

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech in Apparel Production Management (APM)
(Applicable from the academic session 2018-2019)

Mathematics III (BS TT 401)

Name of the Course:	Mathematics III
Course Code: BS TT 401	Semester: IV
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Exam.: 15 Marks
Tutorial: Nil	Assignment & Quiz: 10 (=8+2) Marks
	Attendance: 5 Marks : 5
Practical: hr./week	End Semester Exam.: 70 Marks
Credit Points: 3	

Objective:

1	To gather knowledge about different numerical methods required to solve numerically different systems.
2	To have basic understanding of Laplace transform to be applied to solve different problems.
3	To understand the basic idea of partial differential equations with different solution procedure.
4	To provide understanding of basic probability theory including random variables, distribution functions.
5	To understand the basic idea of statistics including measures of central tendency, correlation and regression

Pre-Requisite:

1	BS-M102
2	ES-CS201, BS-M202
3	ES-CS291

End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.

Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 4	10	10				
B	1 to 4			6	3	5	15
C	1 to 4			6	3	15	45

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

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Unit	Content	Hrs/Unit	Marks/Unit
1	<p>Numerical Methods: Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. (2L) Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. (4L) Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. (3L) Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method. (4L) Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method. (4L) Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method. (5L)</p>	22	50
2	<p>Laplace Transform (LT): Definition; Existence of LT; LT of elementary functions; First and second shifting properties; Change of scale property; LT of derivative of functions. LT of $t^n f(t)$, LT of $\frac{f(t)}{t^n}$; LT of periodic function and unit step function. Convolution theorem (statement only). (4L) Inverse LT; Solution of ODE's (with constant coefficients) using LT. (3L)</p>	7	15
3	<p>Partial Differential Equations: Solution of one dimensional wave equation, One dimensional heat-conduction equation, Laplace equation in two dimension by the methods of 1: Separation of variables 2: Laplace Transform. (4L)</p>	4	10
4	<p>Probability and Statistics: Random Variable: Definition of random variable. Continuous and discrete random variables. Probability density function & probability mass function for single variable only. (2L) Probability Distributions: Distribution function and its properties (without proof), examples. Discrete distributions, some important discrete distributions: Binomial & Poisson distributions and related problems. Continuous distributions, Some important continuous distributions: Uniform, Exponential, Normal distributions and related problems. (2L) Expectation: Definitions of Expectation & Variance, properties & examples. Determination of Mean & Variance of continuous and discrete distributions. 3L Measures of Central tendency, Moments, Skewness and Kurtosis, Correlation and regression, Rank correlation. (3L) Curve fitting by the method of least squares- fitting of straight lines, second degree parabola. (2L)</p>	12	25

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	Total	45	100

Text and reference books:

- 1) Erwin Kreyszig, Advanced Engineering Mathematics.
- 2) Chandrika Prasad & Reena Garg, Advanced Engineering Mathematics (Khanna Publishing House).
- 3) B.S. Grewal, Higher Engineering Mathematics.
- 4) S. Ross, A First course in Probability.
- 5) J.B. Scarborough, Numerical Mathematical Analysis.
- 6) Jain, Iyengar & Jain, Numerical Methods (Problems and Solutions)
- 7) S.A. Mollah, Numerical Analysis and Computational Procedure.
- 8) A.P. Baisnab & M Jas, Elements of Probability and Statistics.

Course Outcome:

At the end of the course, it is expected that the students

- 1) Have a clear knowledge about Laplace transforms and partial differential equations.
- 2) Will learn the concepts of discrete and continuous random variables and the basic idea of statistics.
- 3) Can solve problems related to textile technology by applying different numerical techniques.

Special Remarks (If any): NIL

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Numerical Methods Lab ES TT 491

Name of the Course:		Numerical Methods Lab
Course Code: ES TT 491		Semester: 4
Duration: 6 months		Maximum Marks: 100
Teaching Scheme		Examination Scheme
Theory		Continuous Internal Assessment:
Tutorial: Nil		External Assessment: 60
Practical: 2 hr./week		Distribution of marks: 40
Credit Points: 1		
Course Outcomes:		
1	Student will be able to apply the acquired knowledge ES TT 401	
2	Students will be able to solve the mathematical equation by numerical methods.	
	Students will be able to handle and apply the application software.	
Pre-Requisite:		
1	BS –M 102	
2	BS TT 401	
3	ES- CS 201, ES-CS291	
Practical: 10 number of experiments		
	1) Intellectual skills- 70	
	2) Motor skill- 30	

Laboratory Experiment:	
1	Assignments on Newton forward /backward interpolation formula.
2	Assignment on Lagrange's interpolation formula.
3	Assignments on numerical integration using Trapezoidal rule.
4	Assignments on numerical integration using Simpson's 1/3 rule.
5	Assignments on numerical solution of a system of linear equations using Gauss elimination method
6	Assignments on numerical solution of a system of linear equations using Gauss-Seidel iteration method.
7	Assignments on numerical solution of Algebraic Equation by Regular-falsi method.
8	Assignments on numerical solution of Algebraic Equation by Newton Raphson method.
9	Assignments on ordinary differential equation: Euler's method.
10	Assignments on ordinary differential equation: Runga-Kutta method

