat.

Consolidation

- Length – Continuous
- Strength - 2.5 – 5 gpd
- Elongation at break – 10 – 25%
- Diameter – 0.00054 to .0018 inch
- Colour – Yellow wish
- Moisture regain – 11%
- Action of heat – 330° F disintegrates
- Action of light – weakened

Uses of silk

Ladies garments

Kidswear

Classes of dyes used

Acid dyes

Basic dyes

Reactive dyes

- Prepare the slide for longitudinal view.
- Prepare the slide for cross-sectional view.
- Examine the views in the microscope.
- Sketch the view.

Consolidation

Longitudinal view of raw silk seem to be double filament with rough surface.

Degummed silk is rod like and smooth. Cross sectional view of raw silk appears as double filament triangular in shape with rounded corners. Cross sectional degummed silk is triangular with rounded corners.

Product – chart and diagram.

Activity VII

Name – Production of silk.

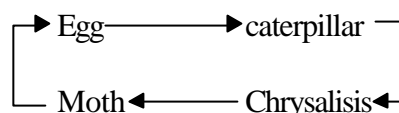
Activity : Observation

Materials – Cocoon, silk filament and silk yarn, photographs.

Process

- Group the pupil into 5 batches.
- Supply the materials to each group.
- Instruct them to observe cocoon, filaments and yarns.
- Instruct them to unwind the filament from cocoon.
- Then compare it with the filaments and yan supplied.
- Observe the difference.
- Note the points.
- Instruct them to discuss the life cycle of butterfly up to the stage of pupa.

- Note the stages.
- Display the photographs of life cycle of silk worm.
- Instruct to note the various stages of life cycle of silk worm and various stages required to convert cocoons to silk yarn.

Consolidation**Life cycle**

Sericulture – It is the process of cultivation of mulberry tree and the production of cocoon.

Various steps involved in the production of silk yarn.

- Sericulture
- Life cycle of silk.
- Reeling
- Throwing
- Doubling
- Different types of silk-yarn.

Product – The subject diary and chart.

Activity VIII

Name – chemical properties of silk.

Activity – Experimentation

Materials – Silk filament, same chemicals used in unit III (Activity II) and soap solution.

Process:

- Divide the pupils into 7 groups.
- Supply dilute acids, alkalies, oxidizing agents and reducing.
- Instruct to treat a part of silk with above chemicals separately in cold and heat bath.
- Note the reaction.
- Supply concentrated acids, alkalies, oxidizing agents and reducing agents.
- Instruct to treat a portion of silk fiber with the above chemicals separately in cold and hot bath.
- Note the reactions.
- Instruct to treat the balance portion of silk with boiled soap solution and sodium carbonate.
- Note the reaction.

Consolidation – The teacher consolidates the reaction of the above chemical reagents on silk.

Product – Subject diary

Composition of silk

• Fibroin	– 76%
• Sericin (Silk gum)	– 22%
• Fat and wax	– 1.5%
• Mineral salts	– 0.5%

De-gumming of silk

- The process of removal of silk gum (Sericine) from raw silk using mild alkalie and soap.

Weighting of silk

It is the process of adding weight of silk so that handling can be done with out entanglement.

Unit 6 - Semi Synthetic and Fully Synthetic Fibers

Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	Classify synthetic fiber in to semi synthetic and fully synthetic fibres through observation, discussion and experimentation.	<ul style="list-style-type: none"> Semi synthetic and fully synthetic materials in staple and filament form. 	<ul style="list-style-type: none"> Observing Identifying Analyzing 	<ul style="list-style-type: none"> Observation Discussion Experimentation 	<ul style="list-style-type: none"> Various fibers - staples and filaments 	<ul style="list-style-type: none"> Subject diary 	<ul style="list-style-type: none"> Participation in discussion Various process skill Performing experiments 	2
2.	Explore the process of manufacture of viscose rayon, acetate rayon and its properties through observation, discussion, flow chart preparation.	<ul style="list-style-type: none"> Raw materials Chemicals required Reaction in different steps in processing 	<ul style="list-style-type: none"> Observing Measuring Control variables Making operation definition 	<ul style="list-style-type: none"> Observation Discussion Flow chart preparation 	<ul style="list-style-type: none"> Chart Reference books Samples of raw materials Lab equipments 	<ul style="list-style-type: none"> Flow chart Diagram Subject diary 	<ul style="list-style-type: none"> Flow chart Drawing skill Observing ability 	8

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
3.	Find out the process of manufacture of nylon and terylene and its properties through observation, discussion and flow chart.	<ul style="list-style-type: none"> • Polymerisation • Caprolactum • Hexamethylene diamine, adipic acid • Terephthalic acid • Ethylene glycol • Other chemicals 	<ul style="list-style-type: none"> • Observing • Measuring • Control variables • Making operation definition 	<ul style="list-style-type: none"> • Observation • Discussion • Flow chart 	<ul style="list-style-type: none"> • Chart • Reference books • Samples of raw materials • Lab equipments 	<ul style="list-style-type: none"> • Flow chart • Sketch • Subject diary 	<ul style="list-style-type: none"> • Flow chart • Drawing skill • Observing ability 	10

Unit VI

Semi Synthetic and Fully Synthetic Fibres

Introduction

This unit deals with the natural raw materials required and chemicals used for the preparation of semi-synthetic fibres viscose and acetate rayon. The various steps involved in the manufacture are given with their physical and chemical properties. It also gives the chemicals required for manufacturing the fully synthetic fibres nylon and terylene and the detailed manufacturing process, physical and chemical properties of these fibres. On completion of the unit, the students acquire the difference between semi-synthetic and fully synthetic fibres, their manufacture and properties.

Curriculum Objectives

1. To understand and distinguish semi-synthetic and fully synthetic fibres through observation, discussion and experimentation.
2. To know the process of manufacture of viscose rayon. Acetate rayon and its properties through observation discussion and flow chart preparation.
3. Understand the process of manufacture of nylon and terylene and its properties, through observation, discussion and flow chart preparation.

Syllabus

Difference between semi synthetic and fully synthetic fibres – cellulose based semi – synthetic fibres viscose and acetate Rayons. Viscose – sequence of operations involved in manufacturing, steeping, shredding, ageing, xanthation, preparation of spinning solution, ripening, filtering, spinning, coagulation and regeneration cellulose, purification. Microscopical appearances, action of acids, alkalies and dye stuffs. Acetate rayon – steps involving in manufacture – Acetylation, partial hydrolysis, purification, preparation of

spinning solution, spinning and drawing of filaments. Physical and chemical properties.

Fully synthetic fibres – poly amides and polyesters, chemicals required for nylon - 6 and nylon – 66 – Manufacture – flow chart – polymerization reaction – nylon spinning unit.

Terylene – chemicals required – conditions of polymerization – spinning method. Important physical and chemical properties of nylon and terylene.

Pre-requisites

Basic knowledge about organic chemistry, functional groups and polymerisation.

Activity I

Name – Semi – Synthetic and fully synthetic fibers/filaments.

Activity – Observation

Materials – Samples of viscose, acetate rayon, nylon and terylene fibers.

Process

- Divide the students into five groups.
- Distribute the samples to each group.
- Examine the difference in appearance.
- Examine the difference in strength.
- Note the differences.

Consolidation, teacher consolidates the differences.

Viscose – Silk like appearance

Acetate – Not so lustrous as viscose

Less strength

Nylon and Terylene – Less lustrous than viscose and acetate – more strength.

Product – Subject diary.

Activity II

Name – Semi synthetic and fully synthetic fibers.

Activity – Discussion

Discussion Points

- Raw materials required for semi synthetic fiber.
- Raw materials required for fully synthetic fiber.
- Note the points.

Consolidation – The teacher consolidates that the requirement of natural raw material (cellulose/protein) for semi synthetic fibres, Petroleum by products for fully synthetic fibers.

Product – Subject diary.

Activity III

Name – Semi synthetic and fully synthetic fibers.

Activity – Experimentation.

Materials – Viscose rayon and terylene fibers.

Process

- Students are divided in to five groups.
- Distribute the samples.
- Instruct them to burn the fibres.
- Examine the characteristics.
- Note the points.

Consolidation

Viscose rayon burns quickly with white fumes having smell similar to burning paper. Terylene melts.

Product – Subject diary.

Activity IV

Name – Manufacture of viscose and acetate rayon.

Activity – Discussion.

Process – Through classroom discussion on the following points, pupils understand the different steps involved in the manufacture of viscose rayon and acetate rayon

Discussion points

- Raw materials required for viscose.
- Chemicals required.
- Sequence of operations in viscose manufacture.
- Coagulation and regeneration of cellulose.
- Purification.

- Note the points.
 - Raw materials required for acetate.
 - Stages involved in manufacture.
 - Dry spinning and drawing.
- Note the points.

Consolidation

Viscose rayon Manufacture • Purification of cellulose • conditioning of wood pulp steeping • shredding ageing xanthation dissolving blen ding, filtration and deaeration Ripening Spinning.

Acetate rayon manufacture Purification of cotton Pre-treatment Acetylation Partical Hydrolysis Preparation of dope Spinning.

Product – Subject diary.

Activity V

Name – physical properties of viscose and acetate rayon.

Activity – observation.

Materials – Samples of viscose rayon and acetate rayon fibers and filaments microscope.

Process

- Divide the pupils in to 5 groups.
- Supply the materials.
- Identify the physical properties.
- Note the properties.

- Compare the properties.
- Strength – (weak/average/good)
- Elasticity – (Low/medium/high)
- Moisture absorption – (Yes or No)
- Lusture - (low/average/good)

Consolidation

Property	Viscose	Acetate
Strength	1.5 – 2.4 gpd	1.4 gpd
Elasticity	15 – 30%	30%
Moisture absorption	11 to 13%	6.5%
Lusture	Can be controlled by the manufacture	Can be controlled by the manufacture.

- Prepare the slides for LV and CSV.
- Examine the views in Microscope.
- Sketch the view.

Consolidation

- Viscose rayon – LV – uniform diameter with striations running parallel to the fiber axis. CSV – Triangular in cross section.
- Acetate rayon – LV – Distinct lengthwise striations no cross markings.
- CSV – Irregular shape with serrated outline.

Products – chart and diagram.

Activity – VI

Name – Chemical properties of viscose and acetate.

