



BANGLADESH TECHNICAL EDUCATION BOARD
Agargaon, Dhaka-1207.

4-YEAR DIPLOMA IN TEXTILE ENGINEERING CURRICULUM
COURSE STRUCTURE & SYLLABUS
(PROBIDHAN-2022)

APPAREL MANUFACTURING
TECHNOLOGY CODE: 14

4th SEMESTER
(Effective from 2022-2023 Academic Sessions)

DIPLOMA IN TEXTILE ENGINEERING
COURSE STRUCTURE
PROBIDHAN-2022
APPAREL MANUFACTURING (14)

Apparel Manufacturing (14)

4th Semester

SL. No.	Subject		Period Per Week		Credit	Marks Distribution						
						Theory Assessment			Practical Assessment			Grand Total
	Code	Name	Theory	Practical		Continuous	Final	Total	Continuous	Final	Total	
1	21141	Man Made Fibre & Filament	2	0	2	40	60	100	-	-	-	100
2	21142	Yarn Manufacturing-II	3	3	4	60	90	150	25	25	50	200
3	21241	Fabric Manufacturing-II	3	3	4	60	90	150	25	25	50	200
4	21341	Wet Processing-I	3	3	4	60	90	150	25	25	50	200
5	21342	Sustainability in Textile Industry	2	0	2	40	60	100	-	-	-	100
6	21441	Apparel Manufacturing-I	3	3	4	60	90	150	25	25	50	200
7	26811	Basic Electronics	2	3	3	40	60	100	25	25	50	150
Total			18	15	23	360	540	900	125	125	250	1,150

DIPLOMA IN TEXTILE ENGINEERING
SYLLABUS
PROBIDHAN-2022
APPAREL MANUFACTURING (14)
4th SEMESTER

Subject Code	Subject Name	Period Per Week		Credit
		T	P	
21141	Man Made Fibre and Filament	2	-	2

Rationale	Textile fabrics and clothing represent social civilizations and culture. Man Made fibre have revolutionized in this sector. Man Made Fibre are the basic elements of textile processing. The use of Man-Made Fibre has been increasing day by day due to its different distinct characteristics. Students of diploma in textile engineering need to achieve the basic knowledge, skill and attitude on overall manufacturing process of Man-Made Fibre and Filament. Fundamental idea about the properties of Man-Made Fibre and Filament are prerequisite in practical field. To fulfill these purposes, this course has been included in this program. By attaining this knowledge, skill and attitudes the students will be able to face the present and future challenges which need to be handled in this field.
Learning Outcome (Theoretical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> - Explain Man-Made Fibre manufacturing process. - Explain Regenerated Cellulosic Fiber manufacturing process. - Identify problem during production. - Provide effective solution during production. - Explain High-performance Man-Made Fibre. - Illustrate recycling process and sustainability of Man-Made Fibre.

Detailed Syllabus (Theory)

SL No.	Topics with Contents	Class (1 Period)	Final Marks
1	<p>Introduction to Man Made Fibres & Filament</p> <p>1.1 Define Man Made Fibre 1.2 Discuss the history of Man-Made Fibre 1.3 Classify Man Made Fibre 1.4 Differentiate between Man-Made Fibre & Natural Fibre 1.5 Define Filament and Polyester Staple Fibre (PSF) 1.6 Differentiate between fibres and filament 1.7 List the brand name of different filament 1.8 Define monomer, polymer and degree of polymerization 1.9 Classify polymerization 1.10 State the properties of fibre forming polymer.</p>	2	4
2	<p>Manufacturing Process of Man-Made Fibre</p> <p>2.1 Illustrate the manufacturing flow chart of Man-Made Fibre production 2.2 Mention different spinning methods of Man-Made Fibre 2.3 Illustrate Melt, Dry and Wet Spinning process 2.4 Define extruder 2.5 Classify different types of extruder 2.6 Discuss principle of extruder 2.7 Differentiate among Melt, Dry and Wet spinning methods 2.8 Define spinneret and spin pack 2.9 Describe the features and functions of spinneret 2.10 Define down thermal boiler and quenching 2.11 Interpret the functions and importance of quenching 2.12 Illustrate the working principle of down thermal boiler.</p>	6	6
3	<p>Regenerated Cellulosic Fibre</p> <p>3.1 Define Regenerated fibre 3.2 Mention different types of Regenerated Cellulosic fibre 3.3 Describe the manufacturing process of Viscose, Tencel, Modal & Cuprammonium 3.4 List the trade names of Viscose, Tencel, Modal & Cuprammonium. 3.5 Discuss physical properties of Viscose, Tencel, Modal & Cuprammonium 3.6 Illustrate chemical properties of Viscose, Tencel, Modal & Cuprammonium 3.7 Mention the end uses of Viscose, Tencel, Modal & Cuprammonium.</p>	3	8

4	<p>Polyester Fibre</p> <p>4.1 Define Ester, Polyester, Partial Oriented Yarn (POY), Draw Textured Yarn (DTY) and Fully Drawn Yarn (FDY)</p> <p>4.2 List the chemicals of polyester production</p> <p>4.3 Describe the production process of polyester</p> <p>4.4 Mention trade names of polyester</p> <p>4.5 Discuss Physical and chemical properties of polyester</p> <p>4.6 Define Mono ethylene Glycol (MEG) and Poly Terephthalic Acid (PTA)</p> <p>4.7 Illustrate Mono ethylene Glycol (MEG) and Poly Terephthalic Acid (PTA) manufacturing process</p> <p>4.8 Mention the end uses of Polyester</p> <p>4.9 Define Intrinsic Viscosity (IV)</p> <p>4.10 Compute Intrinsic Viscosity and control yarn quality.</p>	4	6
5	<p>Polyamide Fibre</p> <p>5.1 Define Polyamide Fibre</p> <p>5.2 Mention different types of Polyamide Fibre</p> <p>5.3 Discuss the raw materials for Nylon 6 and Nylon 6.6</p> <p>5.4 Mention the nomenclature of Nylon 6 and Nylon 6.6</p> <p>5.5 Illustrate the process flowchart of Nylon 6 and Nylon preparation</p> <p>5.6 Describe the manufacturing process of Nylon 6 and Nylon 6.6</p> <p>5.7 Discuss physical properties of Nylon 6.6</p> <p>5.8 Discuss chemical properties of Nylon 6 and Nylon 6.6</p> <p>5.9 Mention the end uses of Nylon 6 and Nylon 6.6</p> <p>5.10 Distinguish between Nylon 6 and Nylon6.6.6.</p>	3	6
6	<p>Polyacrylonitrile</p> <p>6.1 Define Acrylic fibre</p> <p>6.2 Mention raw materials of Acrylic fibre</p> <p>6.3 Illustrate the process flowchart of Acrylic fibre manufacturing</p> <p>6.4 Discuss the manufacturing process of Acrylic</p> <p>6.5 Mention physical properties of Acrylic</p> <p>6.6 Mention chemical properties of Acrylic</p> <p>6.7 Define Mod-acrylic</p> <p>6.8 State the characteristics of Mod-acrylic</p> <p>6.9 Mention the end uses of acrylic and Mod-acrylic.</p>	3	6
7	<p>Polyacetate Rayon</p> <p>7.1 Define Acetate and Tri-Acetate Rayon</p> <p>7.2 Illustrate the process flowchart of Acetate manufacturing</p> <p>7.3 Discuss the manufacturing process of Poly Acetate Rayon</p> <p>7.4 Mention physical properties of Poly Acetate Rayon</p> <p>7.5 Mention chemical properties of Poly Acetate Rayon</p> <p>7.6 Distinguish between acetate and Tri-acetate</p> <p>7.7 Mention the end uses of Poly Acetate Rayon.</p>	3	6

8	<p>Polyurethane (Spandex)</p> <p>8.1 Mention the raw materials of Spandex fibre 8.2 Define Polyurethane and Air Covered Yarn (ACY) 8.3 Illustrate the process flowchart for manufacturing Spandex 8.4 Describe the production process of Spandex 8.5 Mention physical properties of Spandex 8.6 Mention chemical properties of Spandex 8.7 Mention the uses of Spandex 8.8 List trade names of Spandex.</p>	3	6
9	<p>High Performance Fibres</p> <p>9.1 Define High-Performance Fibers 9.2 List the name of High-Performance Fibres 9.3 Mention the end uses of Aramid, Carbon, Glass Fibre, Ultra High Molecular Weight Polyethylene (UHMWPE) and Polytetrafluoroethylene (PTFE) 9.4 Mention the end uses of Metallic and Rubber Fibre 9.5 Define Micro and Nano Fibre 9.6 List the raw materials for manufacturing of Micro and Nano fibre.</p>	3	6
10	<p>Sustainable Man-Made Fibre</p> <p>10.1 Define Sustainable Man-Made Fibre 10.2 State the objectives of Sustainable Man-Made Fibre 10.3 Express the importance of Sustainable Man-Made Fibre 10.4 Define Recycle Polyester 10.5 Illustrate the manufacturing process of Recycle Polyester 10.6 Mention the end uses of Recycle Polyester 10.7 Define Biodegradable Man-Made Fibre 10.8 List Biodegradable Man-Made Fibres.</p>	2	6
Total		32	60

Recommended Books:

Sl.	Book Name	Writer Name	Publisher Name & Edition
01	Hand Book of Textile Fibres, Volume: II	J. GORDON COOK	Woodhead Publishing Ltd.2009
02	Synthetic Textile	MEENAKSHI RASTOGI	Sonali Publications, New Delhi, 2009
03	Fibres and Yarn	MEENAKSHI RASTOGI	Sonali Publications, New Delhi, 2009
04	Textile Raw Materials – II	Engr. Md. Abdul Mojid	Prime Publication
05	Polyester Fiber Manufacture	Marshal Sittig	Noyes Dtat Corporation
06	Synthetic Fibers: nylon, polyester, acrylic, polyolefin	J E McIntyre	Wood Head Publications

Website References:

Sl	Web Link	Remarks
01	https://www.youtube.com/channel/UCWqYV3o_68pcoAdJadtORrA	
02	https://nptel.ac.in/	
03	https://textilelearner.net/	
04	https://bunon.info/	
05	https://textilefashion.net/	

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DIPLOMA IN TEXTILE ENGINEERING
SYLLABUS
PROBIDHAN-2022
APPAREL MANUFACTURING (14)
4th SEMESTER

Subject Code	Subject Name	Period Per Week		Credit
21142	YARN MANUFACTURING II	T	P	C
		3	3	4

Rationale	Students need to gather basic knowledge and skill on overall process of the yarn manufacturing technology as well as machinery mainly Lap former, Comber, Simplex, Ring frame, Jute draw frame, Flyer spinning, Winding and Yarn finishing. By acquiring that knowledge, skills and attitude students will be able to know Yarn Manufacturing Technology-II as well as able to study in further courses.
Learning Outcome (Theoretical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Describe the operation of Lap former, Comber, Simplex and Ring frame. • Illustrate the operation of Jute draw frame, Jute spinning frame, Winding machinery. • Mention the quality parameters of input and output materials of different machineries. • Classify yarn manufacturing machinery. • Mention the process sequence of different yarn manufacturing. • Describe the basic principles of yarn manufacturing process. • Solve the production related problems. • Describe yarn winding and finishing process. • Explain faults, causes and remedies of different sections of yarn manufacturing.
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Observe process sequence and machinery of Yarn manufacturing. • Identify Comber, Simplex, Ring frame, Jute drawing frame, Jute spinning frame, Winding and Finishing machinery. • Identify different parts of yarn manufacturing machinery • Perform the operation of yarn manufacturing machinery.