Text and reference books:

Special Remarks (If any): NIL

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Digital Electronics & Microprocessor (ES TT 401)

Name of the Course:	Digital Electronics & Microprocessor
Course Code: ES TT 401	Semester: IV
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 2hrs./week	Mid Semester Exam.:15Marks
Tutorial:	Assignment & Quiz: 10 (=8+2)Marks
	Attendance: 5Marks : 5
Practical:	End Semester Exam.: 70 Marks
Credit Points:2	

Objective:

1	To enable the students to understand the basic concepts of Boolean Algebra and learn the use of the digital logic gates.
2	To familiarize the students with different combinational and sequential digital circuit designs and A/D and D/A conversion techniques.
3	To illustrate them the basic concepts of Microprocessors and Microcontrollers and enable them to implement Microprocessor- and Microcontroller-based system designs using assembly language programming.

Pre-Requisite:

1	General physics – Class 10+ 2, BS-PH101
2	Basic Electrical Engineering ES –EE 101

End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.

Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 3	10	10				
B	1 to 3			6	3	5	15
C	1 to 3			6	3	15	45

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Unit	Content	Hrs/Unit	Marks/Unit
1. Number Systems, Boolean Algebra and Basic Logic Gates.	Review of Number System: Decimal, Binary, and Hexadecimal number systems. Conversion from one system to another, Signed numbers Representation. BCD Numbers. Concept of parity.	3	20

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	<p>Boolean Algebra and Logic Simplification: Basic Binary Operations, Basic Laws of Boolean Algebra, De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh's map.</p> <p>Digital Logic Gates: Definitions, symbols and truth table of NOT, OR, AND, NAND, NOR, XOR, XNOR gates, De Morgan's theorems; Realization of basic gates using universal gates; Realization of simple Boolean equations using universal gates.</p>		
2. Digital Logic Design and Data Conversion and Transmission Techniques.	<p>Combinational Logic Design: Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer, Parity Generator, Half and Full Adder and Subtractor Circuits, Serial and Parallel Adders, Conditional Adder-Subtractor Circuit, Basic Concept on ALU Design.</p> <p>Sequential Logic Design: Latches, Flip-flops: S-R, D, J-K, T, Triggering of Flip-flops, Master/Slave Configuration, Excitation Tables and Timing Diagrams, Synchronous UP/Down Counter, Shift registers - SISO, SIPO, PIPO, PISO, Basic Memory Devices ROM and RAM: Addressing Techniques and Block Diagrams.</p> <p>Data Conversion and Transmission Techniques: A/D and D/A Converters, Serial and Parallel Data Transmission.</p>	12	40
3. Basics of Microprocessors and Microcontrollers and their Application in Textile Industry	<p>Introduction to Microprocessors: Evaluation of microprocessors, Microcomputer Organization: ALU, Memory, I/O Devices and Buses, Operating System, Assembler, Compiler.</p> <p>Introduction to Intel 8085 8-bit Microprocessor: Programming and Hardware Models of 8085, Buses, Flags and Register Organization, Pin Description, Memory Interfacing, Instruction Sets, Addressing Modes, Machine Cycles and Bus Timings, Programming in machine and assembly languages, Counters and Time Delays, Stack & Subroutines, Interrupts.</p> <p>Interfacing Peripherals (I/Os): Programmable peripheral interface (8255), Programmable Interrupt Controller (8259A), Direct Memory Access (8237), Programmable Keyboard/Display Interface (8279), Interfacing A/D and D/A convertor.</p> <p>Introduction to Intel 8051 8-bit Microcontroller: Difference between Microprocessor and Microcontrollers., 8051 Microcontroller: Architecture, Pin and Port Description.</p> <p>Applications of Microprocessors/Microcontrollers in Textile Industry: Temperature control, Water Level</p>	15	40

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	Control, Flow Control, Moisture Control, Stepper Motor Speed Control, pH Level control.		
	Total	30	100

Text and reference books:

1. M. Morris Mano - Digital Logic and Computer Design - PHI
2. Leach, Malvino et al. - Digital Principles and Applications – McGraw Hill
3. R. P. Jain – Modern Digital Electronics – McGraw Hill
4. S. Salivahanan and S. Arivazhagan – Digital Circuits and Design – Oxford
5. Floyed& Jain - Digital Fundamentals - Pearson.
6. Ramesh Gaonkar - Microprocessor Architecture, Programming and Applications with the 8085 – Penram International Publishing.
7. Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publishing
8. Mazidi - The 8051 Microcontroller and Embedded Systems: Using Assembly and C - Pearson

Course Outcome:

At the end of this course students will be able to –

1. Develop digital logics to solve real life problems, and synthesize them using basic logic gates and the universal logic gates
2. Analyze, design and implement different combinational logic circuits
3. Analyze, design and implement different sequential logic circuits
4. Analyze different data transmission techniques and A/D and D/A convertor circuits
5. Draw and Describe Architecture of 8085 Microprocessor and 8051 Microcontroller
6. Write assembly language programs for 8085 microprocessors and analyze the interfacing with various I/Os.
7. Design microprocessor or microcontroller based systems for various Textile Engineering applications.