Activity – Discussion.

Process

Discussion points

Action of concentrated and dilute:

- Acids
- Alkalies
- Oxidising agents
- Reducing agents
- Dyes

Consolidation

The teacher consolidates the action of important chemical re-agents on viscose and acetate rayon.

Product – Subject diary.

Activity – VII

Name – Manufacture of viscose and acetate rayon.

Activity – Flow chart preparation.

Process

- Preparation of flow chart for viscose rayon.
- Preparation of flow chart for acetate rayon.

Consolidation – The teacher consolidates the flow charts.

Product – Flow charts.

Activity VIII

Name – Manufacture of Nylon and Terylene.

Activity – Discussion.

Process – Through class room discussion on the following points, pupils understand the different steps involved in the manufacture of Nylon 60, Nylon – 66 and Terylene.

Discussion Points

Chemicals required for Nylon – 66 and Nylon – 6.

- Polymerisation.
- Melt spinning.
- Drawing
- Note the points.
- Chemicals required for Terylene manufacture.
- Polymerisation.
- Melt spinning.
- Drawing.

Note the points.

Consolidation.

Raw materials.

Nylon – 66 – Hexamethylene diamine and adipic acid.

Nylon – 6 – Caprolactum.

Terylene – DMT and Ethylene glycol.

Polymerisation – Condensation polymerization.

Spinning – Melt spinning.

Product – Subject diary.

Activity – IX

Name – physical properties of nylon and polyester.

Activity – observation.

Materials – samples of Nylon, Terylene and Microscope.

Process

- Divide the pupils into five groups.
- Supply the materials.
- Identify the physical properties.
- Note the properties.
- Presentation and discussion.
- Strength – (weak/average/good)
- Elasticity (low/medium/high)
- Moisture absorption (Yes or No)
- Lusture – (low/average/good)

- Melting point – (low/medium/high)

Consolidation

Properties	Nylon	Terylene
Strength	6 – 8.5 gpd	6 – 9 gpd.
Elasticity	15 – 30%	10 – 30%
Moisture regain	3.5 to 5%	0.4%
Lusture	Can be controlled	Can be controlled.
Melting points	215° C	250°C

Product – chart prepared by the students.

- Prepare the slides for LV and CSV.
- Examine the views in Microscope.
- Sketch the view.

Consolidation – Teacher consolidates that the LV of polyester and nylon is very regular, rod like appearance and circular in cross section.

Product – Diagram.

Activity – X

Name – Chemical properties of Nylon and Terylene.

Activity – Discussion.

Process

Discussion points

Action of dilute and concentrated.

- Acids.
- Alkalies
- Oxidising agents.
- Reducing agents
- Dyes

Consolidation.

The teacher consolidates the action of above chemical re-agents on Nylon and Terylene.

Product – Subject diary.

Activity X

Name – Manufacture of Nylon and Terylene.

Activity – Reference and flow chart preparation.

Process

- Preparation of flow chart for Nylon.
- Preparation of flow chart for Terylene.
- Presentation

Consolidation – The teacher consolidates the flow charts.

Product – Flow charts.

Unit 7 - Soaps and Synthetic Detergents

Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	To find out the methods of manufacture and properties of soaps, detergents and turkey red oil through discussion, observation, and experimentation.	<ul style="list-style-type: none"> • Soap s , detergents, turkey red oil • Different methods of manufacture of soap-soft and hard soap. • Properties of soap s , detergents and turkey red oil. 	<ul style="list-style-type: none"> • Observing • Identifying • Analysing • Measuring 	<ul style="list-style-type: none"> • Discussion • Observation • Experimentation 	<ul style="list-style-type: none"> • Samples of soaps and detergents • Chemicals and other Ingredients. 	<ul style="list-style-type: none"> • Subject diary • Soap • Detergent 	<ul style="list-style-type: none"> • Basic knowledge • Participation in discussion. • Presentation ability 	6
2.	Find out detergent action and wetting action of soap, detergent, turkey red oil and through discussion, observation and experimentation.	<ul style="list-style-type: none"> • Detergents action and wetting action of soaps, detergents and turkey red oil. • Hard soap. • Soft soap. 	<ul style="list-style-type: none"> • Observing • Identifying • Experimentence 	<ul style="list-style-type: none"> • Discussion • Observation • Experimentation 	<ul style="list-style-type: none"> • Samples of soaps, detergents, turkey red oil. • Sample cloth coloured and non-coloured. 	<ul style="list-style-type: none"> • Subject diary • Chart 	<ul style="list-style-type: none"> • Basic knowledge • Participation in discussion. • Presentation ability 	4

Unit VII

Soaps and Detergents

Introduction

Soaps and detergents are used to remove impurities from the cloth. Soaps are manufactured by using oil and alkali. Oils generally used are coconut oil, olive oil, palm oil etc. Alkalies used are sodium carbonate, sodium hydroxide, potassium hydroxide etc. Detergents are made by the sulphonation of castor oil. The impurities are not re-deposited, but precipitated on the solution. Students get a clear idea about the manufacture of soaps and detergents and their ability to remove the impurities.

Curriculum Objectives

1. To understand the methods of manufacture and properties of soaps, detergents and Turkey Red Oil through, discussion, observation, and demonstration.
2. To know the detergents action and wetting action of soap, detergent and Turkey Red

Oil, through discussion, observation, and demonstration.

3. To distinguish between hard soap and soft soap through discussion, observation and demonstration.

Syllabus

Definition – different methods of manufacture – chemicals required – hard and soft soap – action of acids. Detergents – definition – difference between detergents and soaps – effect of hard and soft water on soaps and detergents. Turkey Red Oil – preparation – wetting and detergent action.

Pre-requisites

Knowledge about, washing soap. Toilet soaps and detergents.

Activity I

Name – soaps and detergents.

Activity – Discussion.

Materials – Soaps, detergents, sodium hydroxide, fatty acids (oils), turkey red oil.

Process

- Instruct the pupil to observe the above materials.
- Note the difference between soaps and detergents.
- Try to identify the ingredients required for various types of soaps.
- Try to identify the ingredients required for various types of detergent.s
- Try to identify the nature of fatty oils.
- Identify the reaction of concentrated alkalies with fatty acids.

Consolidation

Teacher consolidate the nature of soaps, detergents, fatty acids, action of concentrated alkalies with fatty acids and manufacture of soaps, detergents and TRO.

Product

Subject diary.

Activity II

Name – Soaps and detergents.

Activity – Observation.

Materials – Samples of hard and soft soaps,

detergents, oils, perfumes, chemicals, coloured and white cloth.

Process

- Divide the pupil into five groups.
- Issue hard and soft soap.
- Instruct to differentiate.
- Note the points.

Consolidation – The teacher consolidates the characteristics of soft and hard soap.

Soft Soap

- Coconut oil/olive oil + mild alkalie.
- Used as toilet soap.

Hard soap

- Caster oil + strong alkaly.
- Used as washing soap.
- Issue samples of soaps and detergents.
- Instruct to differentiate.
- Note the points.

Consolidation – Difference between soaps and detergents.

Soaps

- Attract the impurities again.
- Less lather than detergents.

Detergents

- Removed impurities are detracted.
- More lather.
- Issue coloured and white cloth.
- Instruct to dissolve soaps and detergents separately.
- Treat coloured and white cloth sample with cold and boiled solution of soap and detergent solution of separately.
- Observe the actions of each solution to while and coloured fabric.
- Note the points.

Consolidation – Detergent action of soaps and detergents at cold and hot temperature in white and coloured materials.

Product – Subject diary.

Activity – III

Name – Manufacture of soaps, detergents and turkey red oil.

Activity – Experimentation

Materials – Caster oils, coconut oil, sodium hydroxide, sodium carbonate, potassium hydroxide, sodium carbonate, perfumes.

Process

- Divide the pupil into five groups.
- Instruct to mix a definite proportion of sodium carbonate and coconut oil.

- Instruct to mix a definite proportion of caster oil and sodium hydroxide.
- Heat both the mixture separately upto boiling temperature.
- Allow to cool it.
- Examine the difference of the product.
- Note the reactions/changes.

Consolidation – Teacher consolidate the method of manufacture of soft soap, hard soap, detergents and TRO.

Product – Soaps and detergents, subject diary.

Activity – IV

Name – detergent and wetting action.

Activity – Experimentation.

Materials – Solutions of hard and soft soaps, detergents, turkey red oil coloured and white cloth.

Process

- Instruct the pupil to treat coloured and white fabrics with dilute and concentrated solution of:
 - a) Soft soap solution in cold.
 - b) Hard soap solution in boiling.
 - c) Detergent solution in cold.
 - d) Detergent solution in boiling.
 - e) TRO in cold.

- f) TRO in boiling.
- g) Observe the action of coloured and white cloth consolidation – Teacher consolidates the detergent and wetting action of soaps, detergents and TRO and differentiates hard and soft soap.

TRO and differentiates hard and soft soap.

Product; subject diary.

Unit 8 - Treatment of materials Prior to Dyeing and Printing

Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	To classify properties and bleaching action of bleaching agents through observation, discussion and experimentation.	<ul style="list-style-type: none"> • Action of bleaching agents on various textile materials. • Definition of bleaching. • Various bleaching agents. 	<ul style="list-style-type: none"> • Observing • Classifying • Analysing 	<ul style="list-style-type: none"> • Observation • Discussion • Experimentation 	<ul style="list-style-type: none"> • Samples of bleaching agents. • Reference books • Chart 	<ul style="list-style-type: none"> • Subject diary • Filled up table 	<ul style="list-style-type: none"> • Basic knowledge • Participation in discussion. • Various process skills. 	5
2.	Find out the pre-treatments and methods of bleaching of cotton, linen, jute, silk and wool through observation and discussion.	<ul style="list-style-type: none"> • Various samples of cotton, linen, jute, silk, wool. • Objects of pre-treatments • Various steps involved. • Chemicals and reactions. • Procedure. 	<ul style="list-style-type: none"> • Observing • Identifying • Experimenting 	<ul style="list-style-type: none"> • Discussion • Observation • Experimentation 	<ul style="list-style-type: none"> • Samples of bleaching agents • Charts • Reference books 	<ul style="list-style-type: none"> • Bleached materials • Subject diary 	<ul style="list-style-type: none"> • Basic knowledge • Participation in discussion. • Process skills 	18

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
3.	Find out the removal of added and adhering impurities from viscose, nylon and terylene through observation, discussion and assignment.	<ul style="list-style-type: none"> • Samples of viscose, acetate, nylon, terylene • Various chemicals 	<ul style="list-style-type: none"> • Observing • Measuring • Experimenting. 	<ul style="list-style-type: none"> • Observation • Discussion • Assignment 	<ul style="list-style-type: none"> • Samples of bleaching agents. • Reference books • Chart 	<ul style="list-style-type: none"> • Subject diary • Assignment table 	<ul style="list-style-type: none"> • Basic knowledge • Participation in discussion. • Assignment 	2

Unit VIII

Treatment of Materials Prior to Dyeing and Printing

Introduction

For getting a uniform colour, the textile materials should be freed from the impurities present in it. Different textile fibres contain different types of impurities. Therefore, different types of treatments are required to remove the impurities present in them. Natural textile fibres contain large amount of impurities and hence require severe treatments for their removal. Synthetic fibres contain very little amount of impurities and hence a simple washing with soap is adequate to remove the impurities. On the completion of the unit, the students will be able to understand the objects of pre-treatments and different types of pre-treatments given to them.