Detailed Syllabus (Theory)

SL No.	Topics with Contents	Class (1 Period)	Final Marks
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1	<p>Lap Former</p> <p>1.1 State the objectives of Lap former. 1.2 Mention functions of Lap former. 1.3 Describe the material path diagram of Lap former. 1.4 Describe working principle of different Lap former. 1.5 Discuss the necessities of lap preparation before Combing. 1.6 State the Lap former stop motions. 1.7 Mention the purposes of Lap former stop motions. 1.8 Discuss causes and remedies of wastages produced during lap preparation.</p>	3	6
2	<p>Comber</p> <p>2.1 Define Combing process. 2.2 State the objectives of Comber machine. 2.3 Mention functions of Comber machine. 2.4 List the types of Comber machine. 2.5 Illustrate the material path of Comber machine. 2.6 Discuss basic principle of Combing machine with sketch. 2.7 Illustrate working principle of Combing machine. 2.8 Describe Combing cycle with sketch. 2.9 Mention function of Index wheel.</p>	4	8
3	<p>Wastage and Faults of Comber</p> <p>3.1 Explain Draw box. 3.2 State the setting points of Comber. 3.3 Explain the changes of setting points and effects on changing in Comber machine. 3.4 List wastes produced in Comber machine. 3.5 Discuss the waste control process in Comber. 3.6 Mention the factors influence the amount of noel. 3.7 Define degree of Comber machine. 3.8 Classify the degree of Comber machine. 3.9 Discuss the causes and remedies of wastages. 3.10 Calculate draft, production and efficiency of Comber machine.</p>	2	3
4	<p>Simplex</p> <p>4.1. Mention the objectives of Simplex. 4.2 State the functions of Simplex. 4.3 Explain the importance of Simplex. 4.4 Illustrate material path diagram of Simplex. 4.5 Describe working principle of Simplex. 4.6 Explain drafting and twisting. 4.7 Discuss different drafting system. 4.8 Differentiate between roller and apron draft. 4.9 Illustrate twisting mechanism. 4.10 Discuss twist multipliers.</p>	4	8

5	<p>Winding and Building mechanism of Simplex.</p> <p>5.1 Define roller setting of Simplex machines. 5.2 State the considering factors of roller setting. 5.3 Discuss the change places and effects of changing in Simplex machine. 5.4 Mention the objectives of building motion. 5.5 State the functions of building motion. 5.6 Illustrate building mechanism of simplex machine. 5.7 Describe differential motion. 5.8 List the Name of wastages produced in Simplex machine. 5.9 Calculate roving hank, draft, twist, speed, production and efficiency of Simplex machine.</p>	4	8
6	<p>Ring Frame</p> <p>6.1. Mention the objectives of Ring frame. 6.2 State the functions of Ring frame. 6.3 List the important components of Ring frame. 6.4 Illustrate material path of Ring frame. 6.5 Describe working principle of Ring frame. 6.6 Discuss the causes and remedies of yarn faults.</p>	4	6
7	<p>Roller setting</p> <p>7.1 Define roller setting of Ring frame. 7.2 State the factors influencing roller setting in Ring frame. 7.3 Describe the changing places and effects of changing in Ring frame. 7.4 State the importance of roller setting in Ring frame. 7.5 Discuss the causes and remedies of yarn breakage in Ring frame.</p>	2	3
8	<p>Drafting and Twisting of Ring frame</p> <p>8.1 Explain drafting and twisting. 8.2 Describe different drafting system. 8.3 Illustrate twisting mechanism. 8.4 Discuss twist multipliers. 8.5 Mention types of Rings, Travelers and Spindles. 8.6 State the functions of Ring, Traveler, Spindle, Spacer, Cradle arbour roller, Cot roller and Arm pressure. 8.7 Describe the building motion of Ring frame. 8.8 Calculate draft, twist, speed, production and efficiency of Ring frame.</p>	4	9

9	<p>Winding and Finishing</p> <p>9.1 State objectives of yarn conditioning. 9.2 Describe the process of yarn conditioning. 9.3 State the necessity of winding. 9.4 Describe the cone winding process. 9.5 Name the different yarn packages. 9.6 Describe the causes and remedies of winding faults. 9.7 Discuss the causes and remedies of package faults. 9.8 Explain the reeling process. 9.9 Describe the bundling and bailing process. 9.10 Calculate production and efficiency of winding.</p>	4	8
10	<p>Jute Draw Frame (1st, 2nd and 3rd)</p> <p>10.1 State the objectives of Jute drawing. 10.2 Mention functions of Jute drawing. 10.3 Mention the types of Jute drawing frame. 10.4 Illustrate the material path diagram of Jute Draw frame. 10.5 Describe working principle of push bar Draw frame. 10.6 Describe working principle of spiral Draw frame. 10.7 Distinguish between push bar and spiral Draw frame.</p>	4	8
11	<p>Drafting in Jute Drawing Frame</p> <p>11.1 Define Faller bar, Reach, Nip and Faller Lead percentage. 11.2 Describe the relation between draft and doubling. 11.3 State the importance of auto stop motion, crimping of sliver, can packing arrangement, can coiling. 11.4 Compare among 1st, 2nd and 3rd Draw frame. 11.5 State the change places and effects on changing in Draw frame. 11.6 Mention the causes and remedies of faults in Jute draw frame. 11.7 Calculate draft, lead percentage and production in Draw frame.</p>	4	6
12	<p>Jute Spinning frame of Jute</p> <p>12.1 State the objectives of Flyer spinning frame. 12.2 Mention functions of spinning frame. 12.3 Classify the Flyer spinning frame. 12.4 Illustrate the material path diagram of Flyer spinning frame. 12.5 Describe working principle of Flyer spinning frame.</p>	3	6
13	<p>Drafting and Twisting in Jute Spinning Frame</p> <p>13.1 Define drafting and twisting. 13.2 Describe the drafting systems in jute spinning frame. 13.3 Define slip and apron draft. 13.4 Distinguish between slip and apron drafting system. 13.5 Explain doffing. 13.6 Discuss twist factor for different count. 13.7 Define building motion. 13.8 Describe working principle of building motion. 13.9 Describe Lynex drive. 13.10 Calculate draft, twist and production of Jute spinning frame.</p>	4	8

14	Jute Winding and Finishing	2	3
	14.1 State the objectives of winding.		
	14.2 Mention the types of winding.		
	14.3 Describe mechanism of Cop winding machine.		
	14.4 Describe mechanism of Spool winding machine.		
	14.5 Mention the causes and remedies of winding faults.		
14.6 Calculate production and efficiency of winding machine.			
	Total	48	90

Detailed Syllabus (Practical)

SL No.	Topics with Contents	Class (3 Period)	Continuous Marks
1	Observe Lap Former 1.1 Observe and identify different parts of Lap former. 1.2 Draw material path of Lap former. 1.3 Sketch gearing diagram of Lap former. 1.4 Calculate draft and production of Lap former. 1.5 Maintain the record of performed experiment.	2	2.5
2	Observe Combing 2.1 Observe and identify different parts of comber. 2.2 Observe the working principle of a comber and identify its components. 2.3 Demonstrate the Combing cycle in accordance with index wheel. 2.4 Calculate noil %, production and efficiency from gearing diagram of Comber. 2.5 Identify setting points. 2.6 Maintain the record of performed experiment.	2	2.5
3	Observe Simplex 3.1 Observe and identify different parts of Simplex. 3.2 Sketch gearing diagram of Simplex. 3.3 Calculate the draft, twist and production of Simplex. 3.4 Draw and demonstrate the bobbin building mechanism of Simplex. 3.5 Maintain the record of performed experiment.	2	2.5
4	Observe Ring Spinning Frame 4.1 Observe different parts of Ring spinning frame. 4.2 Draw the material passage of Ring spinning frame. 4.3 Maintain the record of performed experiment.	2	2.5

5	Observe Drafting and Twisting 5.1 Sketch gearing diagram 5.2 Calculate draft, draft constant, twist, twist constant and production of Ring frame. 5.3 Demonstrate the bobbing building mechanism. 5.4 Maintain the record of performed experiment.	2	2.5
6	Observe Winding and Finishing 6.1 Identify different parts of Winding machine. 6.2 Demonstrate the working procedure of cone winding. 6.3 Sketch the passage diagram of cone winding. 6.4 Calculate the production and efficiency of cone winding. 6.5 Maintain the record of performed experiment.	1	2.5
7	Observe Packaging, bundling and Bailing 7.1 Demonstrate packaging. 7.2 Observe bundling. 7.3 Perform bailing. 7.4 Maintain the record of performed experiment.	1	2.5
8	Observe Jute Draw frame 8.1 Identify different parts of Jute Draw frame. 8.2 Sketch gearing diagram. 8.3 Calculate draft, draft constant, faller drops per minute, faller bar lead % and production. 8.4 Maintain the record of performed experiment.	1	2.5
9	Observe Flyer spinning 9.1 Identify different parts of Flyer spinning. 9.2 Sketch gearing diagram. 9.3 Calculate draft, draft constant, twist, twist constant and production. 9.4 Maintain the record of performed experiment.	1	2.5
10	Observe Jute winding and Finishing 10.1 Identify different parts of cop winding machine. 10.2 Sketch the passage diagram of cop winding machine. 10.3 Sketch the gearing diagram of cop winding machine. 10.4 Perform production calculation of cop winding machine. 10.5 Identify different parts of spool winding machine. 10.6 Sketch the passage diagram of spool winding machine. 10.7 Sketch the gearing diagram of spool winding machine. 10.8 Perform production calculation of spool winding machine. 10.9 Maintain the record of performed experiment.	2	2.5
	Total	16	25

Necessary Resources (Tools, equipment and Machinery):

SI	Item Name	Quantity (piece/s)
01	Lap Former	1
02	Comber	1
03	Simplex	1

04	Ring frame	1
05	Winding machine	1
06	Jute 1 st Drawing Frame	1
07	Jute 2 nd Drawing Frame	1
08	Jute 3 rd Drawing Frame	1
09	Flyer Spinning Frame	1
10	Jute Winding Machine	1
11	Tools Box	5

Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
01	Process Management in Spinning	R. Senthil Kumar	
02	Spun yarn technology (Vol-III)	R. Van cot Ramon	India
03	Principle of short staple spinning (Vol-II)	Dr. Professor Ayub Nabi Khan	
04	ইয়ার্ণ ম্যানুফেকচারিং-৩	ইঞ্জিঃ মোঃমহিবুল ইসলাম	
05	ইয়ার্ণ ম্যানুফেকচারিং-২	ইঞ্জিঃ একেএম ফজলুল হক	
06	Process control and yarn quality in spinning	G. Thilagavathi and T. Karthik	
07	Manual of Short Staple Spinning	W. Klein	

Website References:

SI	Web Link	Remarks
01	https://textilelearner.net	
02	https://www.textileadvisor.com	
03	https://www.textilecalculations.com	
04	https://www.textilesphere.com	

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DIPLOMA IN TEXTILE ENGINEERING
SYLLABUS
PROBIDHAN-2022
APPAREL MANUFACTURING (14)
4thSEMESTER

Subject Code	Subject Name	Period Per Week		Credit
		T	P	
21241	Fabric Manufacturing- II	3	3	C
		3	3	4

Rationale	Students need to gather basic knowledge and skill on overall process of the weaving and knitting, mainly hand loom, power loom, primary, secondary and tertiary motions of loom and circular knitting machine. Fundamental knowledge and skills are prerequisite to study woven fabric, loom and knitting machine. This subject covers the overview of production of raw fabrics and process.
Learning Outcome (Theoretical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Describe various types of loom and motion. • State primary, secondary and tertiary motion. • Illustrate temple motion of the loom. • Calculate the production of the loom. • Describe operation of various types of loom. • Explain different types of knitting elements and equipment. • Discuss operation of various types of knitting machine.
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Identify the various motions of loom. • Identify the various primary, secondary and tertiary motions of loom • Calculate the production of loom. • Perform the operation of loom. • Identify weft knitting machineries and their operation. • Calculate the production of knitting machine.

Detailed Syllabus (Theory)

SL No.	Topics with Contents	Class (1 Period)	Final Marks
1	LOOM 1.1 Define Loom. 1.2 Classify Loom. 1.3 Define hand Loom. 1.4 Define power Loom. 1.5 Define modern loom. 1.6 Define different types of modern loom. 1.7 Describe different types of hand loom. 1.8 Describe different types of power loom. 1.9 Discuss the Historical Development of loom.	3	6
2	MOTIONS OF LOOM 2.1 Define the motions of loom. 2.2 Describe the necessity of motions of loom. 2.3 Classify the motion of loom. 2.4 Describe primary motions of loom. 2.5 Describe secondary motions of loom. 2.6 Describe tertiary motions of loom.	3	6
3	SHED AND SHEDDING MECHANISM 3.1 Define shed. 3.2 Classify shed 3.3 Describe different types of shed. 3.4 Discuss the advantages and disadvantages of different types shed. 3.5 Define shedding. 3.6 Describe different shedding mechanism in weaving process. 3.7 Differentiate between positive and negative shedding. 3.8 Describe the construction of plain tappet. 3.9 Describe the construction of twill tappet. 3.10 Describe Dwell period.	4	8
4	PICKING 4.1 Define picking. 4.2 Classify picking 4.3 Describe over picking mechanism in weaving process. 4.4 Describe under picking mechanism in weaving process. 4.5 Differentiate between over picking and under picking. 4.6 Describe the faults of picking. 4.7 Calculate the picking force. 4.8 Define modern picking.	2	4
5	BEAT-UP 5.1 Define beat-up. 5.2 Discuss the necessity of beat-up motion in weaving. 5.3 Describe the importance of sley. 5.4 Describe functions of reed. 5.5 Describe different types of beat-up mechanism. 5.6 Describe the cam beat-up mechanism. 5.7 Define reed count and heald count. 5.8 Classify reed count and heald count. 5.9 Calculate reed count and heald count.	3	4

6	<p>TAKE UP MOTION</p> <p>6.1 Define the take up motion. 6.2 Mention the necessity of take up motion. 6.3 Classify the take up motion. 6.4 Describe the construction and working principle of 5-wheel take up motion. 6.5 Describe the construction and working principle of 7-wheel take up motion. 6.6 Describe the working principle of negative take up motion. 6.7 Differentiate between positive and negative take up motion. 6.8 Solve the mathematical problems of 5 and 7 wheel take up Motion. 6.9 Calculate PPI, Pick Spacing and Loom Constant from 5 wheel take up motion from gearing diagram. 6.10 Calculate PPI, Pick Spacing and Loom Constant from 7 wheel take up motion from gearing diagram.</p>	5	8
7	<p>LET OFF MOTION</p> <p>7.1 Define let off motion. 7.2 Mention the necessity of let off motion. 7.3 Classify the let off motion. 7.4 Describe the construction and working principle of negative let off motion. 7.5 Describe the construction and working principle of semi-positive let off motion. 7.6 Describe the construction and working principle of positive let off Motion. 7.7 Differentiate between positive and negative Let off motion.</p>	3	4
8	<p>BRAKE MOTION</p> <p>8.1 Define Brake motion. 8.2 Describe the importance of Brake motion. 8.3 Classify Brake motion. 8.4 Describe different types of Brake motion. 8.5 Discuss the working principle of different Brake motions.</p>	2	4
9	<p>TEMPLE MOTION</p> <p>9.1. Define temple motion. 9.2. State the objective of temple. 9.3. State the functions of temple. 9.4. List the types of temples. 9.5. Discuss different types of temples. 9.6. Distinguish between ring and roller temple.</p>	2	4
10	<p>WEAVING ISSUES AND CALCULATION</p> <p>10.1 Mention the features of Modern loom. 10.2 Mention the features of Projectile loom. 10.3 State the features of Rapier loom. 10.4 State the features of Air jet loom. 10.5 Mention the properties of woven fabric. 10.6 Describe different type of selvage. 10.7 Discuss the causes and remedies of woven fabric faults. 10.8 Solve the mathematical problems related to the production of loom.</p>	4	12
11	<p>WEFT KNITTING</p> <p>11.1 Define weft knitting. 11.2 Classify weft knitting machines from different aspect.</p>	5	7

	<p>11.3 Classify flat knitting machines.</p> <p>11.4 List the types of circular knitting machine.</p> <p>11.5 List the types of straight bar knitting machine.</p> <p>11.6 Sketch flat bar, straight bar and garment length knitting Machine.</p> <p>11.7 Describe the working principle of flat bar, straight bar and garment length knitting machine.</p> <p>11.8 Discuss the properties of knitted fabric.</p> <p>11.9 Discuss the causes and remedies of knitted fabric faults.</p>		
12	<p>SINGLE JERSEY CIRCULAR KNITTING MACHINE</p> <p>12.1 Describe the knitting elements of single jersey circular knitting machine.</p> <p>12.2 Describe single jersey circular knitting machine.</p> <p>12.3 Discuss Knitting action of single jersey circular knitting machine.</p> <p>12.4 Describe hand driven socks knitting machine.</p> <p>12.5 Describe automatic socks knitting machine.</p> <p>12.6 Explain hand driven sweater machine.</p> <p>12.7 Describe hand driven muffler machine.</p> <p>12.8 Describe dial linking machine.</p>	3	6
13	<p>DOUBLE JERSEY CIRCULAR KNITTING MACHINE</p> <p>13.1 Describe the knitting elements of double jersey circular knitting machine.</p> <p>13.2 State the features of rib circular knitting machine.</p> <p>13.3 Describe knitting action of rib circular knitting machine.</p> <p>13.4 State the features of Interlock circular knitting machine.</p> <p>13.5 Describe knitting action of interlock circular knitting machine.</p> <p>13.6 Sketch the basic weft knit structures.</p> <p>13.7 Describe characteristics basic weft knit structures.</p>	3	4
14	<p>WARP KNITTING</p> <p>14.1 Define warp knitting.</p> <p>14.2 Classify warp knitting.</p> <p>14.3 Describe the knitting elements of warp knitting machine.</p> <p>14.4 Differentiate between weft knitting and warp knitting.</p>	2	3
15	<p>KNITTING PRODUCTION CALCULATION</p> <p>15.1 Calculate the knitting production in length per time unit.</p> <p>15.2 Calculate the knitting production in weight per time in different unit.</p> <p>15.3 Calculate the knitting production in linear weight per time different unit.</p> <p>15.4 Calculate the knitting production from WPI, CPI, stitch length and stitch density.</p> <p>15.5 Calculate the width of knitted fabric.</p> <p>15.6 Calculate the GSM of knitted fabric.</p>	4	10
		48	90

Detailed Syllabus (Practical)

SL No.	Topics with Contents	Class (3 Period)	Continuous Marks
1	<p>OBSERVE LOOM AND MOTIONS OF LOOM</p> <p>1.1 Observe the operation of Hand loom</p> <p>1.2 Sketch the yarn path of the loom</p>	2	2.5

	<p>1.3 Identify different parts of loom</p> <p>1.4 Observe the operation of Power loom</p> <p>1.5 Maintain the record of performed experiment.</p>		
2	<p>OBSERVE PICKING</p> <p>2.1 Demonstrate the Over picking mechanism</p> <p>2.3 Demonstrate the Under-picking mechanism</p> <p>2.4 Maintain the record of performed experiment.</p>	2	2.5
3	<p>OBSERVE BEAT-UP</p> <p>3.1 Demonstrate the beat-up mechanism</p> <p>3.2 Select the appropriate reed</p> <p>3.3 Observe the hand loom beat-up</p> <p>3.4 Observe the power loom beat-up</p> <p>3.5 Maintain the record of performed experiment.</p>	2	2.5
4	<p>OBSERVE LET OFF MOTION</p> <p>4.1 Demonstrate the negative let off motion</p> <p>4.2 Sketch the diagram of negative let off motion</p> <p>4.3 Demonstrate the positive let off motion</p> <p>4.4 Maintain the record of performed experiment.</p>	1	2.5
5	<p>OBSERVE TAKE UP MOTION</p> <p>5.1 Draw and Identify the 5-wheel take up motion.</p> <p>5.2 Calculate PPI, Pick Spacing and Loom Constant of 5 wheel take up motion.</p> <p>5.3 Draw and Identify the 7-wheel take up motion.</p> <p>5.4 Calculate PPI, Pick Spacing and Loom Constant of 5 wheel take up motion.</p> <p>5.5 Maintain the record of performed experiment.</p>	2	2.5
6	<p>DEMONSTRATE STRAIGHT BAR KNITTING MACHINE</p> <p>6.1 Observe the operation of Straight bar knitting machine.</p> <p>6.2 Identify Straight bar knitting machine.</p> <p>6.3 Sketch Straight bar knitting machine.</p> <p>6.4 Point out different parts of Straight bar knitting machine.</p> <p>6.5 Maintain the record of performed experiment.</p>	1	2.5
7	<p>DEMONSTRATE SINGLE JERSEY CIRCULAR KNITTING MACHINE</p> <p>7.1 Observe the operation of single jersey circular knitting machine.</p> <p>7.2 Identify single jersey circular knitting machine.</p> <p>7.3 Sketch single jersey circular knitting machine.</p> <p>7.4 Point out different parts of single jersey circular knitting machine.</p> <p>7.5 Maintain the record of performed experiment.</p>	2	2.5
8	<p>DEMONSTRATE DOUBLE JERSEY CIRCULAR KNITTING MACHINE</p> <p>8.1 Observe the operation of double jersey circular knitting machine.</p> <p>8.2 Identify double jersey circular knitting machine.</p> <p>8.3 Sketch double jersey circular knitting machine.</p> <p>8.4 Point out different parts of double jersey circular knitting machine.</p> <p>8.5 Maintain the record of performed experiment.</p>	2	2.5