Special Remarks (If any): Nil

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Digital Electronics & Microprocessor Lab (ES TT 492)

Name of the Course:		Digital Electronics & Microprocessor Lab
Course Code: ES TT 492		Semester: IV
Duration: 6 months		Maximum Marks: 100
Teaching Scheme		Examination Scheme
Theory:		Continuous Internal Assessment:
Tutorial: Nil		External Assessment: 60
Practical: 3 hr./week		Distribution of marks: 40
Credit Points: 1.5		
Course Outcomes:		
At the end of this course students will be able to -		
1	Apply the knowledge of digital electronics to identify the logic gates (IC), design and implement digital circuits like adder, subtractor etc.	
2	Identify the use of multiplexers/demultiplexers and encoders/decoders in combinational circuit design.	
3	Apply the knowledge of flip-flop to realise them with logic gates	
4	Identify and demonstrate the different components present in the 8085 trainer kit	
5	Develop different assembly language programs of arithmetic and logical operations	
6	Apply the knowledge of digital electronics and microprocessors to solve a real life problem	
Pre-Requisite:		
1	General physics - BS-PH101	
2	Basic Electrical Engineering ES –EE 101	
Practical: 15 number of experiments		
	3)	Intellectual skills- 60 % (average)
	4)	Motor skill- 40% (average)

Laboratory Experiment:	
1	Familiarization with the digital ICs and Study of basic logic gates.
2	Realization of basic logic gates using universal logic gates
3	Construction of Multiplexer and Demultiplexer circuits using logic gates.
4	Construction of Encoder and Decoder circuits using logic gates.
5	Implementation of Half Adder and Full Adder circuits using basic logic gates
6	Realisation of RS-JK & D flipflop using logic gates.
7	Introduction to the architecture of 8085 microprocessor kit
8	Write an assembly language program to move a data block without overlap.
9	Write an assembly language program to perform addition or subtraction of two 8 bit numbers using 8085 instruction set.
10	Write an assembly language program to add BCD numbers using 8085

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	instruction set
11	Write an assembly language program to find the smallest and the largest number from a list of N numbers.
12	Write an assembly language program to implement multiplication of two 8-bit numbers by successive addition method.
13	Write an assembly language program to sort a list of N numbers in ascending/descending order

Text and reference books:

1. M. Morris Mano - Digital Logic and Computer Design - PHI
2. Floyed& Jain - Digital Fundamentals - Pearson.
3. Ramesh Gaonkar - Microprocessor Architecture, Programming and Applications with the 8085 – Penram International Publishing.

Special Remarks (If any): NIL

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Textile Fabric Formation (PC APM 401)

Name of the Course:	Textile Fabric Formation
Course Code: PC APM 401	Semester: IV
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Exam.:15Marks
Tutorial: Nil	Assignment & Quiz: 10 (=8+2)Marks
	Attendance: 5Marks : 5
Practical: hr./week	End Semester Exam.: 70 Marks
Credit Points: 3	

Objective:

- 1** To introduce the basic concepts of fabric manufacturing to the student of APM.
- 2** To create interest among students and work on their analytical ability
- 3**

Pre-Requisite:

- 1** ES TT 301, ES TT 391
- 2** PC APM 301, PC APM 391

End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.

Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 8	10	10				
B	1 to 8			6	3	5	15
C	1 to 8			6	3	15	45

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction to textile fabric: Definition of fabric; requirement of fabric for human beings; different types of fabric, such as woven, knitted, non-woven, braid etc. and their formation methodology and field of applications.	3	5
2	Weaving process: Principle of woven fabric formation; different fabric terminology, such as warp, weft, ends, picks, thread density, thread spacing, fabric areal density, selvage etc. different types of looms; flow process sequence of in fabric formation; passage of warp yarn in looms; introduction to weaving preparatory process, such as sizing, pirn winding, warping, drawing and denting; introduction to various primary, secondary and auxiliary motions in	8	20

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	loom		
3	Shedding: Introduction to different types of shedding mechanism in loom, tappet, dobby and jacquard shedding with relative merits and demerits. Shedding principle in tappet shedding, dobby shedding, Jacquard shedding; positive and negative shedding; heald, read and dent calculation in loom.	5	10
4	Picking and beatup: Introduction to different types of picking; comparisons between shuttle and shuttle-less picking; brief concept of cone over picking and under picking; principle of picking in shuttle and different shuttle-less picking mechanism; Calculation of fabric length, production rate in loom; concept of loom type, loom width and loom speed in different types of picking; Introduction to different types of selvage; principle of beatup mechanism in loom. Different types of betup mechanism	8	20
5.	Secondary and Auxiliaries motion: Introduction to letoff and takeup mechanism. Concept of negative and positive letoff and takeup; Concept of change of picks spacing in loom; brief introduction to warp stoop motion, warp protector and weft stoop motion.	3	5
6.	Knitting process: Introduction to knitted fabric. Different fabric terminology, wales, course, loop length, fabric areal density; field of application of knitted fabric; brief comparison with woven fabric. Basic loop formation principle. Concept of warp and weft knitting; introduction to knit, tuck and flat loop; brief introduction of rib, purl and interlock knitting.	5	10
7.	Nonwoven: definition, classification, field of application; concept of web formation and bonding process; different types of web formation and bonding process; Introduction to few web formation, such as parallel laid and cross laid; introduction to needle punching bonding process and thermal bonding; brief comparison between woven, knitted and nonwoven fabric.	5	10
8	Different types of woven fabric: concept of interlacement and float; brief introduction of plain, twill, matt, satin weave. introduction to different plain, twill, rib, basket and satin woven fabric such as gauze, chiffon, voile, muslin, chambray, butter linen, broadcloth, grosgrain, poplin, Bedford cord, dimity, denim, gabardine hopsacking, oxford, duck, canvas, bird's eye, pique, damask, brocade etc.; leno weave; creep fabric; velvets fabric; terry cloth fabric.	8	20
	Total	45	100