Curriculum Objectives

- To classify properties and bleaching action of bleaching agents through observation, discussion and experimentation.
- Find out the pre-treatments and methods of bleaching of cotton linen, jute, silk and wool through observations, discussion and experimentation.
- Find out the removal of added and adhering impurities from viscose, acetate, nylon and terylene through observation and discussion.

Syllabus

Treatment of material prior to dyeing and printing.

Different types of materials used for textile purposes – cotton, wool, silk, linen, jute, viscose, acetate, nylon and terylene. Impurities present in the above fibres – natural, added and adhered impurities. Pre-treatment of cotton. Singeing – definition, plate, roller and gas singeing machines, sketch and description – Merits and demerits of different types of singeing machines. De-sizing objects – different methods employed – oxidative

method and reduction method. Oxidative method – chlorine, chlorite and bromite process. Enzymatic desizing. Kier boiling – objects – chemical required – chemical changes taking place – vertical and horizontal Kiers. Defects in scouring – preventive measures – Grey souring – objects – bleaching – definition – classification of bleaching agents – oxidising and reducing agents – examples for each type. Bleaching of cotton using hydrogen peroxide, bleaching powder and sodium hypochlorite. Continuous J-box - scouring and bleaching – Impurities present in linen and jute – treatments done to remove the impurities. Bleaching of linen and jute. Silk-degumming and bleaching with hydrogen peroxide. Wool - carbonisation – scouring – bleaching with sulphur dioxide. Removal of added and adhering impurities from viscose, acetate, nylon and terylene.

Pre-requisites

- Knowledge about the natural colours and impurities present in cotton, linen, jute, silk and wool.
- Colours, adhering and added impurities present in artificial fibers.

Activity I

Name – Treatments prior to dyeing and printing.

Activity – Discussion.

Materials – Bleached and unbleached cotton fabrics or yarns.

Process

- Display the samples to the pupils.
- Compare the colours of samples.
- Differentiate the colours.
- Types of bleaching agents.
- Oxidising bleaching agents.
- Reducing bleaching agents.
- Bleaching action.

Classification of bleaching agents.

Sl. No.	Name	Oxidising/ reducing
1.	Bleaching powder	_____
2.	Potassium permanganate	_____
3.	Hydrogen peroxide	_____
4.	Sulphur dioxide	_____
5.	Ozone	_____
6.	Sodium hydro sulphite	_____

Consolidation – The teacher consolidates the bleaching agents.

Sl. No.	Name	Oxidising/ reducing
1.	Bleaching powder	Oxidising
2.	Potassium permanganate	Oxidising
3.	Hydrogen peroxide	Oxidising
4.	Sulphur dioxide	Reducing
5.	Ozone	Oxidising
6.	Sodium hydro sulphite	Reducing

Product – Filled up table.

Activity II

Name – Properties of bleaching agents.

Activity – Observation

Materials : Bleaching powder, potassium permanganate, hydrogen peroxide, sulphur dioxide, sodium hydrosulphite.

Process

- Instruct the pupil to feel the smell carefully.
- Check whether it is liquid / powder / solid.
- List the observations.

Sl. No.	Bleaching agents	Smell	Form	Colour
1.	Bleaching powder	.....	.....	.....
2.	Potassium permanganate	.....	.....	.....
3.	Hydrogen peroxide	.....	.....	.....
4.	Sulphur dioxide	.....	.....	.....
5.	Sodium hydro sulphite	.....	.....	.....

Consolidation

Sl. No.	Bleaching agents	Smell	Form	Colour
1.	Bleaching powder	Odour of chlorine	Powder	White
2.	Potassium permanganate	Odourless	Crystalline	Violet
3.	Hydrogen peroxide	Odourless	Liquid	Colourless
4.	Sulphur dioxide	Smell of rotten egg	gas	black
5.	Sodium hydro sulphite	Irritating smell of sulphur.	Powder	White

Activity III

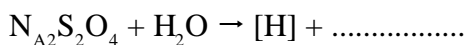
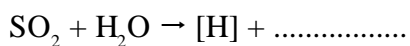
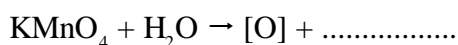
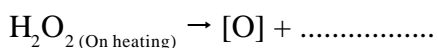
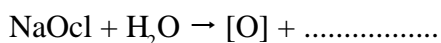
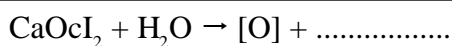
Name – Bleaching action.

Activity – Experimentation.

Materials – Solutions of bleaching powder sodium hypo chlorite potassium permanganate, hydrogen peroxide, sulphur dioxide, sodium hydro sulphite and cotton yarn.

Process

- Divide the pupils into 5 groups.
- Instruct to each group to wet six samples thoroughly.
- Treat each sample thoroughly with dilute solutions of above chemicals separately for about one hour.
- Note the colour changes of the sample.

Consolidaiton

Product – subject diary.

Activity IV

Name – Pre-treatments and bleaching of natural fibers.

Activity – Observation.

Materials – Raw and bleached samples of cotton, linen, jute, silk and wool.

Process

- Display the samples.
- Instruct to compare bleached and unbleached samples of each materials.
- Try to identify soluble impurities.
- Try to identify insoluble impurities.
- Try to identify adhered impurities and its reason.
- Note the points.
- Instruct to identify the treatments required to remove above impurities.
- Arrange the steps of treatments.
- Note the points and instruct to prepare a table of treatments required fabric and yarn.

Consolidation – pre-treatments required.

Sl. No.	Treatments	Fabric	Yarn
1.	Stamping and stitching	✓	×
2.	Brushing	✓	×
3.	Singeing	✓	✓
4.	Desizing	✓	×
5.	Scoring	✓	✓
6.	Gry souring	✓	✓
7.	Washing	✓	✓
8.	Bleaching (optional)	✓	✓
9.	White souring	✓	✓
10.	Washing	✓	✓
11.	Blueing or Tinting.	✓	✓

Product – Table prepared by the students.

Activity V

Name – Pre-treatments and bleaching of natural fibers.

Activity – Discussion

Process

- Identify the pre-treatments required for :
 - Cotton, linen, jute, wool and silk fabric.
 - Cotton, linen, jute, wool and silk yarn.
- List the treatment required for various yarns and fabrics separately.

Consolidation – Teacher consolidates

various pre-treatment required fro cotton, linen, jute, wool and silk yarn and fabric separately.

Product – Subject dairy.

Activity VI

Name – Bleaching of natural fibers.

Activity – Experimentation.

Materials – Pre-treated yarn of cotton, linen, jute, wool silk and solutions of Hydrogen peroxide.

Process

- Divide the pupils into 5 batches.
- Issue the above materials to each batch.

- Instruct to treat the materials in separate pots with dilute H_2O_2 solution at boiling temperature for about one hour.
- Wash thoroughly.
- Observe the change in the natural colour of the material.
- Note the procedure.

Consolidation – Teacher consolidates the procedure.

Product – Bleached samples, subject diary.

Activity VII

Name – Pre-treatments and bleaching of artificial fibers.

Activity – Observation.

Materials – Raw and bleached samples of viscose, acetate, nylon and terylene.

Process

- Display the samples.
- Instruct to compare bleached and unbleached samples of each material.
- Try to identify added impurities.
- Try to identify the adhered impurities.
- List the impurities.
- Identify the pre-treatments required.

(a) Viscose rayon.

(b) Acetate rayon.

- (c) Nylon
- (d) Terylene

- Note the points

Consolidation – Teacher consolidates the impurities present and the treatments required to remove the added and adhered impurities, present in artificial fibers.

Product – Subject diary.

Activity VIII

Name – Removal of Impurities from artificial fibers.

Activity – Discussion.

Process

- Identify the treatments required to remove:-
 - (a) Added impurities from viscose, acetate, nylon and terylene yarn and fabric.
 - (b) Adhered impurities from viscose, acetate, nylon and terylene yarn and fabric.
- List the treatments required for each fibers separately.

Consolidation

Teacher consolidates various impurities present and treatments required for each material.

Product – Subject diary.

Activity – IX

Name – Pre-treatments of dyeing and printing.

Activity – Assignment.

Prepare tables showing.

- (a) Impurities present in natural fibers (both yarn and fabric.)
- (b) Treatment given to natural fibers before dyeing and printing.

(c) Impurities present in artificial fibers. (both yarn and fabric.)

(d) Treatment given to remove added and adhered impurities from artificial fibres.

Consolidation – The teacher consolidates the various tables.

Product – Assignment tables.