9	OBSERVEDIFFERENT KNITTED STRUCTURE	1	2.5
	9.1 Observe different design of knitted structure.		
	9.2 Differentiate different design of knitted structure.		
	9.3 Analyze different knit fabrics. 9.4 Maintain the record of performed experiment.		
10	OBSERVE SOCKS KNITTING MACHINE	1	2.5
	10.1 Observe the operation of a socks knitting machine.		
	10.2 Make a pair of socks sample by using in hand driven or automatic socks machine. 10.3 Maintain the record of performed experiment.		
Total		16	25

Necessary Resources (Tools, Equipment and Machinery):

SL	Item Name	Quantity (piece/s)
01	Woven fabrics	100 yds
02	Knitted fabrics	100 yds
03	Knotting Comb	10 pcs
04	Hand loom	01 pc
05	Power Loom	01 pc
06	Circular Knitting Machine	01 pc
07	Flat bed Knitting Machine	01 pc
08	Electronic Balance	01 pc
09	Inspection Table	01 pc
10	Nipper, Measure tape, Scale	10 pcs (each)
11	Counting Glass	10 pcs
12	Scissor	10 pcs
13	Levers, Shaft, Bowl, Spring, Dead Weight, pulley	01 set
14	Loom Card	50 pcs
15	Gear	10 pcs
16	Needle	10 set
17	Cylinder	01 pc
18	Cam	100 pcs
19	GSM Cutter	10 pcs
20	Mechanical Machine tools	01 set
21	Swatch card	10 pc

Recommended Books:

SL No.	Book Name	Writer Name	Publisher Name & Edition
01	Related Books published by BTEB		
02	Woven textile, Principles, Technologies and Applications Second edition (Wp)	K Grandhi	
03	Innovative Jacquard Textile Design Using Digital (WP) Top of from	Frankie	Ng &jia ZH Release

04	Introduction to Textile Engineering	Dr. Abu Bakr Siddique & Dr. Hosne Ara Begum	Books Fair Publications
05	Fabric structure And Design Second addition	N. Gokarnesham	
06	Structure of mechanics of woven fabrics (Wp)	Finlian	Hu Release Date 18 Oct 2004
07	Knitting technologies 3 rd addition (WP)	D.j Spencer	Apr-2001
08	Advance In 3 rd Textile (WP)	Miaogang	Chan Publication
09	Woven Terry Fabrics (WP)	Jetendra Singh, Swadesh Verma	7 th Sep 2016

Website References:

SL No.	Web Link	Remarks
01	https://youtue/HGaYRUz0g40	
02	https://www.youtube.com/channel/UCWqYV3o_68pcoAdJdtORrA	
03	https://nptel.ac.in/	
04	https://textilelearner.net/	
05	https://bunon.info/	

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DIPLOMA IN TEXTILE ENGINEERING
SYLLABUS
PROBIDHAN-2022
APPAREL MANUFACTURING (14)
4th SEMESTER

Subject Code	Subject Name	Period Per Week		Credit
		T	P	
21341	WET PROCESSESING-I	3	3	C
				4

Rationale	This course is designed to gather depth knowledge about different preparatory process of textile dyeing for the students. The aim of this course is to make the students familiar with conventional and modern wet process techniques. Students will able to learn about preparatory processes like water treatment, scouring, bleaching, mercerizing etc.
Learning Outcome (Theoretical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Identify & describe basic principles of modern technique and process sequence of water treatment, scouring, bleaching & mercerizing. • Identify & explain modern equipment & devices involved in wet processing • Explain different chemical properties • Identify & classify different water • Explain procedure of different pretreatment process • Explain physical changes of textile goods after performing pretreatment • Explain the advantages and limitations of different types of pretreatment.
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Identify process sequence and machineries of wet processing. • Point out modern techniques and devices involved in different stages of pretreatment. • Identify different chemicals, auxiliaries & their application. • Demonstrate different chemicals, apparatus and equipment's.

Detailed Syllabus (Theory)

SL No.	Topics with Contents	Class (1 Period)	Final Marks
1	<p>Basic concept of wet process.</p> <p>1.1. Define wet processing. 1.2. Describe the importance of wet processing in Textile sector. 1.3. Mention the steps of wet processing. 1.4. Illustrate the process flow chart of pre-treatment for woven fabric. 1.5. Illustrate the process flow chart of pre-treatment for knit fabric.</p>	3	4

2	<p>Treatments of water</p> <p>2.1 Discuss the importance of water quality in wet processing. 2.2 Mention the standard water quality for wet process. 2.3 Distinguish between hard and soft water. 2.4 Explain the problems of hard water in wet processing. 2.5 Define water treatment. 2.6 Describe the soda lime process. 2.7 Describe the base or ion exchange process. 2.8 Define sequestering/chelating. 2.9 Describe the methods of expressing hardness. 2.10 Describe the process of estimating hardness of water.</p>	4	6
3	<p>Acid, Base and salts</p> <p>3.1. Define acid, base and salts. 3.2. Discuss the chemistry of acid, base and salts. 3.3. Classify acid, base and salts. 3.4. Mention the uses of acids, bases and salts in wet process. 3.5 Define alkalinity of acid and acidity of alkali.</p>	3	6
4	<p>pH, Normality, Molarity, Molality of solution and waste water standard</p> <p>4.1 Define pH of a solution. 4.2 Mention the importance of pH for solution. 4.3 Describe the process of pH determination. 4.4 Define buffer solution. 4.5 Discuss normality, molality and molarity. 4.6 Solve the problems of pH, normality, molality and molarity. 4.7 Discuss COD, BOD and DO. 4.8 Discuss the standard of discharge waste water in environment as per Bangladesh Government rules.</p>	4	7
5	<p>Auxiliaries for pretreatments</p> <p>5.1 Define auxiliaries for pretreatment. 5.2 Mention oxidizing agents. 5.3 Explain the uses of oxidizing agents in textile wet processing. 5.4 Mention the name of reducing agents. 5.5 Explain the uses of reducing agents in textile wet processing. 5.6 Define detergents. 5.7 Classify detergents. 5.8 Discuss the uses of detergents in textile wet processing. 5.9 Define sequestering agent. 5.10 Mention the uses of sequestering agents in textile wet processing.</p>	5	7
6	<p>Brushing and shearing.</p> <p>6.1 Define brushing and shearing. 6.2 Explain the necessity of brushing and shearing. 6.3 Describe the process of brushing and shearing.</p>	1	4
7	<p>Singeing and Heat setting</p> <p>7.1 Define singeing. 7.2 Explain the necessity of singeing. 7.3 Mention the processes of singeing.</p>	3	6

	<p>7.4 Describe the process of gas singeing.</p> <p>7.5 Discuss the faults and remedies of singeing.</p> <p>7.6 Mention the use of enzymes in pretreatment process</p> <p>7.7 Define heat setting for elastomeric fabric.</p> <p>7.8 State the objectives of heat setting.</p> <p>7.9 Discuss the process of heat setting.</p> <p>7.10 Mention the faults and remedies of heat setting.</p>		
8	<p>Batching for knit dyeing</p> <p>8.1 Define batching.</p> <p>8.2 State the objectives of batching.</p> <p>8.3 Mention the factors for batch preparation.</p> <p>8.4 Draw the process flow chart of batch preparation for dyeing.</p>	2	4
9	<p>De-sizing</p> <p>9.1 Define de-sizing.</p> <p>9.2 State the objectives of de-sizing.</p> <p>9.3 Classify de-sizing process.</p> <p>9.4 Describe the enzymatic de-sizing procedure.</p> <p>9.5 Mention the faults and remedies of de-sizing.</p>	3	6
10	<p>Scouring</p> <p>10.1 Define scouring.</p> <p>10.2 Explain the necessity of scouring.</p> <p>10.3 Mention the methods of scouring.</p> <p>10.4 Mention the functions of chemicals used in scouring.</p> <p>10.5 Describe the scouring process of cotton fabric for exhaust & continuous method</p> <p>10.6 Mention the faults and remedies of scouring.</p> <p>10.7 Describe the scouring of blended fibers.</p>	4	10
11	<p>Bleaching</p> <p>12.1 Define bleaching.</p> <p>12.2 Mention the objectives of bleaching.</p> <p>12.3 State the types of bleaching agent.</p> <p>12.4 Describe bleaching mechanism of hypochlorite.</p> <p>12.5 Describe bleaching mechanism of cotton with peroxide.</p> <p>12.6 Mention merits and demerits of hypochlorite and peroxide bleaching</p>	3	8
12	<p>Bleaching processes</p> <p>13.1 Describe the bleaching process in exhaust process</p> <p>13.2 Describe pad-roll/pad- batch process.</p> <p>13.3 Describe continuous process for bleaching.</p> <p>13.5 Describe the bleaching of polyester-cotton blended fabrics.</p> <p>13.6 Mention the factors considered for the selection of bleaching agent.</p>	4	7
13	<p>Combined preparatory processes</p> <p>14.1 State the necessity of combined processes.</p> <p>14.2 Describe combined de-sizing & scouring.</p> <p>14.3 Describe combined scouring & bleaching.</p> <p>14.4 Describe combined de-sizing, scouring & bleaching.</p>	4	7

14	Souring/Neutralization 11.1 Define souring. 11.2 Mention the necessity of souring. 11.3 Describe souring processes. 11.4 Distinguish between scouring and souring.	2	4
15	Mercerization 15.1 Define mercerization. 15.2 Classify mercerization processes. 15.3 Mention the objectives of mercerization. 15.4 State the mechanism of mercerization. 15.5 Describe the methods of mercerization for yarn & fabric. 15.6 Discuss the steps of mercerizing.	3	4
Total		48	90

Detailed Syllabus (Practical)