Text and reference books:

1. Textile Mathematics by J. E. Booth (Volume III).
2. Yarn winding by Banerjee and Alagirusamy (NCUTE publication).
3. Textile Sizing by Goswami, Anandjiwala and Hall.
4. Weaving mechanism by Marks and Robinson (Textile Institute).
5. Weaving: Conversion of Yarn to Fabric by Lord and Mohamed.
6. Woven cloth construction by Robinson.
7. An introduction to textile mechanisms by P. Grosberg.
8. Sizing - Materials, Methods, Machinery by Ajpgoankar, Talukdar and Wadekar.

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9. Weaving- Machinery, Mechanisms, management by Talukdar, Sriramalu and Ajoankar.

Course Outcome:

On completion of the course students will be able

PC APM 401.1. To understand the basic operations of different components of yarn preparatory machine

PC APM 401.2. To understand basic operations and laws of physics in relation to yarn preparatory mechanism

PC TT 401.3 To Understand basic motions of weaving machine.

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Textile Fabric Formation Lab (PC APM 491)

Name of the Course:	Textile Fabric Formation Lab
Course Code: PC APM 491	Semester: 4
Duration: 6 months	Maximum Marks:
Teaching Scheme	Examination Scheme
Theory	Continuous Internal Assessment:
Tutorial: Nil	External Assessment: 60
Practical: 3 hr./week	Distribution of marks: 40
Credit Points: 1.5	
Course Outcomes:	
1	The student will be able to perform the analysis of various laws of basic physics and mechanics
2	The student will be able to apply the acquired knowledge of PC TAPM 401
3	The student will be able to understand basic preparatory of yarn preparation and fabric formation
4	The student will be able to apply the acquired knowledge of PC TT 401
5	
Pre-Requisite:	
1	PC APM 401
2	ES TT 301
3	
Practical: 13 number of experiments	
	5) Intellectual skills-50
	6) Motor skill-50

Laboratory Experiment:	
1	To study the working of pirn winding machines and prepared shuttle pirn from cone.
2	To study the passage of yarn in shuttle loom.
3	To study the shedding mechanism in tappet shedding loom.
4	To study the picking mechanism in shuttle loom
5	To study the beatup mechanism in shuttle loom
6	To study the takeup mechanism in 7 wheel takeup mechanism and calculate takeup speed.
7	To study the shedding mechanism in dobby loom
8	To study the picking mechanism in rapier loom
9	To study the picking mechanism in airjet loom
10	Observe the comparison between shuttle and shuttle less loom.
11	To perform drawing-in, denting and warp mounting in loom.
12	To study the loop formation in hand driven circular knitting machine.
13	Study of selvedge formation mechanism on a shuttleless loom

Text and reference books:

Special Remarks (If any): NIL

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Chemical Processing of Textile –I (PC APM 402)

Name of the Course:	Chemical Processing of Textile -I						
Course Code: PC APM 402	Semester: IV						
Duration: 6 months	Maximum Marks: 100						
Teaching Scheme	Examination Scheme						
Theory: 3 hrs./week	Mid Semester Exam.:15Marks						
Tutorial: Nil	Assignment & Quiz: 10 (=8+2)Marks						
	Attendance: 5Marks : 5						
Practical: hr./week	End Semester Exam.: 70 Marks						
Credit Points: 3							
Objective:							
1	To acquire the basic knowledge of pretreatment processing of textile fibre/ material						
2	To acquire the knowledge various processing machinery of textile fibre/material						
3							
Pre-Requisite:							
1	BS-CH201						
2							
3							
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 5	10	10				
B	1 to 5			6	3	5	15
C	1 to 5			6	3	15	45
<ul style="list-style-type: none"> Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							

Unit	Content	Hrs/Unit	Marks/Unit
1	<p>Preparatory process in wet processing of cellulosic fibres: Sequence of preparatory chemical process for cellulosic textiles and importance of each step. Difference in process sequence steps between fibre, yarn and fabric form and why. Singeing of yarn and fabric: Objectives & methods- details of gas singeing machine, working principle, process parameters, precautions, advancement Desizing of woven fabric : Objective, methods of desizing process and process parameters, developments in enzymatic process - merits and demerits over other</p>	12	25