Project work to be assigned to learners. Member per group : Maximum 7
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Unit 9 - Mercerisation

Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	Explore the objects, chemical reaction, factors affecting and properties achieved by mercerisation through discussion, experimentation and observation.	<ul style="list-style-type: none"> • Definition of mercerising. • Factors of mercerising. • Effects of mercerising. • Chemicals and reactions. 	<ul style="list-style-type: none"> • Observing • Identifying • Analysing 	<ul style="list-style-type: none"> • Discussion • Experimentation • Observation 	<ul style="list-style-type: none"> • Notes • Charts • Sample of cotton yarn and fabrics • Reference books • Sodium hydroxide solution 	<ul style="list-style-type: none"> • Subject diary • Diagram • Mercerised yarn 	<ul style="list-style-type: none"> • Participation in discussion • Subject knowledge • Diagram • Participation in experiment 	4
2.	To identify the working of hank and cloth mercerising machines, through discussion and demonstration.	<ul style="list-style-type: none"> • Working of machines • Setting of machines • Data • Specification 	<ul style="list-style-type: none"> • Observing • Control variable 	<ul style="list-style-type: none"> • Discussion • Demonstration 	<ul style="list-style-type: none"> • Diagram • Photographs • Cotton yarn and fabric • Sodium hydroxide solution 	<ul style="list-style-type: none"> • Diagram • Subject diary 	<ul style="list-style-type: none"> • Participation in discussion • Drawing skill • Experimental skill 	6

Unit IX

Mercerisation

Introduction

Mercerisation is the process of treating cold concentrated sodium hydroxide of 18% strength. Students have already acquired general properties of cotton. By treating the cotton materials with cold concentrated sodium hydroxide, the materials acquired some important properties like improvement in lusture, strength, moisture absorbing capacity, affinity towards dyes and finishes which attract the users. The importance and method of mercerisation is to be conveyed to the pupil through discussion and experimentation.

Curriculum Objectives

1. Explore the objects of chemical reaction, factors affecting and properties achieved by mercerisation through discussion, experimentation and observation.
2. To identify the working of hank and cloth

mercerising machines, through discussion and demonstration.

Syllabus

Mercerisation – Definition – chemicals used – Important changes taking place – method of mercerising cotton hanks and cloth using machines. Longitudinal and cross sectional views of mercerised cotton.

Pre-requisites

1. Knowledge about raw cotton and processed cotton.
2. Knowledge about finishing of textile materials.

Activity I

Name – Mercerisation.

Activity – Discussion.

Materials – Mercerised and un-mercerised cotton fabric or yarn of same quality.

Discussion points

- Display mercerised and un-mercerised samples.
- Differentiate
 - (a) The appearance
 - (b) Strength
- Moisture content.
- Affinity towards dyes and finishes.
- The quality of the mercerised cotton improves. Why?
- Affinity towards dyes, finishes and chemical reagents improves. Why?
- Note the points.

Consolidation

Effects of Mercerisation

- Improved lusture.
- Increased tensile strength.
- Increased affinity toward dye stuff and finishes.
- Increased action at lower temperature.

Product – subject diary

Activity II

Name - Mercerisation

Activity – Experimentation.

Materials – concentrated sodium hydroxide solution – 18% strength bleached cotton yarn.

Process

- Divide the pupils into seven batches.
- Distribute the materials to each batch.
- Instruct to wet cotton thoroughly and squeeze well.
- Treat it with given solution of sodium hydroxide for about 10 minutes.
- Keep the tension.
- Take out and wash well.
- Observe the changes.
- Note the points.

Consolidation – The teacher consolidates the properties.

Product – Subject diary. Mercerised cotton yarn.

Activity – III

Name – Physical properties of mercerised cotton.

Activity – Observation.

Materials – Mercerised cotton fibre, microscope.

Process

- Distribute the samples to each student.
- Prepare slide for longitude and view and cross sectional view.
- Examine the views in Microscope.

- Sketch the views.

Consolidation

LV – More smoother tube with more smooth surface than un-mercerised cotton.

CV – Circular with no or less lumen.

Product – Diagram

Activity IV

Name – Mercerising machines

Activity – Discussion.

Materials – Diagrams and photographs of hank mercerising and cloth mercerising machines.

Discussion points

- Materials to be mercerised.
- Types of machineries available.
- Control variables.
 - (a) Time
 - (b) Temperature
 - (c) Use of tension.
 - (d) Concentration of alkalie.
 - (e) Washing.
- Passage of material through the machine.
- Different methods for applying tension.

- Chemical changes in the fibre.

- Note the points.

Consolidation – Teacher consolidate the working of cloth mercerising and hank mercerising machines with proper diagram and photographs.

Product – Subject diary.

Activity V

Name – Mercerising machines.

Activity – Demonstration.

Materials Grey cotton yarn and fabric, sodium hydroxide solution – 18%. Demonstration model of hank and fabric mercerising machines.

Process

- Partially fill the containers with NaOH solution.
- Pass the material through the machines.
- Observe the working.
- Sketch the passage of yarn/fabric through the machines and name the parts.

Consolidation : The teacher consolidates the working and vrious control variables hank mercerising and cloth mercerising machines with photographs and sketches.

Product - Diagram and subject diary.

Unit 10 - Classification of dyes and soluble group of dyes

Unit Analysis

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
1.	Acquire knowledge of various classification of dyes according to their method of application through discussion and experimentation.	<ul style="list-style-type: none"> Classification of different group of dyes. 	<ul style="list-style-type: none"> Observing Identifying Classifying 	<ul style="list-style-type: none"> Discussion Experimentation Demonstration 	<ul style="list-style-type: none"> Sample of dyestuffs and materials. Shade cards Colour spectrum 	<ul style="list-style-type: none"> Subject diary Filled up table 	<ul style="list-style-type: none"> Participation in discussion Process skill Experimental skill 	5
2.	Identify the method of application of direct acid and basic dyes on cotton, wool and silk including after treatments require and various factors affecting the depth of shade through discussion and experimentation.	<ul style="list-style-type: none"> Characters of different group of dyes. Dyeing assistant of findings Shade Application After treatments Factors Fastness 	<ul style="list-style-type: none"> Identifying Experiencing Measuring 	<ul style="list-style-type: none"> Discussion Experimentation 	<ul style="list-style-type: none"> Dyes Chemicals Fabric and yarns Dyeing accessories 	<ul style="list-style-type: none"> Dyed samples Subject diary 	<ul style="list-style-type: none"> Participation in discussion Process skill Experimental skill 	15

Sl. No.	Curriculum Objectives	Learning Strategies	Process Skills	Activities	Learning Materials	Products	Evaluation	Time
3.	To get a clear awareness about the properties of reactive dyes method of application on cotton, wool, silk and viscose rayon through discussion and experimentation.	<ul style="list-style-type: none"> • Properties • End group presents in dyestuff and fibre. • Reactive agents. • Difference with direct dyes. • Application. 	<ul style="list-style-type: none"> • Identifying • Experiencing • Measuring 	<ul style="list-style-type: none"> • Discussion • Experimentation 	<ul style="list-style-type: none"> • Dyes • Chemicals • Fabric and yarns • Dyeing accessories 	<ul style="list-style-type: none"> • Dyed samples • Subject diary 	<ul style="list-style-type: none"> • Participation in discussion • Process skill • Experimental skill 	5

Unit X

Classification of dyes and soluble group of dyes

Introduction

Dyestuffs or colouring matters available are classification into eleven groups according to the method of their application. Each group of colour require a particular method for producing the colour. Some colours are soluble in water and other require chemicals for dissolution. Colour is applied to a textile material from a solution made with water. On completion of this unit, the students acquire knowledge regarding the properties and method of application of soluble group of colours.

Curriculum objectives

1. Acquire knowledge of various classification of dyes according to their method of application through discussion, experimentation and observation.
2. Identify the method of application of direct, acid and basic dyes on cotton, wool and

silk including after treatments required and various factors affecting the depth of shade through discussion, experimentation and demonstration.

3. To get a clear awareness about the properties of reactive dyes, method of application on cotton, wool, silk and viscose rayon through discussion experimentation and demonstration.

Syllabus

Classification of dyes and soluble group of dyes.

Classification of dye stuffs according to their methods of application - direct, acid, basic, reactive, sulphur, vat, mordant, naphthol, oxidized, mineral and dispersed dyes.

Direct dyes - properties - solubility - fibres coloured assistants required - sodium carbonate and sodium chloride - Function of assistants -

procedure of application on cotton, wool and silk. After treatments - objects - important after treatments given to improve light, washing and perspiration fastness. Topping with basic dyes - objects, factors affecting the depth of colour - Salt, concentration, time and temperature factors.

Acid dyestuffs - properties - method of application on wool and silk. Functions of acids.

Basic dyes - characteristics, properties - high brilliancy and colouring power - application on cotton after mordanting and fixing. Application on wool and silk using acetic acid and boiled off liquor.

Reactive dyes - reason for reactivity - reactive end group present in the dyestuff and fibres - Reactive agents required - different types of reactive dyes - cold and hot brands. Differences between direct and reactive colours. Fibres coloured with reactive dyes. Method of application on cotton, wool and silk.

Prerequisites

- Learners should be aware of the colouring technique of textiles materials.
- They should have a general idea about textile fibres.

Activity I

Name : Classification of dye stuffs.

Activity : Discussion

- Process:*
- Need of colouring of textile materials.
 - How it is produced on textile materials?
 - What are the materials required to produce colour?
 - Method of application of colours.
 - Classification of dyes.
 - Note the various classification observed.

Consolidation - the teacher consolidates.

- Basis classification -Method of application
- Different classes of dyes - Direct, acid, basic, reactive, sulphur, vat, mordant, naphthol, oxidized, mineral and dispersed dyes.
- Soluble group of dyes -Direct, acid, basic and reactive.
- Insoluble group of days - Sulphur, vat, mordant, naphthol, oxidized, mineral and dispersed dyes.

Product: Subject diary

Activity II

Name : Solubility of dye stuffs.

Activity : Experimentation

Materials: Dye stuffs mentioned in the consolidation of activity I, hot water.

- Process:
- Divide the pupil into seven groups.
 - Instruct them to take a pinch of dye stuffs from one sample using a glass rod.
 - Try to dissolve it in little water.
 - Note the solubility.
 - Repeat the process for all the dye stuffs.
 - Note whether the samples are soluble or not.
 - Instruct them to prepare table which shows the solubility of dye stuffs.

Sl. No.	Group of dyes	Soluble	Insoluble
1.	Direct dyes	✓	
2.	Acid dyes	✓	
3.	Basic dyes	✓	
4.	Reactive dyes	✓	
5.	Sulphur dyes		✓
6.	Vat dyes		✓
7.	Mordant dyes		✓
8.	Naphthol dyes		✓
9.	Oxidized dyes		✓
10.	Mineral dyes		✓
11.	Dispersed dyes		✓

Consolidation

Teacher consolidates soluble and insoluble group of dyes.