SL No.	Topics with Contents	Period	Marks
1	Observe the pH of water. 1.1 Identify the devices involved in pH. 1.2 Observe the operations involved in pH. 1.3 Sketch the pH meter. 1.4 Demonstrate working principle using the pH meter. 1.5 Maintain the record of performed experiments.	1	2.5
2	Observe hardness of water & its removal process. 2.1 Identify the devices involved in this experiment. 2.2 Observe the operations involved in water hardness removal process. 2.3 Sketch the experiment related instruments. 2.4 Demonstrate working principle using material. 2.5 Maintain the record of performed experiments.	2	2.5
3	Observe the acidity of a solution. 3.1 Identify device involved acidity of a solution. 3.2 Sketch the respective apparatus. 3.3 Demonstrate working principle using material. 3.4 Maintain the record of performed experiments.	1	2.5
4	Observe cotton fabric by enzyme de-sizing. 4.1 Identify the different chemicals for enzyme de-sizing. 4.2 Observe the operations involved in enzyme de-sizing. 4.3 Sketch the fabric path of enzyme de-sizing. 4.4 Demonstrate working principle using material. 4.5 Maintain the record of performed experiments.	1	2.5

5	<p>Observe the scouring of cotton fabric using caustic soda.</p> <p>5.1 Identify the different chemicals involved in the process. 5.2 Observe the operations involved in scouring. 5.3 Sketch the respective apparatus. 5.4 Demonstrate working principle using material. 5.5 Maintain the record of performed experiments.</p>	2	2.5
6	<p>Observe the scouring of cotton-polyester blended fabric.</p> <p>5.1 Identify the different chemicals involved in cotton-polyester blended fabric scouring. 5.2 Observe the operations involved in experiment. 1.3 Sketch the respective apparatus. 1.4 Demonstrate working principle using material. 1.5 Maintain the record of performed experiments.</p>	1	2.5
7	<p>Observe the bleaching cotton fabric using hypochlorite.</p> <p>6.1 Identify the different chemicals involved in experiment. 6.2 Observe the operations involved in experiment. 6.3 Sketch the respective apparatus. 6.4 Demonstrate working principle using material. 6.5 Maintain the record of performed experiments.</p>	2	2.5
8	<p>Observe the bleaching cotton fabric using H₂O₂</p> <p>7.1 Identify the different chemicals involved in experiment. 7.2 Observe the operations involved in experiment. 7.3 Sketch the respective apparatus. 7.4 Demonstrate working principle using material. 7.5 Maintain the record of performed experiments.</p>	2	2.5
9	<p>Observe combined scouring & bleaching</p> <p>9.1 Identify the different chemicals involved in experiment. 9.2 Observe the process involved in experiment. 9.3 Sketch the respective apparatus. 9.4 Demonstrate working principle using material. 9.5 Maintain the record of performed experiments.</p>	2	2.5
10	<p>Observe mercerization process</p> <p>10.1 Identify the different chemicals involved in experiment. 10.2 Observe the process involved in experiment. 10.3 Sketch the respective apparatus. 10.4 Demonstrate working principle using material. 10.5 Maintain the record of performed experiments.</p>	2	2.5
Total		16	25

Necessary Resources (Tools, equipment's and Machinery):

Sl	Item Name	Quantity (piece/s)
01	Permutit filter	1
02	Beaker	3
03	Test Tube	12

04	Latex globe	12 pairs
05	Conical flux	6
06	Measuring cylinder	10
07	Pipettes	24
08	Burettes	12
09	Bunsen Burner	6
10	Thermometer	2
11	Stop watch	2
12	pH meter	2
13	Tripod stand	6
14	Sample Dyeing machine	1
15	Washing machine	1
16	Hydro Extractor	1

Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
01	Technology of Textile Processing	Dr. V.A. Shenai	Sebak publication, Bombay, India
02	An introduction to Textile Bleaching	J.T. Marsh	
03	Textile scouring & bleaching	E.R.Trotman	
04	Textile chemistry-1	Md. Mozibur Rahman	

Website References:

SI	Web Link	Remarks
01	https://nptel.ac.in/	
02	https://textilelearner.net/	
03	https://textilestudycenter.com/	
04	https://textiletoday.com/	
05	https://fibre2fashion.com/	

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DIPLOMA IN TEXTILE ENGINEERING
SYLLABUS
PROBIDHAN-2022
APPAREL MANUFACTURING (14)
4th SEMESTER

Subject Code	Subject Name	Period per Week		Credit
21342	Sustainability in Textile Industry	T	P	C
		2	0	2

Rationale	<p>The textile industry is a significant contributor to the global economy, but it also has a significant impact on the environment being a second largest polluting industry in the world. The use of substantial amounts of water, energy, chemicals, and fibers in textile production leads to pollution and negative impacts on natural resources. Additionally, the industry also has a large carbon footprint due to the energy consumption requirement for production and transportation.</p> <p>Incorporating sustainability into the textile industry is essential for protecting the socio-economic and environment economic viability. By implementing sustainable practices, textile companies can reduce their environmental impact, improve their social responsibility, and improve their bottom line.</p> <p>This course aims at providing fundamental knowledge on sustainability principles as well as their application in the textile value chain. Furthermore, it highlights the emerging sustainability issues such as sustainable raw materials, energy efficient machines, renewable energy concept, responsible sourcing, and product development etc. in textile and apparel sector.</p>
Learning Outcome (Theoretical)	<p>After completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • Describe sustainability concept and sustainability implication in Textile Industry. • Interpret sustainable raw materials, dyes and chemicals and applications in the textile industry. • Identify renewable resources required for sustainability practices. • Interpret available sustainable technologies in textile industry. • Interpret circular economy and impacts on Textile Industry • Interpret National and International Standards, Certifications related to Sustainability. • Identify ways of incorporating sustainability concept into sourcing and product development. • Implement sustainable practices in textile factories. • Review best practices and areas for improvement in sustainable textile production. • Identify challenges in the sustainability implementation in Textile Industry.

Detailed Syllabus (Theory)

Unit	Topics with Content	Class (1 Period)	Final Marks
1	<p>Introduction to Sustainability</p> <p>1.1 Define sustainability.</p> <p>1.2 Identify Pillars of sustainability.</p> <p>1.3 Discuss the impacts of sustainability into textile Industry.</p> <p>1.4 Discuss the importance of sustainability in environmental perspectives.</p> <p>1.5 Discuss the importance of sustainability in social perspectives.</p> <p>1.6 Discuss the importance of sustainability in economic perspective.</p> <p>1.6 State Sustainable Development Goals (SDGs).</p> <p>1.7 Relate to SDGs and sustainability in textiles.</p>	2	4
2	<p>Sustainable raw materials</p> <p>2.1 Describe different sustainable raw materials used in the Textile Industry.</p> <p>2.2 Discuss the importance of using sustainable raw materials in textiles.</p> <p>2.3 Identify different sustainable fibers used in Textile Industry.</p> <p>2.4 Identify different sustainable dyes, chemicals and auxiliaries used in textile industry.</p> <p>2.5 Distinguish between conventional and sustainable dyes, chemicals, and auxiliaries.</p> <p>2.6 Interpret sustainable packaging material in the textile industry.</p>	4	8
3	<p>Responsible sourcing and product development</p> <p>3.1 Define responsible sourcing.</p> <p>3.2 Describe principles of responsible sourcing.</p> <p>3.3 Discuss sustainable design and product development process.</p> <p>3.4 Describe incorporation of sustainable design principles into product development.</p> <p>3.5 Compare conventional and sustainable design approaches in product design.</p> <p>3.6 Outline the promotion of sustainable product culture and consumption.</p>	3	6
4	<p>Renewable Resources</p> <p>4.1 Explain renewable resources and its classification.</p> <p>4.2 Describe importance of renewable resources in sustainable textile production.</p> <p>4.3 Describe water saving technologies in textile Industry.</p> <p>4.4 Describe energy saving technologies in textile Industry.</p> <p>4.5 Compute the feed and tariff method according to renewable resource demand.</p> <p>4.6 Identify cost-benefit of adding sustainability measure.</p>	3	6
5	<p>Sustainable Technology</p> <p>5.1 Define Sustainable technology.</p> <p>5.2 State the importance of sustainable technologies in textile industry.</p> <p>5.3 Discuss contribution of sustainable technology in yarn manufacturing.</p> <p>5.4 Describe contribution of sustainable technology in fabric manufacturing.</p>	3	6

	<p>5.5 Discuss Innovative sustainable technology in wet processing.</p> <p>5.6 Discuss Contribution of sustainable technology in design and apparel manufacturing.</p>		
6	<p>Circular economy in textile industry</p> <p>6.1 Define linear economy, and circular economy.</p> <p>6.2 Compare the sustainability aspect of circular economy and linear economy practices.</p> <p>6.3 Explain 4R principles.</p> <p>6.4 Discuss Economic, environmental, and social impacts of applying 4R principles into the textile industry.</p> <p>6.5 Describe ways and benefits of reducing waste in Textile Industry.</p> <p>6.6 Explain concepts and benefits of Reuse.</p> <p>6.7 Discuss the recycle process of different types of waste in Textile Industry.</p> <p>6.8 Discuss the benefits of recycling.</p> <p>6.9 Discuss the recovery process of resources from waste in Textile Industry.</p> <p>6.10 Discuss the benefits of recovery.</p>	3	6
7	<p>Sustainable Standards and Certifications</p> <p>7.1 State the sustainability standard in the textile industry.</p> <p>7.2 identify the benefits of the sustainability standard in textile business.</p> <p>7.3 Outline product related standard and certification.</p> <p>7.4 Define BCI, OCS, GOTS, Oeko-Tex 100, RCS, GRS, FSC, BPI standards used to certify sustainable product.</p> <p>7.5 Mention sustainable process and factory endorsement related standard and certification.</p> <p>7.6 State Higg FEM, STeP by Oeko-Tex, ZDHC, REACH, Blue Sign, cradle to cradle (C2C), GRS 2.2 standards to certify sustainable processes.</p> <p>7.7 Outline environment related standards and certification.</p> <p>7.8 State ISO 14001, ISO 46001 and ISO 50001 standards for environmental certification.</p>	4	6
8	<p>Implement Sustainable practices of textile factories.</p> <p>8.1 Identify ways of incorporating sustainability into product development.</p> <p>8.2 Identify ways of incorporating sustainability into process in selected production area.</p> <p>8.3 Develop a sustainable project based on identified area.</p>	5	8
9	<p>Best practices for sustainable textile production</p> <p>9.1 Identify Best practices from international fashion brands and organizations.</p> <p>9.2 Illustrate the market leading practices related to sustainability in Bangladesh Textile Industry.</p> <p>9.3 Identify best practices of water saving and rainwater harvesting in textile industry.</p> <p>9.4 Express the best practices of green denim process.</p> <p>9.5 Define Zero waste discharge.</p> <p>9.6 State the concept of green factory.</p>	3	6
10	<p>Challenges in the sustainability implementation</p> <p>10.1 Discuss the social challenges to implement sustainability in</p>	2	4