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	desizing processes, precautions, evaluation of desizing efficiency, desizing machinery. Scouring : Objective, methods of scouring, mechanism of scouring, scouring equipments, evaluation of scouring efficiency, solvent scouring, enzymatic scouring. Bleaching : Objective, methods of bleaching, different bleaching agents and their relative merits and demerits, mechanisms of bleaching, process parameters, bleaching equipments, evaluation of bleaching efficiency, optical whitening agents. Mercerization of cotton yarn/fabric : Objective, action of alkali on the morphological/fine structure of cellulose, methods- cold and hot, relative merits and demerits, evaluation process. Quality assessment of goods after preparatory process (ready for dyeing goods) Preparation of coloured materials : Process sequence for preparation of coloured goods (fibre dyed / yarn dyed fabric) Nature of problems associated with the preparation of coloured goods, causes and remedies		
2	Preparation of silk and wool : Nature of impurities present, degumming of silk, scouring of wool, bleaching, application of optical whitening on wool and silk for white goods.	4	10
3	Preparation of synthetic fibres and its blends: Heat-setting: objective, different setting methods, effect of heat setting temperature on fibre properties. Singeing of synthetic fibres, their blends; scouring, bleaching, optical whitening.	8	18
4	Basic Principles of Dyeing . Classification of dyes, brief principle of application on various fibres, Different dyeing methods. Exhaust, semi continuous and continuous dyeing range for cellulosic textiles. Dyeing process with direct, reactive, sulphur, vat dyes and application of naphthol-colour on cotton , dyeing of protein fibres with acid dyes, dyeing of synthetic fibres. Different types of Natural dyes and natural dyeing process to colour different types of textile fibres	10	24
5	Principles of different dyeing Techniques for Textile Materials Comparison between Fibre dyeing, Yarn dyeing, fabric dyeing and Garment Dyeing. Introduction to Dyeing machines - hank dyeing, jigger dyeing, winch dyeing and soft flow dyeing machines, continuous dyeing range pad-steam and pad-thermosol. Modern Garment Dyeing Machines. Concept of space dyeing.	10	23
	Total	45	100

Text and reference books:

1. Shenai V.A 'Technology of textile processing' Vol III,V,VII,&VIII Shevak.Publications 1981
2. Textile Scouring and Bleaching by E.R. Trotman
3. Peter R.H.'textile chemistry' Vol I & Vol II extile institute,Manchester 1970
4. Roy Choudhury A.K. "Textile Preparation and Dyeing" Science Publishers USA and Oxford & IBH, India.
5. Roy Choudhury A./K. "Modern Concept of Colour and Appearance" Science Publishers USA and Oxford & IBH, India.
6. Handbook of Fiber Science and Technology, Vol. I, Fundamentals and Preparation, Part A and B by M. Lewin and S.B. Sello,

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7. Datya K.V.,Vaidya AA ‘Chemical processing of synthetic fibres and blends’ John Wiley&Sons,Newyork,1984
8. W D Schindler and P J Hauser, 2004. Chemical Finishing of Textiles (Cambridge, England: Woodhead)

Course Outcome:

The student will be acquainted with the basics and in depth knowledge of preparatory part of textile chemical processing.

Special Remarks (If any):

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Chemical Processing of Textile –I (PC APM 492)

Name of the Course:	Chemical Processing of Textile Lab I
Course Code: PC APM 492	Semester: 4
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory	Continuous Internal Assessment:
Tutorial: Nil	External Assessment: 60
Practical: 3 hr./week/group	Distribution of marks: 40
Credit Points:1.5	
Course Outcomes:	
1	To apply the knowledge of pretreatment process of textile fabric production
2	To understand the machines related to pretreatment process
3	To understand the processing parameter according to the type of materials
Pre-Requisite:	
1	BS-CH201
2	PC APM 402
3	
Practical: 16 number of experiments	
	7) Intellectual skills-50
	8) Motor skill-50

Laboratory Experiment:	
1	Desizing of loom-state cotton cloth
2	Scouring of cotton fibre/yarn/cloth
3	Bleaching of scoured cotton yarn/cloth using hydrogen peroxide
4	Bleaching of jute fabric using hydrogen peroxide
5	Degumming of silk cloth
6	Bleaching of silk cloth using hydrogen peroxide
7	Dyeing of bleached cotton yarn/fabric using direct dye by exhaust method (open bath)
8	Dyeing of cotton yarn/fabric using reactive dyes (cold and hot brand) by exhaust method
9	Dyeing of bleached cotton fabric by cold-Pad-Batch method using reactive dyes
10	Dyeing of bleached cotton yarn/fabric using Vat dye by exhaust method (open bath)
11	Dyeing of bleached cotton yarn/fabric using Naphthol colouration technique.
12	Dyeing of bleached silk/wool using Acid dye by exhaust method (open bath)
13	Dyeing of polyester fabric using Disperse dye by exhaust method (HT/HP)
14	Dyeing of polyester/cotton blended fabric by continuous dyeing system
15	Measurement of colour parameters and whiteness index by reflectance spectrophotometer.
16	Evaluation of colour fastness to washing and rubbing for coloured textiles