Product: Filled up table.

Activity III

Name : Dye stuffs, fibers and assistant.

Activity : Demonstration

Materials: Different classes of soluble group of dyes, yarns of cotton, linen, jute, wool, silk, viscose, acetate, terylene, nylon and various dyeing assistants.

Process: • Instruct the pupils to dissolve one sample of dye stuffs from each group of dyes.

- Wash all the yarns and squeeze well.
- Treat the yarns with the prepared dye solution and heat it for about 30 minutes.
- Note the affinity of dyes towards the various yarns.
- Instruct to add suitable dyeing assistants in proper proportions into different dye bath.
- Treat the same material again for about 15 minutes.
- Note the affinity of dyes with fibre at this stage also.

Consolidation

- Direct dyes have direct affinity towards cotton, linen, jute, wool, silk and viscose rayon.
- Basic dyes have direct affinity towards jute, cool and silk.
- Acid dyes have direct affinity towards wool, silk and nylon.
- Reactive dyes have direct affinity towards cotton, linen, jute, wool, silk and viscose.

Product: Subject diary.

Activity IV

Name : Preparation of material

Activity : Discussion

- Process:* • Preparation of material.
- Dissolving of dye stuffs.
 - Preparation of dye bath.
 - Dyeing assistants required.
 - Functions of dyeing assistants.
 - Depth of shade.
 - Material liquor ratio.
 - Factors affecting dyeing.
 - Dyeing.
 - Washing
 - Various after treatments.
 - Note the discussion points.

Consolidation

The teacher consolidates various steps involved in the dyeing of direct, acid and basic dyes on cotton, wool and silk including depth of shades, after treatments required, quantity of chemicals, temperature, time, M : L ratio and action of salt.

Product: Subject diary.

Activity V

Name : Application of direct, dyes on cotton, linen, jute and viscose - rayon.

Activity : Experimentation.

Materials: Direct dye stuff, yarns of cotton, linen, jute and viscose, sodium carbonate, sodium chloride, copper sulphate, potassium dichromate, acetic acid, formaldehyde.

Process:

- Dissolving of dyestuff.
- Preparation of dye bath.
- Shades to be dyed.
- Dyeing.
- Washing.
- After treatment for tight, washing, perspiration.
- Topping with basic dyes.
- Instruct to note the procedure.

Consolidation

- Dye bath (a) Depth of shade (.5%, 1%, 2%, & 4%)
 - (b) Sodium carbonate (1 - 3%)
 - (c) Sodium chloride (10 - 25%)
 - (d) Temperature (boiling)
 - (e) Time - 1 hour (45 min + 15 min)
 - (f) M : L ratio - 1 : 20.
- After washing the dyed materials are treated with:
 - (a) Copper sulphate and acetic acid to improve light fastness.
 - (b) Potassium dichromate and acetic acid to improve washing fastness.
 - (c) Copper sulphate, potassium dichromate and acetic acid to improve light and washing fastness.
 - (d) Formaldehyde and acetic acid to improve fastness to perspiration.
 - (e) Topping with basic dyes to improve brilliancy of colour.
- Factors affecting depth of shades.
 - (a) Salt
 - (b) Concentration
 - (e) Time
 - (d) Temperature

Product: Subject diary, dyed material.

Activity : Experimentation.

Activity VI

Name : Application of direct dyes on wool and silk.

Materials: Acid dye stuffs, yarns of wool and silk, mineral acid. (sulfuric acid/hydrochloric acid)

Activity : Experimentation.

Process: • Dissolving of dye stuff.

Materials: Direct dye stuffs, yarns of wool and silk, acetic acid and sodium sulphite.

• Preparation of dye bath.

Process: • Dissolving of dye stuff.

• Shades to be dyed.

• Preparation of dye bath.

• Dyeing

• Shades to be dyed.

• Washing.

• Dyeing

• Instruct to note the procedure.

• Washing.

• Instruct to note the procedure.

Consolidation

• Dye bath (a)Depth of shade (.5%, 1%, 2%, & 4%)

(b)Mineral acid (1 - 2%)

(c) Temperature (boiling)

(e) Time - 1 hour

(f) M : L ratio - 1 : 20

Consolidation

1 - Dye bath (a)Depth of shade (.5%, 1%, 2%, & 4%)

(b)Acetic acid (1 - 3%)

(c)Sodium sulphite (10 - 20%)

(d)Temperature (wool - boiling, silk - 80° C)

(e) Time - 1 hour

(f) M : L ratio - 1 : 20

Product: Subject diary, dyed samples.

Activity VIII

Name : Application of basic dyes on cotton.

Activity : Experimentation.

Materials: Basic dye stuffs, cotton yarn, tannic acid, tartaremetic and acetic acid.

Process: • Mordanting with tannic acid.

• Fixing with tartaremetic.

Activity VII

Name : Acid dyes on wool and silk.

- Dying with basic dyes
 - Dissolving of dye stuffs.
 - Preparation of dye bath.
 - Shades to be dyed.
- Washing.
- Instruct to note the procedure.

Consolidation

Mordanting: Tannic acid (equal to shade)

Fixing: Tar-taremetic (half of the shade)

Dying (a) Depth of shade (.5%, 1%, 2%, & 4%)

(b) Acetic acid (1 - 3%)

(d) Temperature (boiling)

(e) Time - 1 hour

(f) M : L ratio - 1 : 20

Product: Subject diary, dyed samples.

Activity IX

Name : Basic dyes on wool.

Activity : Experimentation.

Materials: Basic dye stuffs, yarns of wool, acetic acid.

- Process:
- Dissolving of dyestuff.
 - Preparation of dye bath.
 - Shades to be dyed.
 - Dyeing

- Washing
- Instruct to note the procedure.

Consolidation

Dye bath (a) Depth of shade (.5%, 1%, 2%, & 4%)

(b) Acetic acid (1 - 3%)

(d) Temperature (boiling)

(e) Time - 1 hour

(f) M : L ratio - 1 : 20

Product: Subject diary, dyed samples.

Activity X

Name : Basic dyes on silk.

Activity : Experimentation.

Materials: Basic dye stuffs, yarns of silk, boiled - off liquor.

- Process:
- Dissolving of dyestuff.
 - Preparation of dye bath.
 - Shades to be dyed.
 - Dyeing
 - Washing
 - Instruct to note the procedure.

Consolidation

Dyeing bath (a) Depth of shade (.5%, 1%, 2%, & 4%)

(b) Boiled off liquor (1 - 3%)

(c) Temperature (boiling)

(d) Time - 1 hour

(e) ML Ratio - 1 : 2

Product: Subject diary, dyed sample.

Activity X

Name : Reactive dyes on cotton, wool, silk and viscose rayon.

Activity : Discussion.

Process:

- Why reactive dyes are called so?
- Reactive end group present in the dye stuff.

- Reactive end group present in the fibre.
- Type of reactive dyes - cold and hot brand.
- Differentiate with direct dyes.
- Note the points.

Consolidation

- Reactive dyes form insoluble colour bond by the action of end groups present in dye stuff and fibre.
- Cold brand - can be dyed in cold condition.
- Hot brand - boiling temperature is required.

Sl. No.	Properties	Direct	Reactive
1.	Fastness	Poor	Good
2.	Alkalie used	Levelling agent	Reactive agent
3.	Solubility	In hot water	Cold/hot
4.	Lusture	Dull	Bright
5.	Colour formed	Water soluble	Insoluble
6.	Method of deposition	Physical	Chemical

Product: Subject diary.

Activity XII

Name : Reactive dyes on cotton, wool, silk and viscose rayon.

Activity : Experimentation.

Materials: Reactive dyes, yarns of cotton, wool, silk and rayon.

- Process:
- Preparation of material.
 - Dissolving of dye stuffs.
 - Preparation of dye bath.
 - Shades to be dyed.
 - Dyeing
 - Washing and soap boiling.
 - Instruct to note the procedure.

Consolidation

- Dye bath (a)Depth of shade (.5%, 1%, 2%, & 4%)

(b)Sodium carbonate (1 - 3%)

Or

Sodium phosphate (1 - 3%)

Or

Sodium hydroxide (1 - 28%)

(c) NaCl (10 - 25%)

(d)Temperature (boiling)

(e) Time - 1 hour.

(f) ML ratio - 1 : 20

Note : Gentle soap boiling is required to remove the hydrolysed dye formed as a result of reaction between dye stuffs and water.

Product subject diary and dyed samples.

Seminar on Textile Technology related subjects to be conducted at the end of unit.

Part II

1. Curriculum Objectives	110
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Unit-wise Learning Activities Section B - (Practical)

1. Physical and chemical properties of textiles and fibers.	111
2. Pre-treatments and bleaching.	114
3. Direct dyes on cotton and after treatments.	117
4. Direct dyes on wool and silk.	120
5. Basic dyes on cotton, wool and silk.	122
6. Reactive dyes on cotton, wool and silk. Acid dyes on wool	124
7. Mercerisation.	126

Part III

1. List of Books	131
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1

Curriculum Objectives (Practical)

1. Finds the effect of action of heat, light, acids, alkalis and bleaching agents on cotton, wool, linen, jute and silk, prepare and present practical record.
2. Identifies the textile fibres by burning test, microscopical appearances, staining test and solubility test, prepare and present practical record.
3. Familiarizes and practises important pretreatments given to cotton, wool and silk, records and presents the results.
4. Practising the bleaching of linen, jute, cotton, wool and silk with suitable bleaching agents and presenting the results.
5. Acquires the knowledge and skills in the application of direct dyestuffs on cotton and after treatments.
6. Identifies the factors affecting the depth of colour produced by direct dyes.
7. Identifies the method of application of direct dyestuffs on silk and wool using acid as assistant and acquires skills to apply the same.
8. Acquires skills in the dyeing of silk with boiled-off liquor as assistant.
9. Familiarizes and practises the procedure of application of basic dyestuffs on cotton.
10. Acquires skills in the method of application of basic dyes on silk and wool.
11. Acquires knowledge and skills in the application of acid dyestuffs on wool.
12. Familiarizes the procedure of application of reactive dyestuffs on cotton, wool and silk and acquires skills to apply reactive dyestuffs on natural fibres.
13. Acquire knowledge and skills in mercerization of yarn in hank form with and without tension.
14. Finding out the features of cloth mercerizing under tension and without tension.