	<p>Bangladesh Textile Industry.</p> <p>10.2 Discuss the environmental challenges to implement in Bangladesh Textile Industry.</p> <p>10.3 Discuss the economic challenges to implement sustainability in Bangladesh Textile Industry.</p> <p>10.4 Identify ways to overcome the challenges of implementing sustainability in textile industry.</p>		
		32	60

Necessary Resources (Tools, equipment's, and Machinery):

SI	Item Name	Quantity
01	Standards and certification document	One for each student
02	Code of conduct sample	One for each student
03	Case studies and assignment related documents	One for each student
04	Project template	One for each student

Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
1	Sustainable Practices in the Textile Industry	Edited by: Luqman Jameel Rather, Mohd Shabbir and Aminoddin Haji	Scrivener Publishing-Wiley edition 2021
2	Sustainability in the Textile and Apparel Industries	Editors: Subramanian Senthilkannan Muthu Miguel Angel Gardetti	Springer Publishing
3	Textiles and Clothing Sustainability- Sustainable Technologies	Edited by Subramanian Senthilkannan Muthu	
4	Sustainability in the Textile Industry	Edited by Subramanian Senthilkannan Muthu	
5	Handbook of Sustainable Textile Production	Edited by Marion I. Tobler-Rohr	Woodhead Publishing
6	Sustainable textiles Life cycle and environmental impact	Edited by R. S. Blackburn	Woodhead Publishing Limited
7	Circular Economy in Textiles and Apparel Processing, Manufacturing, and Design	by Subramanian Senthilkannan Muthu	Woodhead Publishing Limited
8	Energy, Resources and Environment	Alan Reddish and John Blunden	Hodder Education, 2 nd edition

Website References:

SI	Web Link	Marks
1	https://youtu.be/FSjFe30lfYY	
2	https://youtu.be/2MuXmVESAh4	
3	Global Organic Textile Standard: Ecology & Social Responsibility. (2020). <i>The Standard</i> . Retrieved from: https://www.global-standard.org/the-standard	

4	Textile Exchange. (2020). <i>Organic Cotton Standard (OCS)</i> . Retrieved from: https://textileexchange.org/standards/organic-content-standard/	
5	United Nations Forum on Sustainability Standards. (2021). <i>What are voluntary sustainability standards?</i> Retrieved from: https://unfss.org/	
6	https://www.commonobjective.co/article/which-certification-is-right-for-my-business	
7	BGMEA Sustainability Report extension://efaidnbmnnnibpcajpcglclefindmkaj/https://download.bgmea.com.bd/BGMEA%20Sustainability%20Report%202020.pdf	
8	https://www.sdg.gov.bd/page/allgoals	

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DIPLOMA IN TEXTILE ENGINEERING
SYLLABUS
PROBIDHAN-2022
APPAREL MANUFACTURING (14)
4th SEMESTER

Subject Code	Subject Name	Period Per Week		Credit
		T	P	
21441	Apparel Manufacturing-I	3	3	4

Rationale	The textile industry plays a very significant role in the GDP of Bangladesh. For the smooth running of this sector diploma textile engineers are required in the mid-level who are playing key roles in this sector. To prepare an appropriate diploma graduate should have sufficient knowledge in Apparel Manufacturing-I. To attain this objective, we have added this course to the diploma level which consists of apparel manufacturing process containing pattern making, pattern grading, marker making, CAD & CAM, fabric inspection, fabric relaxation, fabric spreading, and fabric cutting process. By acquiring that knowledge, skills and attitude students will be able to gather apparel manufacturing technology as well as able to study in further courses.
Learning Outcome (Theoretical)	After completion of this course, students will be able to: <ul style="list-style-type: none"> - Define the history of the apparel industry, process sequence and different terms of apparel. - Define human body measurement, technical package, pattern making and grading. - Describe marker making, CAD & CAM, and sampling. - Define fabric inspection, spreading and cutting.
Learning Outcome (Practical)	After completion of this course, students will be able to: <ul style="list-style-type: none"> - Design the layout of the apparel manufacturing lab and point out human body measurements. - Perform basic measurement and design components of tops and bottoms. - Demonstrate pattern making, grading and marker making. - Conduct cutting operation.

Detailed Syllabus (Theory)

SL No.	Topics with Contents	Class (1 Period)	Final Marks
1	<p>Basic aspects of Apparel industry</p> <p>1.1 Describe the historical development of apparel industries in Bangladesh.</p> <p>1.2 List down the names of apparel exporting countries.</p> <p>1.3 Discuss the roles of the apparel industries of Bangladesh.</p> <p>1.4 Describe the tailoring process.</p> <p>1.5 Distinguish between tailoring process and industrial apparel manufacturing process.</p>	3	4
2	<p>Process sequence of Apparel Manufacturing</p> <p>2.1 Mention the process flow-chart of apparel manufacturing.</p> <p>2.2 Describe the process flow-chart of apparel manufacturing.</p> <p>2.3 Illustrate the layout plan of the apparel manufacturing unit.</p>	2	3
3	<p>Terms of Apparel Manufacturing</p> <p>3.1. Describe Applique, Allowance, Back tacking, Backing, Basic block, Bar-tack, Basting, Needle gauge and Bespoke.</p> <p>3.2. Describe CB Line, CF Line, CM, CMT, Collar, Cuff, Dart, Darning, Drape, Dummy, Facing, Flap, Hem, Inlay, Jetting, Front rise and Back rise, Piping, Ticket number.</p> <p>3.3. Describe Button Ligne, Molding, Nap, Notch, N.S.A, Pleating, Placket, Quilting, Swatch, Vent and Wrap.</p> <p>3.4. Describe the different commercial terms related to the process sequence of apparel manufacturing: Backward linkage, Forward linkage, GSP, Quota, Invoice, Non-quota, C&F, CIF, L/C, Back to Back L/C and MFA.</p> <p>3.5. Mention the role of BGMEA, BKMEA, BTMA, BJMC, BTMC, BJRI, FBCCI, MOTJ, ISO, ILO and IJSC.</p>	2	5
4	<p>Human Body Anthropometry</p> <p>4.1 Draw a men's standard body with all measurement points.</p> <p>4.2 Describe the measurement points for the men's standard body.</p> <p>4.3 Sketch a women's standard body with all measurement points.</p> <p>4.4 Describe the measurement points for the women's standard body.</p> <p>4.5 Outline ease allowance based on the degree of allowance for menswear</p> <p>4.6 Outline ease allowance based on the degree of allowance for women's wear.</p>	3	6
5	<p>Technical package and measurement of Apparel</p> <p>5.1 Describe measurement sheet, Specification Sheet (Spec Sheet) and Technical Package (Tech Pack).</p> <p>5.2 Explain the specifications of Tech Pack.</p> <p>5.3 Point out the importance of Tech Pack.</p> <p>5.4 Illustrate the Point of Measures (POMs) of T-shirt, Polo shirt, Hoodie from Spec Sheet/ Tech Pack.</p> <p>5.5 Illustrate the Point of Measures (POMs) of Trouser, Shorts from Spec Sheet/ Tech Pack.</p>	5	8

	<p>5.6 Illustrate the Point of Measures (POMs) of Shirt and Jacket from Spec Sheet/ Tech Pack.</p> <p>5.7 Illustrate the Point of Measures (POMs) of 5 pocket denim pants and Chino pants from Spec Sheet/ Tech Pack.</p> <p>5.8 State HTM (How-to-Measure) manual.</p>		
6	<p>Pattern making of Apparel</p> <p>6.1 Define pattern.</p> <p>6.2 Describe the necessity of pattern making.</p> <p>6.3 Explain Block pattern and Production pattern.</p> <p>6.4 Discuss the methods of pattern making.</p> <p>6.5 List the different components of a shirt.</p> <p>6.6 Define grain-line.</p> <p>6.7 Point out the types of grain-line used in pattern making.</p> <p>6.8 List the different components of a pant.</p>	4	8
7	<p>Pattern Grading</p> <p>7.1 Define pattern grading.</p> <p>7.2 Describe the objectives of pattern grading.</p> <p>7.3 Illustrate the types of pattern grading methods.</p> <p>7.4 Mention the advantages of different pattern grading methods.</p> <p>7.5 Mention the disadvantages of different pattern grading methods.</p> <p>7.6 Discuss the method of grade rule setting in computerized grading.</p>	3	5
8	<p>Marker Making</p> <p>8.1 Define marker and marker making.</p> <p>8.2 State the marker efficiency.</p> <p>8.3 Mention the factors affecting on Marker efficiency.</p> <p>8.4 Discuss the methods of marker making.</p> <p>8.5 List down the method of drawing and duplication of a marker.</p> <p>8.6 Explain the prospects and constraints of marker making.</p>	3	4
9	<p>CAD and CAM</p> <p>9.1 Define CAD and CAM.</p> <p>9.2 Mention the advantages of CAD and CAM.</p> <p>9.3 Point out the disadvantages of CAD and CAM.</p> <p>9.4 List out the commonly used commercial CAD software for apparel pattern making, grading, marker making and 3D simulation.</p>	3	10
10	<p>Digitizing and Plotting</p> <p>10.1 Define digitizing.</p> <p>10.2 Describe the importance of digitizing.</p> <p>10.3 Classify pattern digitizing methods.</p> <p>10.4 Describe the process of different pattern digitizing methods.</p> <p>10.5 State the importance of digitizing with and without seam allowances.</p> <p>10.6 Define plotter.</p> <p>10.7 Classify plotter.</p> <p>10.8 Illustrate the working procedure of plotter.</p> <p>10.9 Describe different types of patterns and marker plotting systems.</p>	4	5
11	<p>Sample Making</p> <p>11.1 Define sample.</p> <p>11.2 State the importance of sample for apparel making.</p> <p>11.3 Describe the different types of samples.</p>	2	4

	11.4 Describe the process flowchart of sample for apparel making.		
12	Virtual Sampling and Prototyping 12.1 State virtual prototyping. 12.2 Describe different maps to assess the virtual fit of an apparel. 12.3 List down the properties of the virtual fabric. 12.4 Explain virtual try-on and virtual catwalk. 12.5 List down the physical samples replaced by virtual samples. 12.6 Explain the ways of replacing physical samples with virtual samples.	3	8
13	Fabric Inspection and Fabric Relaxation 13.1 State fabric inspection. 13.2 Mention the importance of fabric inspection. 13.3 Describe the procedure of fabric inspection. 13.4 Explain different types of fabric defects during inspection. 13.5 Describe the 4-point inspection method. 13.6 Describe the 4-point inspection method. 14.1 Define fabric relaxation. 14.2 Mention the fabric relaxation time for different types of fabric.	3	6
14	Spreading 14.3 Define fabric spreading. 14.4 List down the pre-requirements of fabric spreading. 14.5 Describe the methods of fabric spreading. 14.6 Describe types of fabric lays. 14.7 Describe each type of fabric package. 14.8 Classify fabric spreading machines. 14.9 Describe the manual fabric spreading. 14.10 Describe the automatic fabric spreading machine.	3	6
15	Fabric Cutting 15.1 State fabric cutting. 15.2 List down the requirements of fabric cutting. 15.3 Describe the methods of fabric cutting. 15.4 List down the names of the manual cutting machine. 15.5 List down the names of computerized cutting machines. 15.6 Describe Straight knife and Band knife cutting machine. 15.7 Mention the merits of straight knife cutting machine. 15.8 Describe the uses of band knife cutting machine. 15.9 Point out the feature of die-cutting and drill machines. 15.10 Describe a computerized fabric cutting (CAM) machine.	5	8
Total		48	90