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Text and reference books:

Special Remarks (If any): NIL

APPAREL PRODUCTION –II : (Grading, Marker-Planning, Cut-Planning, Spreading PC APM 403)

Name of the Course:	APPAREL PRODUCTION –II : (Grading, Marker-Planning, Cut-Planning, Spreading)
Course Code: PC APM 403	Semester:4th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Exam.:15Marks
Tutorial: Nil	Assignment & Quiz: 10 (=8+2)Marks Attendance: 5Marks : 5
Practical: hr/week	End Semester Exam.: 70 Marks
Credit Points: 3	

Objective:

1	To impart knowledge of National and International standards of Garment size .
2	To impart the theoretical knowledge about how to increase or decrease any pattern in proportion.
3	To impart mathematical and numerical knowledge for efficient and optimum Marker Planning.
4	To impart mathematical and numerical knowledge about cut planning and spread planning for efficient execution of garment production.
5	To Impart scientific knowledge about application of different types of Marker and Spread for different fabric types.

Pre-Requisite:

1	Knowledge of Planar and solid geometry
2	Knowledge of shapes, curves, basic human anatomy.
3	Mathematical and numerical skill. BS-M102
3	Elementary drawing skill ES-ME 291, PC APM302

End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.

Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer'	Marks per question	Total marks
A	1 to 8	10	10				
B	1 to 8			6	3	5	15
C	1 to 8			6	3	15	45

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions

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should be given on top of the question paper.

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction to Grading History. National and International standards, units and terminologies of Garment Size for different types of garments of different age groups and genders.	2	4
2	Principles of grading- Manual Grading & Computerized Grading , Stack and Track methods, Different types of grading- horizontal, vertical and diagonal . Principles of Grading by Slash-and-spread method and Pattern-shifting method. Introduction to Three Dimensional Grading , and its applications	6	14
3	Grading of basic shirt- basic bodice block- front and back, grading of basic sleeves, grading of set in sleeves-principles of grading full raglan sleeve Magyar sleeves , Kimono sleeves etc.	6	14
4	Grading of collars and Tailored lapel, Tailored Collar, Shawl Collar Grading of skirts, Fitted skirt block-front and back, flared skirts, skirt variations, Grading of Trouser Block- Basic Block; Trouser variation . Grading of Jacket, Men's Waistcoat etc.	5	10
5	Definition and importance of Marker, terminologies, Marker parameters – Marker length, Marker width, Marker ratio etc. Marker Efficiency, Mathematical derivations for Marker Efficiency. Techniques of determining Marker Efficiency. Importance of Marker Efficiency. Factors which influences Marker Efficiency. Calculation of fabric consumption from Marker. Order Concentration Chart. Relationship between Order Concentration Chart and Marker Ratio. Numerical problems of Marker Efficiency , Order Concentration Chart , Fabric Consumption etc.	9	20
6	Techniques of Marker Planning for plain fabric – Manual Marker and Computerised Marker . Principles & Techniques of Marker planning for designed fabrics i.e stripe & plaid , printed , jacquard designed , embroidered etc—Marker for fabrics with symmetric design , asymmetric design etc.	8	20
7	Introduction to Spread and Ply . Ply Efficiency and Spread utilization . Mathematical derivations and numerical problems . Different types of Fabric Layout techniques – their features and applications. Different types of spreads – flat spreads , stepped spreads etc – features and applications. Principles of Spreading mechanism . Manual spreading and computerized spreading	5	10
8	Spread planning & Cut Planning. Various types of case study and numerical problems on Cut Planning. Different ways of improvement of fabric utilization in Cutting. Checklist before Cutting. Importance and Techniques of Bundling & Sorting.	4	8
		45	100

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Text and reference books:

1. Gerry Cooklin, "Introduction to Clothing Manufacture", Blackwell Science, UK, 1991
2. Harold Carr & Barbara Latham, "The Technology of Clothing Manufacture", Oxford Pub., USA, 1994
3. Gerry Cooklin, Pattern Grading for Women's Clothes.
4. Gerry Cooklin, Pattern Grading for Men's Clothes
5. Gerry Cooklin, Garment Technology for Fashion Designers
6. Patric Taylor J, Marti shoben M, 'Grading for the Fashion Industry' Stanley Thomas(publishers)Ltd.1990
7. HandrodJack .,'Profesional pattern grading for women's,men's and children's apparel', redendo bench plycon press,1980
8. A.J.Chuter., "Introduction to Clothing Production Management ", Blackwell Scientific Publications 1988.
9. Solinger, J., Apparel Manufacturing Handbook, 2nd ed., Textile Book Publication, 1988

Course Outcome:

1	Students will gather knowledge of National and International standards of Garment size
2	Students will gather the theoretical knowledge about how to increase or decrease any pattern in proportion.
3	Students will gather mathematical and numerical knowledge for efficient and optimum Marker Planning.
4	Students will gather mathematical and numerical knowledge about cut planning and spread planning for efficient execution of garment production.
5	Students will gather knowledge about application of different types of Marker and Spread for different fabric types.