Unit - 01

Physical and Chemical Properties of Textile Fibres

Introduction

The important textile fibres are cotton, linen, jute, silk, wool, viscose rayon, acetate rayon, nylon and terylene. The composition of these fibres differ each other and hence they have different physical and chemical properties. This unit deals with the important properties. On completion of this unit, the learner will be able to understand the important physical and chemical properties and identify a textile fibre by conducting suitable tests.

Curriculum objectives

1. Finds the effect of action of heat, light, acids, alkalies and bleaching agents on cotton, wool, linen, jute and silk, prepare and present record.
2. Identify the textile fibres by burning test, microscopical appearances, staining test and

solubility test, prepare and present practical record.

Syllabus

1. Action of heat and light on textile fibres.
2. Longitudinal and cross sectional views of textile fibres.
3. Action of dilute and concentrated acids.
4. Action of alkalies
5. Bleaching of cotton, linen, jute, silk and wool.
6. Identification of textile fibres by burning test, microscopical appearance, staining test and solubility test.

Pre-requisites

- Basic knowledge about textile fibres.
- Ability to handle microscope.

- Idea about the physical and chemical properties of fibers and bleaching.

Activities

Preliminary discussion on the topic under consideration and demonstrations are done as and when required. The learners are divided into groups and are asked to conduct the following experiments. The teacher should ensure timely recording. Discussion and consolidation are conducted at the end of every experiment. Samples are verified.

1. Action of sunlight and heat. 2 hours
2. Views of textile fibres through microscope 6 hours
3. Action of mineral acids; HCl, H₂SO₄, HNO₃ 4 hours
4. Action of alkalies, NaOH, Na₂CO₃ 4 hours

5. Bleaching of cotton with bleaching powder, hydrogen peroxide and sodium hypochlorite.
6. Bleaching of linen and jute with sodium hypochlorite.
7. Bleaching of silk with hydrogen peroxide.
8. Bleaching of wool with sulphur dioxide 12 hours
9. Tests for identification of cotton, linen, jute, silk, wool, viscose, acetate, nylon, terylene by

- Burnig test
- Microscopical appearance
 - Staining test
 - Solubility test 12 hours

Product

- Records
- Samples prepared

Unit - 1 (Practical) Physical and Chemical Properties of Textile Fibres

Unit Analysis

Sl. No.	Objectives	Idea/Concepts	Process Skills	Activities	Materials Required	Products	Evaluation	Time (Hrs.)
1.	Finds out the effect of the action of heat, light, acids, alkalis and bleaching agents on cotton, wool, linen, jute and silk, prepare and present practical record.	<ul style="list-style-type: none"> Action of heat, light and chemicals on natural fibres. 	<ul style="list-style-type: none"> Observing Experimenting Measuring Controlling variables Communicating Handling equipment (microscope, ...) Analysing Inferring 	<ul style="list-style-type: none"> Demonstration Practice Preparation of record Presentation Consolidation 	Sources of heat, light, flame, chemicals, natural fibres, microscope, dye pot, glass rod, measuring jar	<ul style="list-style-type: none"> Records 	<ul style="list-style-type: none"> Practical skills Records 	40
2.	Identify the textile fibres by burning test, microscopic appearances, staining test and solubility test, prepare and present practical record.	<ul style="list-style-type: none"> Test for identifying text file fibres. 	<ul style="list-style-type: none"> Observing Experimenting Communicating Inferring 	<ul style="list-style-type: none"> Demonstration Doing test Recording Presentation Consolidation 	<ul style="list-style-type: none"> Fibres and flame 	<ul style="list-style-type: none"> Record 	<ul style="list-style-type: none"> Skills to conduct tests Record 	

Unit - 02

Pre-treatment and Bleaching

Introduction

Before dyeing and printing, the textile materials should be pretreated to remove the various types of impurities present in them. After the removal of impurities, they are whitened by bleaching. Pretreatments help to give uniform colour while dyeing or printing. Learners understand the different types of pretreatments required for different fibres and the method of bleaching on completion of this unit.

Curriculum objectives

1. Familiarises and practises the important pretreatments given to cotton, wool and silk, records and present the results.
2. Practising the bleaching of cotton, linen, jute and silk and wool with suitable bleaching agents and presenting the results.

Syllabus

1. Singeing, desizing, kier boiling, of cotton

fabric; singeing and Kier boiling of cotton yarn.

2. Degumming of silk.
3. Carbonisation of wool.
4. Bleaching of cotton using bleaching powder, sodium hypochlorite and hydrogen peroxide.
5. Bleaching of linen and jute using sodium hypochlorite.
6. Silk bleaching with hydrogen peroxide.
7. Bleaching of wool with sulphur dioxide.

Pre-requisites

- Idea about the various types of impurities present in textile fibres and their removal.
- Objectives of pretreatments and bleaching,
- Different types of bleaching agents.

Activities

Preliminary discussion on the topic followed

by demonstration and discussion, sample verification, consolidation etc., are conducted as and when required.

Learners practice

1. Singeing, desizing, Kier boiling of cotton fabric, singeing and kier boiling of cotton yarn. 16 hrs.
2. Degumming of silk. 4 hrs.
3. Carbonisation of wool. 4 hrs.
4. Bleaching of cotton using:
 - bleaching powder 8 hrs.
 - sodium hypochlorite 8 hrs.
 - hydrogen peroxide 4 hrs.

5. Bleaching of linen using sodium hypochlorite - 4 hrs.

6. Bleaching of jute using sodium hypochlorite 4 hrs.

7. Bleaching of silk using hydrogen peroxide 4 hrs.

8. Bleaching of wool using sulphur dioxide 4 hrs.

Product

- Record
- Samples

Unit - 2(Practical) Pre-treatment and Bleaching

Unit Analysis

Sl. No.	Objectives	Idea/Concepts	Process Skills	Activities	Materials Required	Products	Evaluation	Time (Hrs.)
1.	Familiarise and practices the important pre-treatments given to cotton, wool, and silk, records and presents the results	<ul style="list-style-type: none"> Pre-treatments on natural fibres chemicals. 	<ul style="list-style-type: none"> Observing Experimenting Measuring Controlling variables Communicating Analysing Inferring Handling equipments 	<ul style="list-style-type: none"> Experiment Recording Presentation Consolidation 	<ul style="list-style-type: none"> Textile fibres, chemicals 	<ul style="list-style-type: none"> Pre-treated samples Record 	<ul style="list-style-type: none"> Ability to conduct experiments Quality of pre-treated samples 	60
2.	Practicing the bleaching of linen, jute, cotton, wool and silk with suitable bleaching agents and presenting the result.	<ul style="list-style-type: none"> Bleaching of natural fibres. Bleaching agents. 	<ul style="list-style-type: none"> Observing Experimenting Measuring Communicating Inferring 	<ul style="list-style-type: none"> Demonstration Practicals Recording Presentation Consolidation 	<ul style="list-style-type: none"> Fibres, Bleaching agents 	<ul style="list-style-type: none"> Bleached samples Records 	<ul style="list-style-type: none"> Quality of bleached samples Records 	

Unit - 03

Direct Dyestuffs on Cotton and After Treatments

Introduction

Direct dyestuffs are the cheapest of all classes of dyestuffs and can be applied easily on cotton. For colouring, sodium carbonate and sodium chloride are required as assistants. The colours are not fast and hence they are chemically after treated to improve their different fastness properties to a certain extent. Learners will be able to understand the procedure for the application of direct colours on cotton and after treatments on completion of this unit.

Curriculum objectives

1. Acquires knowledge and skills in the application of direct dyes on cotton and after treatments.
2. Identifies the factors affecting the depth of colour produced by direct dyes.

Syllabus

1. Method of application of direct yellow, orange, red, blue, green, violet, brown and black.
2. After treatment with copper sulphate, potassium dichromate and formaldehyde.
3. Topping with basic colours.
4. Salt factor and concentration factor.

Pre-requisites

- General idea about the procedure for dyeing with direct dyestuffs, objects of after treatments, different methods of after treatments and the factors affecting the depth of colour produced by direct dyestuffs.

Activities

Preliminary discussion on the topic followed by demonstration will be done by the teacher. Experiments done by the learners will be evaluated on completion of each experiment.

Learners practice.

1. Application of direct dyestuffs on cotton with yellow, dyestuffs, orange, red, blue, green, violet, brown, black 48 hrs.
2. After treatment with - copper sulphate, potassium dichromate, copper sulphate and potassium dichromats, formal dehyde. 20 hrs.
3. Topping with basic dyestuffs. 4 hrs.
4. To understand the difference in the depth of colour by changing the quantity of salt and water. 8 hrs.

Product

- sRecord - samples and procedure

Unit - 3 (Practical) Direct Dyes on Cotton and After Treatments

Unit Analysis

Sl. No.	Objectives	Idea/Concepts	Process Skills	Activities	Materials Required	Products	Evaluation	Time (Hrs.)
1.	Acquires knowledge and skill in the application of direct dyes on cotton and after treatments.	<ul style="list-style-type: none"> Direct dyes, chemicals for after treatments, cotton materials. 	<ul style="list-style-type: none"> Observing Experimenting Controlling variables Measuring Communicating Inferring 	<ul style="list-style-type: none"> Demonstration Practicals Recording Presentation Consolidation 	<ul style="list-style-type: none"> Cotton, direct dyes, chemicals. 	<ul style="list-style-type: none"> Samples prepared Records 	<ul style="list-style-type: none"> Skill to apply direct dyes. Quality of sample prepared Record 	80
2.	Identifies the factors affecting the depth of colour produced by direct dyes.	<ul style="list-style-type: none"> Factors affecting the depth of colour 	<ul style="list-style-type: none"> Observing Experimenting Controlling variables Measuring Communicating Inferring 	<ul style="list-style-type: none"> Experiment Recording Presentation Consolidation 	<ul style="list-style-type: none"> Chemicals 	<ul style="list-style-type: none"> Record 	<ul style="list-style-type: none"> Record 	

Unit - 04

Direct Dyestuffs on Wool and Silk

Introduction

Direct dyestuffs are applied on wool and silk with the addition of acetic acid and sodium sulphate as assistants. Wool is coloured at boiling temperature while silk at 80°C. On completion of this activity, students get practised in the application of direct dyestuffs on wool and silk.