Detailed Syllabus (Practical)

SL No.	Topics with Contents	Class (3Period)	Continuous Marks
1	<p>Observe Layout Plan of Apparel Manufacturing Lab.</p> <p>1.1 Observe the present layout condition of the apparel manufacturing lab.</p> <p>1.2 Replicate the apparel manufacturing laboratory layout in A4 size paper maintaining measurement ratio.</p> <p>1.3 Measure the dimensions of all machinery that exists in the apparel manufacturing laboratory.</p> <p>1.4 Measure machine to machine distance and machine to wall distance.</p> <p>1.5 Perform total space utilization from taken measurements.</p> <p>1.6 Maintain the record of the performed experiment.</p>	1	2.5
2	<p>Observe Human Body Anthropometry</p> <p>2.1 Observe different points of men's body measurement.</p> <p>2.2 Observe different points of women's body measurement.</p> <p>2.3 Sketch the human body with the aid of measured points.</p> <p>2.4 Identify body measurements.</p> <p>2.5 Maintain the record of the performed experiment.</p>	1	2.5
3	<p>Observe Basic Components of Top and Bottoms</p> <p>3.1 Draw a flat sketch of the basic shirt on A4 size paper.</p> <p>3.2 Identify the components of a basic shirt.</p> <p>3.3 Design a flat sketch of a basic trouser on A4 size paper.</p> <p>3.4 Identify the components of a basic trouser.</p> <p>3.5 Maintain the record of the performed experiment.</p>	1	2.5
4	<p>Observe Pattern Making of a Basic T-Shirt</p> <p>4.1 Find out the Point of Measures (POM) from Specification Sheet (Spec Sheet) / Technical Package (Tech Pack) of a basic T-shirt.</p> <p>4.2 Select the appropriate base size of a basic T-Shirt.</p> <p>4.3 Create different pattern pieces of a basic T-shirt according to the measurement.</p> <p>4.4 Sketch notch mark and grain-line of a basic T-shirt.</p> <p>4.5 Maintain the record of the performed experiment.</p>	2	2.5
5	<p>Observe Pattern Grading of a basic T-Shirt</p> <p>5.1 Select zero point of the front part, back part, and sleeve for grading.</p> <p>5.2 Select grade points for a specific pattern of a basic T-shirt.</p> <p>5.3 Choose the rule setting of a specific pattern for a basic T-shirt.</p> <p>5.4 Calculate grading increment values of the front part, back part, and sleeve of a basic T-shirt.</p> <p>5.5 Perform pattern grading according to the grading increment calculation of a basic T-shirt.</p> <p>5.6 Maintain the record of the performed experiment.</p>	2	2.5
6	<p>Observe Marker Making and Cutting of a basic T-Shirt</p> <p>6.1 Calculate size ratio from the order of a basic T-shirt.</p> <p>6.2 Arrange the pattern pieces according to design and grain-line a basic T-shirt.</p>	2	2.5

	<p>6.3 Construct the outlines of pattern pieces over marker paper for marker making of a basic T-shirt.</p> <p>6.4 Perform fabric spreading according to the fabric characteristics of a basic T-shirt.</p> <p>6.5 Place the marker paper on the fabric lay.</p> <p>6.6 Perform cutting operation for the basic T-Shirt panels.</p> <p>6.7 Maintain the record of the performed experiment.</p>		
7	<p>Observe Pattern Making of a basic pant</p> <p>7.1 Find out the Point of Measures (POM) from Specification Sheet (Spec Sheet) / Technical Package (Tech Pack) of a basic pant.</p> <p>7.2 Select the appropriate base size of basic pant.</p> <p>7.3 Create different pattern pieces of a basic pant according to the measurements.</p> <p>7.4 Sketch notch mark and grain-line of a basic pant.</p> <p>7.5 Maintain the record of the performed experiment.</p>	1	2.5
8	<p>Observe Pattern Grading of a basic pant</p> <p>8.1 Select zero point of the front part, back part, pocket, fly piece, waistband, and pocket facing for grading of a basic pant.</p> <p>8.2 Select grade point for a specific pattern of a basic pant.</p> <p>8.3 Choose the rule setting of a specific pattern of a basic pant.</p> <p>8.4 Calculate grading increment values of the front part, back part, pocket, fly piece, waistband, and pocket facing of a basic pant.</p> <p>8.5 Perform pattern grading according to the grading increment calculation of a basic pant.</p> <p>8.6 Maintain the record of the performed experiment.</p>	2	2.5
9	<p>Observe Marker Making and Cutting of a basic pant</p> <p>9.1 Calculate size ratio from the order of a basic pant.</p> <p>9.2 Arrange the pattern pieces according to design and grainline of a basic pant.</p> <p>9.3 Construct the outlines of pattern pieces over marker paper for marker making of a basic pant.</p> <p>9.4 Perform fabric spreading according to the fabric characteristics.</p> <p>9.5 Place the marker paper on the fabric lay.</p> <p>9.6 Perform cutting operation of different panels of a basic pant.</p> <p>9.7 Maintain the record of the performed experiment.</p>	2	2.5
10	<p>Operate Straight Knife and Band Knife Cutting Machine</p> <p>10.1 Identify the different components of Straight Knife and Band Knife cutting machine.</p> <p>10.2 Perform cutting operations.</p> <p>10.3 Identify the safety points of the cutting machine during operation.</p> <p>10.4 Maintain the record of the performed experiment.</p>	2	2.5
Total		16	25

Necessary Resources (Tools, Equipment, and Machinery):

SL No.	Item Name	Quantity (piece/s)
01	Measurement tape	20 Pcs
02	Pattern board	50 Pcs
03	Marker paper	30yds
04	Straight knife cutting machine	1unit
05	Band knife cutting machine	1unit

06	Safety gloves for cutting	2 Pcs
07	Scissors	6 Pcs
08	Chalk	3Box
09	Long straight scale	12 pcs
10	Curve scale	12 pcs
11	French curve (as per requirement)	12 pcs
12	Single Jersey fabric	As per requirement
13	Denim fabric	As per requirement
14	Woven fabric	As per requirement
15	Pocketing fabric	As per requirement
16	Cutting table	1 unit

Recommended Books:

SL No.	Book Name	Writer Name	Publisher Name & Edition
01	An introductory knowledge about garment manufacturing technology	Abu Nafiz, Md. SaifulAzam, Md. Abu Saleh.	Books Fair, 2 nd Edition
02	Garments & Technology	M. A. Kashem	GranthonirProkashoni, 3 rd Edition
03	Technology of Clothing Manufacture	Carr and Latham	Wiley, 2 nd Edition
04	Cooklin's Garment Technology for Fashion Designers	Steve Hayes, John McLoughlinand DorothyFairclough	Blackwell Publishing, Fourth Edition

Website References:

SL No.	Web Link	Remarks
01	https://www.youtube.com/c/VisualLearningwithMazhar	
02	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=827	
03	https://www.youtube.com/c/Vidyamitra/playlists	
04	https://www.textileblog.com/200-apparel-terms-and-definitions-for-professionals/	

Engr. Mamtaz Uddin Ahmed

Former Principal
Directorate of Textiles,
Ministry of Textiles & Jute

Engr. Shah Alam

Principal
Bhaluka Textile Engineering
Institute

Lutfor Rahman Shanzid

Assistant Professor (Textile)
Primeasia University

Mahmood ul Islam

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Crown RMG

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Planning Manager
Anwara Composite Mills Ltd.

DIPLOMA IN TEXTILE ENGINEERING
SYLLABUS
PROBIDHAN-2022
APPAREL MANUFACTURING (14)
4thSEMESTER

Subject Code	Subject Name	Period per Week		Credit
26811	BASIC ELECTRONICS	T	P	C
		2	3	3

Rationale	Electronic devices have become an important part of our day-by-day life. Now a days it is difficult for us to live without electronic device. We live in a generation that uses electronics and smart technologies. Where robots and artificial intelligence is capable of doing human works in all technological equipment with more ease and efficiency. Operation of all machines, devices and equipment are controlled by electronic device and circuits. This subject covers only such topics which will enable the diploma engineers to identify and maintenance the electronics parts and able to proper fault finding.
Learning Outcome (Theoretical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Describe soldering • Determine the value of Capacitor & Resistor using numeric and color code. • Describe Semiconductor and Semiconductor Diode. • Describe Rectifier circuits • Explain Construction and characteristics of PNP and NPN Transistor. • Explain the construction and operation of Single and Multi stage amplifier
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Perform soldering. • Calculate values of different resistors and capacitors with the help of color code. • Check the semiconductor diode and Determine characteristics of Diode • Verify the wave-shape of half-wave and full wave rectifier circuit • Test special diodes. • Verify the bipolar junction transistor characteristics. • Determining Q-Point and gain of transistor amplifier. • Determining frequency response of single stage R-C coupled transistor amplifier.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (3 Period)	Final Marks
1.	SOLDERING AND COLOR CODE 1.1 Define soldering. 1.2 List the materials of soldering. 1.3 Describe the steps of soldering. 1.4 Mention the properties of a good soldering joint. 1.5 Describe the active and passive components used in electronic circuits. 1.6 Mention the function of resistor, capacitor and inductor in electronic circuits. 1.7 Describe the procedure of determining the value of Capacitor, & Resistor using numeric and color code.	3	4
2	SEMICONDUCTOR 2.1 Define conductor, semiconductor and insulator. 2.2 Describe semiconductor with atomic structure. 2.3 Describe the effect of temperature on conductivity of Semiconductor. 2.4 Classify Semiconductor. 2.5 List the commonly used semiconductor 2.6 Describe the formation of P-type and N-type semiconductor. 2.7 Describe the charges on N-type and P-type Semiconductor 2.8 Explain the majority & minority charge carriers of P-type & N-Type Semiconductor.	3	4
3	SEMICONDUCTOR DIODE 3.1 Define PN junction diode 3.2 Describe the formation of PN junction. 3.3 Explain forward and reverse bias in PN junction. 3.4 Explain the forward and reverse Voltage-Current (VI) characteristics curve of PN junction diode. 3.5 Define load line, static resistance, (iii) dynamic resistance, 3.6 Define forward breakdown voltage, (v) Peak inverse voltage (PIV) and (vi) Reverse break down voltage. 3.7 Describe the specification of PN Junction diode.	3	4
4	SPECIAL DIODES 4.1 Define Zener Diode. 4.2 Describe the operation of Zener diode. 4.3 Explain Volt-Ampere (VI) characteristics of Zener diode. 4.4 Describe the application of Zener diode in, voltage stabilization, meter protection and peak clipper circuits. 4.5 Describe the construction, operation and application of Tunnel diode, Varactor diode, Schottky diode, Step-Recovery diode, PIN diode, LED, LCD, photo diode and Solar cell.	3	4