Special Remarks (If any): NIL

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Apparel Production Lab- II: (Grading, Marker-Planning, Cut-Planning, Spreading PC APM 493)

Name of the Course:	Apparel Production Lab- II: (Grading, Marker-Planning, Cut-Planning, Spreading)
Course Code: PC APM 493	Semester:4th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: hrs./week	Continuous Internal Assessment:
Tutorial: Nil	External Assessment: 60
Practical: 3 hr./week	Distribution of marks: 40
Credit Points: 1.5	
Course Outcomes:	
1	Students will acquire practical knowledge about how to increase or decrease any pattern in proportion for creation of Graded patterns in case of components of different types of garment.
2	Students will acquire mathematical and practical knowledge about Marker Ratio , Cutting Allowance , Optimum arrangements of Patterns in Marker.
3	Students will acquire mathematical and practical knowledge for efficient and optimum Marker Planning , calculation of Marker Efficiency% , Practical significance of Marker Efficiency % etc.
4	Students will acquire practical knowledge and technological implications about Marker Planning in case of Designed Fabrics.
5	Students will acquire mathematical and practical knowledge about cut planning and spread planning through application-software for efficient execution of garment production.
Pre-Requisite:	
1	Knowledge of Planar and Solid geometry. PC APM 403
2	Knowledge about aesthetic, shape and form.
3	Basic drawing skill. ES ME 291, PC APM 402
Practical: 12 number of experiments	
	1) Intellectual skills- 60%
	2) Motor skill- 40%

Laboratory Experiment:	
1	Draft and make the patterns for the standard base size and Graded those patterns for the higher/lower sizes, for Basic Bodice of formal Shirt –FRONT & BACK. Use Manual Grading Techniques.
2	Draft and make the patterns for the standard base size and Grade those patterns for the higher/lower sizes, for Regular Sleeve, Kimono Sleeve etc. Use Manual

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	Grading Techniques.
3	Draft and make the patterns for the standard base size and Grade those patterns for the higher/lower sizes, for Collar/Collar Band/Lapel/Cuff/Pocket/Placket/Yokeetc. Use Manual Grading Techniques.
4	Draft and make the patterns for the standard base size and Grade those patterns for the higher/lower sizes, for Trouser- Front Panel & Back Panel. Use Manual Grading Techniques.
5	Draft and make the patterns for the standard base size and Grade those patterns for the higher/lower sizes, forSkirt/A-Line Frock/Pencil-Skirt/Flared Skirt etc. Use Manual Grading Techniques.
6	Draft and make the patterns for the standard base size and Grade those patterns for the higher/lower sizes, for Salwar-Suit/Kurti/Kameez etc. Use Manual Grading Techniques.
7	Draft and make the patterns for the standard base size and Grade those patterns for the higher/lower sizes, for Pyjama/Salwar-trouser. Use Manual Grading Techniques.
8	Prepare a Manual Marker using all the base and graded patterns of Shirt components. Calculate the Marker Efficiency % . Use Plain Fabric.
9	Prepare a Manual Marker using all the base and graded patterns of Shirt components. Calculate the Marker Efficiency % . Use Designed Fabric.
10	Prepare a Manual Marker using all the base and graded patterns of Trouser/Skirt components. Calculate the Marker Efficiency % .Use Plain Fabric / Designed Fabric
11	Prepare a Manual Marker using all the base and graded patterns of Salwar-Suit/Kameez/Kurta components. Calculate the Marker Efficiency % .Use Plain Fabric / Designed Fabric
12	Creation of Cut-pLanning/Lay-Lot Planning through any Application Software.

Text and reference books:

1. Gerry Cooklin, "Introduction to Clothing Manufacture", Blackwell Science, UK, 1991
2. Harold Carr & Barbara Latham, "The Technology of Clothing Manufacture", Oxford Pub., USA, 1994
3. Gerry Cooklin, Pattern Grading for Women's Clothes.
4. Gerry Cooklin, Pattern Grading for Men's Clothes
5. Gerry Cooklin, Garment Technology for Fashion Designers
6. Patric Taylor J, Marti shoben M, 'Grading for the Fashion Industry' Stanley Thomas(publishers)Ltd.1990
7. HandrodJack ., 'Profesional pattern grading for women's,men's and children's apparel', redendo bench plycon press,1980
8. A.J.Chuter., "Introduction to Clothing Production Management ", Blackwell Scientific Publications 1988.
9. Solinger, J., Apparel Manufacturing Handbook, 2nd ed., Textile Book Publication, 1988

Special Remarks (If any): NIL

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Environmental Sciences (MC 401)

Name of the Course:		Environmental Sciences					
Course Code: MC 401		Semester: IV					
Duration: 6 months		Maximum Marks:					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: Marks					
Tutorial: Nil		Assignment & Quiz: Marks					
		Attendance: Marks					
Practical: hr./week		End Semester Exam.: 70 Marks					
Credit Points: 0							
Objective:							
1	Be able to understand the natural environment and its relationships with human activities.						
2	Be able to apply the fundamental knowledge of science and engineering to assess environmental and health risk.						
3	Be able to solve scientific problem-solving related to air, water, noise & land pollution						
Pre-Requisite:							
1	Basic knowledge of Environmental science						
2	BS 301						
3							
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 7	10	10				
B	1 to 7			6	3	5	15
C	1 to 7			6	3	15	45
<ul style="list-style-type: none"> • Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							