Curriculum objectives

1. Identifies the method of application of direct dyestuffs on silk and wool using acid as assistant and acquires skills to apply the same.
2. Acquires skills in the dyeing of silk with boiled-off liquor as assistant.

Syllabus

1. Application of direct dyestuff on wool and silk using acid as assistant with
Red, yellow, blue, green, violet and black colours.
2. Dyeing of silk with boiled-off liquor as assistant with direct

Pink, brown, yellow and red.

Pre-requisites

- Learners should have the idea of application of direct dyestuffs on silk with acid or boiled off liquor as assistants and the application on wool with acid as assistant.

Activities

The skill of the learners will be evaluated by the teacher at the end of each experiment. It will be consolidated and recorded by the teacher.

Learners practice.

1. Application of direct dyestuffs on silk and wool with acid as assistant using
Direct - Red, yellow, blue, green, violet and black 40 hrs.
2. Application of direct dyestuffs on silk with boiled-off liquor as assistant using
Direct - Pink, brown, yellow and red 20 hrs.

Product

- 1 Record book and dyed samples, procedure.

Unit - 4 (Practical) Direct Dyes on Wool and Silk

Unit Analysis

Sl. No.	Objectives	Idea/Concepts	Process Skills	Activities	Materials Required	Products	Evaluation	Time (Hrs.)
1.	Identifies the method of application of direct dyes on silk and wool using acid as assistant and acquires skills to apply the same.	<ul style="list-style-type: none"> • Methods of application of direct dyes on silk and wool using acids as assistant. 	<ul style="list-style-type: none"> • Observing • Experimenting • Controlling variables • Measuring • Communicating • Inferring 	<ul style="list-style-type: none"> • Practicals • Recording • Presentation • Discussion • Consolidation 	<ul style="list-style-type: none"> • Silk, wool, direct dyes, acid and boiled - off liquor 	<ul style="list-style-type: none"> • Samples prepared • records 	<ul style="list-style-type: none"> • Ability to apply • Record • Quality of the samples 	60
2.	Acquires skill in the dyeing of silk with boiled off liquor as assistant.	<ul style="list-style-type: none"> • Dying of silk with boiled - off liquor as assistant. 	<ul style="list-style-type: none"> • Observing • Experimenting • Controlling variables • Measuring • Communicating • Inferring 	<ul style="list-style-type: none"> • Practicals • Recording • Presentation • Discussion • Consolidation 	<ul style="list-style-type: none"> • Silk 	<ul style="list-style-type: none"> • Samples prepared • record 	<ul style="list-style-type: none"> • Quality of the sample record 	

Unit - 05

Basic Dyestuffs on Cotton, Wool and Silk

Introduction

Basic dyestuffs are characterised by their brilliancy of colours. Wool and silk can be directly coloured while cotton requires mordanting and fixing before colouring with basic dyestuffs. Acetic acid is used as the assistant during dyeing. The learners get experience in dyeing cotton, wool and silk with basic dyes.

Curriculum objectives

1. Familiarises and practises the procedure of application of basic dyes on cotton.
2. Acquires skills in the method of application of basic dyestuffs on silk and wool.

Syllabus

1. Mordanting, fixing and dyeing of cotton with basic dyestuffs using

Auramine, Rhodamine, Methyl violet, Methylene blue, Malachite green and Bismarck brown (50 hrs.)
2. Application of basic colours on wool and silk with Auramine, Rhodamine, Methyl violet and Malachite Green (30 hrs.)

Pre-requisites

- The learner should be aware of the necessity for mordanting and fixing cotton materials prior to dyeing with basic dyestuffs and should have the idea of dyeing wool and silk with these colours.

Activities

Preliminary discussion and demonstration will be held by the teacher. Experiment done by learners will be consolidated and recorded after each experiment.

1. Learners practice dyeing with basic dyes on cotton by mordanting, fixing and dyeing with:

Auramine, Rhodamine, Methyl violet, Methylene blue, Malachite green and Bismarck brown (50 hrs.)
2. Application of basic dyestuffs on wool and silk with: Auramine, Rhodamine, Methyl violet and Malachite green. (30 hrs.)

Product

- Record and dyed samples, procedure.

Unit - 5 (Practical) Basic Dyes on Cotton, Wool and Silk

Unit Analysis

Sl. No.	Objectives	Idea/Concepts	Process Skills	Activities	Materials Required	Products	Evaluation	Time (Hrs.)
1.	Familiarise and practice procedure of application of basic dyes on cotton.	<ul style="list-style-type: none"> Procedure of application of basic dyes on cotton, wool, silk, on basic dyes, chemicals used as assistants, boiled-off liquor. 	<ul style="list-style-type: none"> Observing Experimenting Controlling variables Measuring Communicating Inferring 	<ul style="list-style-type: none"> Practicals Recording Presentation Discussion Consolidation 	<ul style="list-style-type: none"> Materials of cotton, wool, silk, chemicals, boiled-off liquors. 	<ul style="list-style-type: none"> Coloured samples, Record 	<ul style="list-style-type: none"> Practical skills Quality of samples Record 	80
2.	Acquires skill in the method of application of basic dyes on silk and wool.	<ul style="list-style-type: none"> Method of application of basic dyes on silk and wool 	<ul style="list-style-type: none"> Observing Experimenting Controlling variables Measuring Communicating Inferring 	<ul style="list-style-type: none"> Practicals Recording Presentation Discussion Consolidation 	<ul style="list-style-type: none"> Silk, wool, chemicals 	<ul style="list-style-type: none"> Prepared samples Record 	<ul style="list-style-type: none"> Quality of samples Record 	

Unit - 06

Reactive Dyestuffs on Cotton, Wool Silk and Acid Dyestuffs on Wool

Introduction

Reactive dyes chemically react with the fibre and forms an insoluble colour on the fibre. Reactivity is shown only in the presence of a suitable reactive agent like sodium carbonate, sodium phosphate or sodium hydroxide. They give fast colours on cotton, wool and silk.

Fast colours are produced on wool with acid dyestuffs. The presence of mineral acid is required for getting the colour. The learners get practised in dyeing with reactive and acid colours on completion of this unit.

Curriculum objectives

1. Acquires knowledge and skills in the application of acid dyes on wool.
2. Familiarises the procedure of application of reactive dyes on cotton, wool and silk and acquire skills to apply reactive dyes on natural fibres.

Syllabus

1. Application of metalin yellow, kiton red, kiton blue, kiton brown and kiton black on wool. Application of reactive yellow, blue and red on cotton, wool and silk.

Pre-requisites

- Learners should have the idea of application of acid and reactive dyes on textile fibres.

Activities

Preliminary discussion and demonstration will be held by the teacher. After each experiment, the skill of learner will be evaluated and recorded by the teacher.

1. Application on wool with
 - i. Metalin yellow
 - ii. Kiton red
 - iii. Kiton blue
 - iv. Kiton brown
 - v. Kiton black (20 hrs.)
2. Application of reactive colours on cotton, wool and silk
 - vi. Reactive yellow
 - vii. Reactive blue and
 - viii. Reactive red (40 hrs.)

Product

- Samples, procedures and record.

Unit - 6 (Practical) Reactive Dyestuffs on Cotton, Wool, Silk and Acid Dyes on Wool

Unit Analysis

Sl. No.	Objectives	Idea/Concepts	Process Skills	Activities	Materials Required	Products	Evaluation	Time (Hrs.)
1.	Acquires knowledge and skills in the application of acid dyes on wool.	<ul style="list-style-type: none"> Acid dyes, wool, reactive dyes, cotton, silk, chemicals. 	<ul style="list-style-type: none"> Observing Experimenting Communicating Controlling variables Infering 	<ul style="list-style-type: none"> Practicals Recording Presentation Discussion Consolidation 	<ul style="list-style-type: none"> Cotton, wool, silk, acid dyes, reactive dyes, assistants 	<ul style="list-style-type: none"> Coloured samples, record 	<ul style="list-style-type: none"> Ability to apply the method. Quality of samples. Record 	60
2.	Familiarises the procedure of application of reactive dyes on cotton, wool and silk and acquires skills to apply reactive dyes on natural fibres.	<ul style="list-style-type: none"> Procedure of application of reactive dyes. 	<ul style="list-style-type: none"> Observing Experimenting Controlling variables Infering 	<ul style="list-style-type: none"> Practicals Recording Presentation Discussion Consolidation 	<ul style="list-style-type: none"> Cotton, wool, silk, reactive dyes. 	<ul style="list-style-type: none"> Prepared samples, Record 	<ul style="list-style-type: none"> Quality of samples Record 	

Unit - 07

Mercerisation

Introduction

It is the process of treating cotton yarn or fabric with 18% NaOH solution under controlled conditions. The treated cotton attains improved lusture, strength and moisture absorbing capacity. On completion of this unit, the learners get practised in yarn and cloth mercerising process.

Curriculum objectives

1. Acquires knowledge and skills in mercerisation of yarn in hank form with and without tension.
2. Finding out the features of cloth mercerising under tension and without tension.

Syllabus

1. Hank mercerising with and without tension. Cloth mercerising under tension and without tension.

Pre-requisites

- Students must be aware of the conditions required and factors affecting mercerisation.

Activites

Teacher will hold demonstration. Skill of the students in hank and cloth mercerising will be recorded and consolidated by the teacher.

1. Hank mercerising under tension.
2. Hank mercerising without tension(20 hrs.)
3. Cloth mercerising under tension.
4. Cloth mercerising without tension(20 hrs.)

Product

- Mercerised hank, mercerised cloth, procedure, record.