5	<p>DC POWER SUPPLY</p> <p>5.1 Define dc power supply</p> <p>5.2 Describe importance of dc power supply.</p> <p>5.3 Compare regulated and unregulated power supply.</p> <p>5.4 Describe the operation of a typical regulated dc power supply with block diagram.</p> <p>5.5 Define rectifier and rectification.</p> <p>5.6 Explain the operation of half wave, full wave and bridge rectifier circuit.</p> <p>5.7 Determine the ripple factor, efficiency and TUF of half wave, full wave and bridge rectifier.</p> <p>5.8 Explain the operation of capacitor, inductor-capacitor and pi (π) filter circuit.</p> <p>5.9 Solve problem related to ripple factor, efficiency and TUF.</p>	3	8
6	<p>BIPOLAR JUNCTION TRANSISTOR (BJT)</p> <p>6.1 Define Transistor.</p> <p>6.2 Describe the construction of PNP and NPN Transistor.</p> <p>6.3 Explain the mechanism of current flow of PNP and NPN Transistor.</p> <p>6.4 State the biasing rules of BJT.</p> <p>6.5 Establish the relation among Base, Emitter and Collector current ($I_E = I_C + I_B$).</p>	2	4
7	<p>Transistor Characteristics</p> <p>7.1 Describe three basic transistor configuration (CB, CC, CE) circuits.</p> <p>7.2 Explain the characteristics curve of CB, CC and CE transistor configurations.</p> <p>7.3 Describe current amplification factor α, β and γ.</p> <p>7.4 Establish the relation among α, β and γ.</p> <p>7.5 Solve problem related to I_E, I_C, I_B, α, β and γ</p>	3	4
8	<p>TRANSISTOR BIASING AND STABILIZATION</p> <p>8.1 Define load line, Operating point, stability and stabilization.</p> <p>8.2 State the biasing rule of transistor.</p> <p>8.3 Describe faithful amplification.</p> <p>8.4 Describe the methods of drawing DC load line.</p> <p>8.5 Explain the leakage current in CB & CE circuits.</p> <p>8.6 List the factors affecting stability of Q-points.</p> <p>8.7 Describe various methods of transistor biasing.</p> <p>8.8 Determine the stability factor of various transistor biasing circuits.</p> <p>8.9 Solve problem related to components values, Q-Points and stability factor.</p>	4	8

9	SINGLE STAGE TRANSISTOR AMPLIFIER 9.1 Define amplifier and single stage amplifier. 9.2 Mention the types of amplifiers. 9.3 Explain operation of transistor as amplifier with graphical demonstration. 9.4 Describe the operation of voltage divider biased CE amplifier circuit. 9.5 Explain the phase reversal of CE amplifier. 9.6 Draw DC and AC equivalent circuit of voltage divider biased CE amplifier circuit. 9.7 Determine the AC equivalent load resistance of the CE amplifier circuit. 9.8 Determine voltage and power gain of the CE amplifier circuit. 9.9 Solve problem related to voltage and power gain where β and input resistance of the transistor are given.	4	10
10	MULTISTAGE TRANSISTOR AMPLIFIER 10.1 Define Multi stage amplifier. 10.2 Describe role of capacitor in single stage amplifier. 10.3 Describe gain, decibel gain frequency response, half power point, 3db point and bandwidth. 10.4 Mention the advantages of dB gain. 10.5 Describe the operation of RC coupled, Transformer coupled and direct coupled multistage amplifier. 10.6 Explain the frequency response of RC coupled, Transformer coupled and direct coupled multistage amplifier. 10.7 Mention the advantages and disadvantages of RC coupled, Transformer coupled and direct coupled multistage amplifier. 10.8 Solve problem related to voltage and power gain where β and input resistance of the transistor are given.	4	10
Total		32	60

Detailed Syllabus (Practical)

Unit	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	Solder & de-solder of electronic components and wires to the other components and circuit boards. 1.1. Select electronic components, wires and PCB. 1.2. Select the rating of the soldering iron suitable for the work piece. 1.3. Clean and tin both iron & work piece. 1.4. Feed new soldering materials to the tinned and heated joint in order to produce a correct soldering.	1	3

	<p>1.5. Check the quality of soldering.</p> <p>1.6. Clean and tin iron and de-solder the joint and components.</p> <p>1.7. Use solder suckers and solder braid for de-soldering.</p> <p>1.8. Maintain the record of performed job.</p>		
2	<p>Determine the values of different resistors, capacitors and inductor.</p> <p>2.1 Select resistors, capacitors and inductors of different values.</p> <p>2.2 Identify the colors or numeric code</p> <p>2.3 Determine the value of resistors, capacitor and inductor with tolerance.</p> <p>2.4 Maintain the record of performed job.</p>	1	2
3	<p>Sketch forward and reverse characteristics curves of a semiconductor diode.</p> <p>3.1 Select meter, power supply, components and materials.</p> <p>3.2 Complete circuit according to circuit diagram for forward bias.</p> <p>3.3 Check all connections.</p> <p>3.4 Apply different forward voltage and measure corresponding forward current.</p> <p>3.5 Record results in tabular form.</p> <p>3.6 Connect circuit according to circuit diagram of reverse bias.</p> <p>3.7 Apply different reverse voltage and measure corresponding forward current.</p> <p>3.8 Record results in tabular form.</p> <p>3.9 Sketch the VI curves from collected data.</p> <p>3.10 Maintain the record of performed job.</p>	1	2
4	<p>Sketch waves of half-wave and full-Wave rectifier circuit</p> <p>4.1 Select meter, component, oscilloscope and materials.</p> <p>4.2 Complete circuit of a half wave rectifier according to the circuit diagram.</p> <p>4.3 Check the circuit before operation.</p> <p>4.4 Measure the input and output voltage and observe wave shapes in the oscilloscope.</p> <p>4.5 Sketch the input and output voltage wave shapes.</p> <p>4.6 Maintain the record of performed job.</p>	1	3
5	<p>Testing special diodes.</p> <p>5.1 Select different types of special diodes.</p> <p>5.2 Set the AVO meter in the ohm scale.</p> <p>5.3 Measure resistances for each of two terminals.</p> <p>5.4 Determine the condition (good and bad).</p> <p>5.5 Determine the different terminals.</p> <p>5.6 Maintain the record of performed job.</p>	2	2
6	<p>Identifying the type and terminals of bipolar junction transistor.</p>	2	3

	<p>6.1 Select PNP and NPN bipolar junction transistors.</p> <p>6.2 Take AVO and manufacturer's literature of transistor.</p> <p>6.3 Identify transistor terminals.</p> <p>6.4 Measure base-emitter and base-collector resistance.</p> <p>6.5 Determine the specifications with the help of manufacturer's literatures.</p> <p>6.6 Identify PNP, NPN transistors. Base, Collector and Emitter.</p> <p>6.7 Maintain the record of performed job.</p>		
7	<p>Determining input and output characteristics of a transistor in common emitter connection.</p> <p>7.1. Select DC power supply units, AVO meters, circuit board, components, and required materials.</p> <p>7.2. Construct the circuit.</p> <p>7.3. Adjust the voltage to appropriate point.</p> <p>7.4. Record input and output voltage and current.</p> <p>7.5. Plot the curve with recorded data.</p> <p>7.6. Determine the value of β.</p> <p>7.7. Maintain the record of performed job.</p>	2	2
8	<p>Determine the Q- point of R-C coupled CE transistor amplifier.</p> <p>8.1. Draw the circuit diagram for the experiment.</p> <p>8.2. Collect tools, equipment and materials.</p> <p>8.3. Make all the connections according to the circuit diagram.</p> <p>8.4. Check the connections.</p> <p>8.5. Energize the circuit and record the Collector emitter voltage and collector current.</p> <p>8.6. Draw the load line and locate the Q-Point on the load line.</p> <p>8.7. Maintain the record of performed job.</p>	2	3
9	<p>Determine the voltage gain of CE transistor amplifier.</p> <p>9.1. Draw the circuit diagram of CE transistor amplifier.</p> <p>9.2. Collect required tools, equipment and materials.</p> <p>9.3. Make all the connections according to the circuit diagram.</p> <p>9.4. Check the connections and Q-Point.</p> <p>9.5. Energize the circuit and record the input and output voltage.</p> <p>9.6. Calculate the voltage gain.</p> <p>9.7. Maintain the record of performed job.</p>	2	2
10	<p>Demonstrate the frequency response of single stage R-C coupled CE transistor amplifier.</p> <p>10.1. Draw the circuit diagram for the experiment.</p> <p>10.2. Collect required tools, equipment and materials.</p> <p>10.3. Make all the connections according to the circuit diagram.</p> <p>10.4. Check the connections.</p> <p>10.5. Energize the circuit and record the data.</p> <p>10.6. Draw the frequency response curve from the data.</p> <p>10.7. Maintain the record of performed job.</p>	2	3
	Total	16	25

Necessary Resources (Tools, Equipment and Machinery):

Sl. No.	Item Name	Quantity
1	Soldering Iron with Stand, De-soldering gun, Third Hand, Hot air gun, Iron Sponge, AVO Meter, Flat screw driver, Philips screw driver, Cutting pliers, Nose pliers, Automatic multifunction wire stripper. Tester, Knife, Power extension board.	30 Nos
2	DC power Supply, Function generator, Oscilloscope, Analog Electronics Trainer, Power project board/ bread board, Center taps Transformer (220/12V, 2A, 5A)	10 nos
3	Diode, Resistor, Potentiometer, Inductor, Capacitor, Transistor, LED, Zener Diode, Photo Diode. Tunnel diode, Varactor diode, Schottky diode, Step-Recovery diode, PIN diode, LCD and Solar cell.	50 nos
4	Resin, soldering lead, Soldering tip, Fixable wire, Wire Brush	as required

Recommended Books:

Sl No.	Book Name	Writer Name	Publisher Name & Edition
1	Principles Of Electronics	V. K. Mehta	S.Chand
2	Basic Electronics (Solid State)	B. L. Theraja	S. Chand

Website References:

Sl. No.	Web Link	Remarks
1	https://www.youtube.com/channel/	
2	https://youtu.be/qsWkA-5grogo	
3	https://youtu.be/eXyGIPrD5Qk	
4	https://you.be/f-WiulYIrow	

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