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Unit	Content	Hrs/Unit	Marks/Unit
1	<p>Basic ideas of environment, basic concepts, man, society & environment, their interrelationship (1L)</p> <p>Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. (2L)</p> <p>Materials balance: Steady state conservation system, steady state system with non-conservative pollutants, step function. (1L)</p> <p>Effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering. (2L)</p>	6	15
2	<p>Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. (1L)</p> <p>Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem special reference to Sundar ban); Food chain , definition and one example of each food chain], Food web (2L)</p> <p>Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction (Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. (1L)</p> <p>Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.(2L)</p>	6	15
3	<p>Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. (1L)</p> <p>Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.(1L)</p> <p>Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget.(1L)</p> <p>Lapse rate: Ambient lapse rate Adiabatic lapse rate,</p>	11	28

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	<p>atmospheric stability, temperature inversion (radiation inversion).(2L)</p> <p>Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model.(2L)</p> <p>Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria</p> <p>pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. (2L)</p> <p>Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green-house gases, effect of ozone modification. (1L)</p> <p>Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference). (1L)</p>		
4	<p>Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. (2L)</p> <p>River/Lake/ground water pollution: River: DO, 5-day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river [deoxygenation, reaeration], COD, Oil, Greases, pH. (2L)</p> <p>Lake: Eutrophication [Definition, source and effect]. (1L)</p> <p>Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) (1L)</p> <p>Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. (2L)</p> <p>Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic (1L)</p>	9	22
5	<p>Lithosphere; Internal structure of earth, rock and soil (1L)</p>	3	8

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	Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).(2L)		
6	Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbour hood noise] (1L) Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18hr Index) L_{dn} and. Noise pollution control. (2L)	3	8
7	Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different International environmental treaty/ agreement/ protocol. (2L)	2	4
	Total	40	100

Text and reference books:

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi, 2018
3. De, A. K., "Environmental Chemistry", New Age International.
4. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi 2019

Course Outcome:

On completion of the course students will be able to

1. To understand the natural environment and its relationships with human activities.
- 2 To apply the fundamental knowledge of science and engineering to assess environmental and health risk.
- 3 To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.
- 4 Acquire skills for scientific problem-solving related to air, water, noise& land pollution.

Special Remarks (If any):

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Technical Report Writing and Language Lab(HM 481)

Name of the Course:	Technical Report Writing and Language Lab
Course Code: HM 481	Semester: IV
Duration: 6 months	Maximum Marks:100
Teaching Scheme	Examination Scheme
Theory: hrs./week	Continuous Internal Assessment:
Tutorial: Nil	External Assessment: 60
Practical: 2 hrs ./week	Distribution of marks: 40
Credit Points: 1	
Course Outcomes:	
1	Develop listening, speaking, reading and writing skills.
2	Develop self-confidence and able to reach corporate expectations.
3	Answer questions successfully in interviews and take international examination.
4	Develop interpersonal skills on current problems and events.
5	Make presentations and participate in Group Discussions.
6.	Produce well versed technical report in recognized format
Pre-Requisite:	
1	English (10+2), English (HM-HU201)
2	
3	
Practical: 7 Module	
	1) Intellectual skills- 70
	2) Motor skill- 30

Laboratory Experiment:	
A	Technical Report Writing: Report Types (Organizational / Commercial / Business / Project) Report Format & Organization of Writing Materials, Report Writing (Practice Sessions & Workshops)
B	1.Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory Practice Sessions
	2. Conversation Practice Sessions: (To be done as real life interactions) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their Listening Skill & Speaking Skill honed Introducing Role Play & honing over all Communicative Competence

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	<p>3. Group Discussion Sessions: Teaching Strategies of Group Discussion Introducing Different Models & Topics of Group Discussion Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure</p>
	<p>4. Interview Sessions: Training students to face Job Interviews confidently and successfully Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication.</p>
	<p>5. Presentation: Teaching Presentation as a skill Strategies and Standard Practices of Individual /Group Presentation Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids.</p>
	<p>6. Competitive Examination: Making the students aware of Provincial /National/International Competitive Examinations Strategies/Tactics for success in Competitive Examinations SWOT Analysis and its Application in fixing Target</p>

Text and reference books:

1. Nira Konar: English Language Laboratory: A Comprehensive Manual, PHI Learning, 2011
2. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi, 2019
3. Sudharani: Advanced Manual for Communication Laboratories & Technical Report Writing Pearson Education (W.B. edition), 2011:

Adrian Duff et. al. (ed.): Cambridge Skills for Fluency

A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)

B) Listening (Levels 1-4 Audio Cassettes/Handbooks)

Cambridge University Press 1998 Mark Hancock: English Pronunciation in Use

4 Audio Cassettes/CD'S OUP 2004

Special Remarks (If any): NIL