Unit - 7 (Practical) Mercerisation

Unit Analysis

Sl. No.	Objectives	Idea/Concepts	Process Skills	Activities	Materials Required	Products	Evaluation	Time (Hrs.)
1.	Acquires knowledge in mercerisation of yarn in hank form with and without tension.	<ul style="list-style-type: none"> • Mercerisation of cotton in hank form, cloth form • Sodium hydroxide 	<ul style="list-style-type: none"> • Observing • Experimenting • Controlling variables • Measuring • Communicating • Inferring 	<ul style="list-style-type: none"> • Practicals • Recording • Presentation • Discussion • Consolidation 	<ul style="list-style-type: none"> • Cotton, yarn and cloth, sodium hydroxide 	<ul style="list-style-type: none"> • Mercerised samples, record 	<ul style="list-style-type: none"> • Ability to apply • Quality of mercerised samples • Record 	40
2.	Findout out the features of cloth mercerising under tension and without tension.	<ul style="list-style-type: none"> • Cloth mercerisation under tension and without tension. 	<ul style="list-style-type: none"> • Observing • Measuring • Experimenting • Controlling variables • Analysing • Inferring • Communicating 	<ul style="list-style-type: none"> • Experiment • Recording • Presentation • Discussion • Consolidation 	<ul style="list-style-type: none"> • Chemicals • Fibres 	<ul style="list-style-type: none"> • Samples produced • Record 	<ul style="list-style-type: none"> • Record 	

TERMWISE DISTRIBUTION OF UNITS**Practical***First Year*

Term	Units	Hours
I	1, 2, 3	110
II	3, 4, 5	170
III	6, 7	140
Total		420 horus

TERMWISE DISTRIBUTION OF UNITS**Theory***First Year*

Term	Units	Hours
I	1, 2, 3, 4	40
II	5, 6, 7, 8	55
III	9, 10	45
Total		140 horus

Practical Evaluation and Vocational Evaluation

Practical Evaluation	: 150 scores
Vocational Competency Evaluation	: 50 scores
Total : 200 scores	

Split-up of Scores for Practical Evaluation

<i>Indicator</i>	<i>Score</i>
Identification	15
Record	15
Procedure	35
Handling of equipments	10
Observation/Tabulation	30
Interpretation/Inference	15
Result	15
Viva	15
Total	150

Split up of Score for Vocational Evaluation

<i>Indicators</i>	<i>Score</i>
Regulating and Punctuality	10
Field vist/survey (any one)	20
Simulated experiment/OJT Performance - clinic/camp/exhibition Performance production cum training centre (any one)	20
Total	50

Hour Plan

Name of Teacher :	Class :
Name of School :	Division :
Subject :	Strength :
Unit :	Average Age :
Topic :	Duration :
<i>Curriculum Objectives</i>	<i>Material Required</i>
<i>Process skills</i>	
<i>Previous knowledge</i>	

Sample Questions

1. Human hair is a natural fibre. Mention another filament fiber obtained from nature suitable for textile manufacture.
2. Semi synthetic fibers are also known as regenerated fibers. Give reasons.
3. Compare staple fibre and filament fibre.
4. While selecting a fiber for textile manufacture, desirable properties are also considered. Give reasons.
5. Mildew is formed on wet cotton. Give reason.
6. Give the approximate composition of raw cotton.
7. Mainly one group of colour is used for dyeing and printing of linen and jute. Name the group of colour.
8. Discuss the importance of retting.
9. Suggest two groups of dyes suitable for wool.
10. Silk is known as Queen of fibers. Give reasons.
11. Cellulose raw materials are treated with certain chemicals to produce acetate rayon. Mention the name of chemicals.
12. Nylon – 6 and 6.6 are two important types of Nylons. Discuss the importance of notations after the name Nylon.
13. For washing fabrics, soaps and detergents are commonly used. Which you prefer among them and give reason.
14. Distinguish hard soap and soft soap.
15. You are given raw cotton fabric. List the impurities present in the given cloth.
16. Mention the name of process by which the protruding fibers are removed from the fabric.
17. Discuss the findings of John Mercer in the reaction of sodium hydroxide and cotton.
18. Effects of mercerization is based on certain factors. Mention the factors.
19. Sort the following group of dyes into soluble and insoluble groups.

-
- a. Direct
 - b. Sulphur
 - c. Vat
 - d. Acid
20. In dyeing a sequence of operations are involved. List the sequence.
21. Group the following fibers into natural artificial and mineral fibers.
- a. Viscose Rayon
 - b. Wool
 - c. Linen
 - d. Polyester
 - e. Gold thread
 - f. Jute
 - g. Silk
 - h. Asbestos
22. You are given samples of cotton, silk, acetate rayon and polyester. Identify the materials using flame.
23. Classify the following properties of textile fibers as essential and desirable properties.
- a. Lusture.
 - b. Spinning power
 - c. Elasticity.
 - d. Moisture regain.
 - e. Tensile strength.
 - f. Commercial availability.
 - g. Staple length.
 - h. Colour.
24. The following fibers are not used for textile purposes. Give reasons.
- a. Silk cotton.
 - b. Spider net
 - c. Camel hair
 - d. Metal wire
25. Sketch and mark the structure of cotton fibre.
26. Select suitable dye stuffs for colouring cotton directly from the following.
- a. Basic
 - b. Reactive
 - c. Naphthol
 - d. Direct
 - e. Sulphur
 - f. Vat
 - g. Acid
 - h. Mineral
27. Jute fibers are separated from stem of a plant. List the sequence of operations required.
28. For softening the jute and linen stems, various methods are used. Mention the important methods.
-

29. Sketch the cross-sectional and longitudinal views of wool and give the characteristics.
30. Give the composition of raw wool.
31. Cellulosic raw materials are used for the manufacture of viscose rayon. Mention the various steps involved in the manufacture of viscose rayon.
32. The manufacture of acetate rayon involves a series of operation. Show the series of operation as a flow chart.
33. For almost all textile wet processing Turkey Red Oil is used as wetting agent. Discuss the wetting and detergent action of Turkey Red Oil.
34. Soaps produce less lather on hard water. Give reason.
35. Differentiate scouring and souring.
36. For bleaching of textile materials many bleaching agents are used. Classify them with examples.
37. Differentiate the characteristics of raw cotton and mercerized cotton.
38. By the action of sodium hydroxide on cotton, the material acquires some important properties. Discuss the properties acquired.
39. In dyeing process certain chemicals are also used along with dye stuffs. Mention the objects to use these chemicals.
40. Discuss the processes involved to improve the fastness properties of direct dyed materials.
41. Prepare a chart showing the classification of textile fibers based on the starting point of availability.
42. Wool is also known as appandage fiber and silk is known as secretion fiber. Discuss the reasons.
43. While considering a fiber for textile manufacture, importance is given to essential properties. Summarise the reason.
44. Mention the staple length, strength, elongation, moisture regain, fineness and colour of cotton fibre.
45. Give the action of following chemical reagents on cotton.
 - Hot con: sulphuric acid.
 - Cold dilute hydrochloric acid.
 - Cold concentrated nitric acid.
 - Cold dilute sodium carbonate.
 - Cold concern: Sodium hydroxide.
 - Cold concentrated bleaching powder.
46. Linen fibers are separated from stems of flax plant. Give a brief description about the preparation of fiber from stem.
47. Discuss the different methods adopted for retting linen and jute stems.

48. The life of silk worm is similar to that of butterfly. Discuss the various steps involved in the life of silk moth.
49. Discuss the various steps involved in the preparation of clean wool from raw wool.
50. Nylon – 66 is produced by the condensation polymerization of two monomers. Discuss the steps involved to convert this monomers into Nylon filaments.
51. Polyester is produced by the condensation polymerization of two raw materials. Discuss the steps involved to convert this raw materials into polyester filaments.
52. Give brief description about the method of manufacture of Turkey Red Oil.
53. Give brief description about the method of manufacture of soap.
54. Suppose you are given ten peaces of cotton grey fabric having different length. Suggest suitable sequence of processes required to produce perfect white on it.
55. Conventional bleaching method takes about ten hours. Suggest the speedy method which reduces the time about two hours and discuss the process of operation.
56. In wet processing industries, machineries are used for cloth mercerization. Suggest and explain the working of a machine suitable for cloth mercerizing.
57. In industries, for mercerizing yarns in hank form, automatic and non-automatic machines are used. Give the working of automatic machine with sketch.
58. Outline the method of application of basic dyes on wool.
59. Give the method of application of direct dyes on cotton.
60. Reactive dyes shows reactivity towards fibers – Give reasons.
61. Certain factors affect the depth of colour produced by direct dye stuffs. List and explain the factors.

List of Books

Sl. No.	Title of the Book	Author
1.	Technology of Manmade Fibres	R.W. Moncriff
2.	Teching of Textile Processing - Textile Fbires	Dr.V.Shenai
3.	Textile Chemistry	Dr.V.A. Shenai
4.	Technology of Dyeing	Dr.V.A. Shenai
5.	Fibre science	R. Goplakrishnan
6.	Textile fibres	Hess
7.	Technology of dyeing	Trotman
8.	Technology of bleching and dyeing	Trotman
9.	Mergeriation	Dr. R.S. Prayag

List of Apparatus/Equipment/Machinery Required

1.	Stainless steel dyevessels capacity - 500 ml	: 50 nos.
2.	Glass rods, assorted size	: 10 kg.
3.	Measuring jar 100 cc, 200 cc, 500 cc	: 10 each.
4.	Pipette 10 cc	: 20 nos.
5.	Steel vessel - 20 litre capacity	: 1 no.
6.	Steel vessel - 50 litre capacity	: 1 no.
7.	Plastic bucket 20 litre capacity	: 3 nos.
8.	Plastic buckets 30 litre capacity	: 3 nos.
9.	Plastic mugs	: 6 nos.
10.	Electrically heated water bath with '6'holes of 3" diameter	: 6 nos.
11.	Kerosene wick stove	: 2 nos.
12.	Spirit lamps	: 12 nos.
13.	Gas stove with small burners like candle, 10 in each stove	: 3 nos.
14.	Jigger dyeing machine - Lab model	: 1 no.
15.	Winch dyeing machine - Lab model	: 1 no.
16.	Hank mercerising machine - Lab model	: 1 no.
17.	Cloth mercerising machine - Lab model	: 1 no.
18.	Simple Microscope	: 2 Nos.
19.	Common balance	: 2 Nos.
20.	Printing table (½ mt x ½ mt)	: 4 Nos.
21.	Flat printing table (3 mts x 2 mts)	: 4 Nos.
22.	Printing pad (½ mt x ½ mt)	: 4 Nos.
23.	Screens	: 12 Nos.
24.	Squeegee	: 6 Nos.
25.	Printing block (hand block)	: 24 Nos.
26.	Developing Chamber	: 1 Nos.
27.	Refrigerator (230 litres)	: 1 Nos.