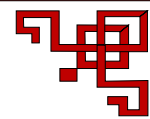


Program of:

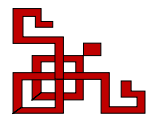


Science and Technology

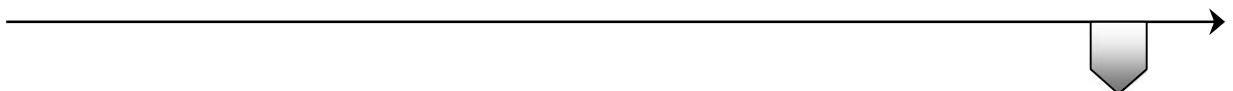
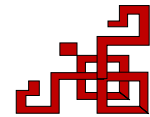
of Pulp, Paper and

Board Industry Diploma

(Program Scheme and



Courses Content)



Program of: Science and Technology of Pulp, Paper and Board Industry Diploma

First Semester

Code	Course Title	No. H.	Prac. H.	Exams		Grade
				Y.W.	Wr.	
P5101	Fibrous raw materials.	2		30	70	100
P5102	Carbohydrates & lignin chemistry.	2		30	70	100
P5103	Company laws and work legislation.	2		30	70	100
P5104	Cellulose & cellulose derivatives.	4		60	140	200
P5105	Language.	2		30	70	100
	Elective Courses (A) *	2		30	70	100
	Elective Courses (B) **	2		30	70	100
	Total	16		240	560	800
	* Elective Courses (A) Choose one from the following:	<p>Note:</p> <p>Course Code Description:</p> <p>Course Name: AB CDEF</p> <p>(AB): is an indicator for the diploma name.</p> <p>(C) : is a number for graduate course level (from 1 to 4).</p> <p>(D) : is a number indicating the semester number.</p> <p>(EF): is a number indicating the serial number of the course during the semester.</p>				
P5106	Physical & mechanical properties of wood.					
P5107	Organic chemistry of pulp and paper processes.					
P5108	Process control engineering.					
	** Elective Courses (B) Choose one from the following:					
P5109	Colloids & surface chemistry.					
P5110	Heat & thermodynamics.					
P5111	Secondary fibers and non-wood pulp.					
*** Extended courses						

Program of: Science and Technology of Pulp, Paper and Board Industry Diploma

First Year: Second Semester

Code	Course Title	No. H.	Prac. H.	Exams		Grade
				Y.W.	Wr.	
P5201	Pulp manufacturing processes.	2		30	70	100
P5202	Chemistry in pulp & paper.	4		60	140	200
P5203	Process control in pulp mill.	2		30	70	100
P5204	Pulp bleaching & chemical recovery.	2		30	70	100
P5205	Technical writing***.	2		30	70	100
	Elective Courses (A) *	2		30	70	100
	Elective Courses (B) **	2		30	70	100
	Total	16		240	560	800
	* Elective Courses (A) Choose one from the following:					
P5206	Polymer.					
P5207	Alkaline pulping.					
P5208	The ISO standards, paper, board & pulps.					
	** Elective Courses (B) Choose one from the following:					
P5209	Pulp engineering.					
P5210	Structure of the paper sheet.					
P5211	Modelling, simulation and control of pulp and paper processes.					
*** Extended courses						

Program of: Science and Technology of Pulp, Paper and Board Industry Diploma

Second Year: First Semester

Code	Course Title	No. H.	Prac. H.	Exams		Grade
				Y.W.	Wr.	
P5301	Stock preparation & papermaking processes.	4		60	140	200
P5302	Unit processes.	2		30	70	100
P5303	Pollution control in the pulp and paper industry.	2		30	70	100
P5304	Research project***	2		50	50	100
P5305	Computer programming.	2		30	70	100
	Elective Courses (A) *	2		30	70	100
	Elective Courses (B) **	2		30	70	100
	Total	16		260	540	800
	* Elective Courses (A) Choose one from the following:					
P5306	Process control in paper mill.					
P5307	Physical properties of fibrous networks.					
P5308	Instrumental Analysis.					
	** Elective Courses (B) Choose one from the following:					
P5309	Energy coast reduction in the pulp and paper industry.					
P5310	Papermaking wetend chemistry.					
P5311	Resin in pulp and paper production.					
*** Extended courses						

Program of: Science and Technology of Pulp, Paper and Board Industry Diploma

Second Year: Second Semester

Code	Course Title	No. H.	Prac. H.	Exams		Grade
				Y.W.	Wr.	
P5401	Pulp & paper testing and evaluation of print quality.	4		60	140	200
P5402	Corrosion chemistry.	2		30	70	100
P5403	Paper recycling.	2		30	70	100
P5404	Research project***.	2		50	50	100
P5405	Statistical analysis.	2		30	70	100
	Elective Courses (A) *	2		30	70	100
	Elective Courses (B) **	2		30	70	100
	Total	16		260	540	800
	* Elective Courses (A) Choose one from the following:					
P5406	Industrial economics and production management.					
P5407	Paper machine operations.					
P5408	Paper coating.					
	** Elective Courses (B) Choose one from the following:					
P5409	Quality Control and management.					
P5410	Dyestuff.					
P5411	Sheet forming process, pressing.					
P5412	Project Economics.					*** Extended courses

First Year: First Semester

P5101- Fibrous Raw Materials: (2h/w)

- Different type of raw materials.
- The quality of raw material and its effect on pulp and paper quality.
- Properties of fibrous materials and their preparation for pulping.
- Non-wood pulping and secondly fibers.
- New raw materials for pulp mills.

P5102- Carbohydrates and Lignin Chemistry: (2h/w)

- Introduction to glycoside formation in monosaccharides five and six membered rings in hemiacetal Structures.
- Structure of disaccharides.
- Structure of cellulose and starch.

Lignin:

Preparation from black liquor, waste product in paper industry.

Determination of structure of lignin by:

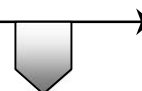
Degradation by different methods including oxidative cleavage, zinc-dust distillation and distillation.

Uses of lignin:

Preparation of dyes, vanillin, activated charcoal, in brick production & adhesives.

P5103- Company Laws and Work Legislation: (2h/w)

- 1- Law of work .
- 2- Individual and Group work contracts .
- 3- Decrees of syndicates and companies .
- 4- Delimitations of employing delinquents and women, foreigners working for Egyptians and Egyptians working for foreigners.
- 5- Arabic and International work agreements.
- 6- Law of Social Insurance.
- 7- Kinds of Social Insurance.
- 8- Study of Decrees related to special kind of social insurance.
- 9- Distinguishing between Decrees of social insurance and other kinds of Insurance.



P5104- Cellulose and cellulose derivatives: (4h/w)

- Cellulose introduction.
- Sources of cellulose
- Chemical nature of cellulose.
- Structure features of cellulose.
- Cellulose degradation.
- Cellulose reactivity.
- Cellulose additives.
- Cellulose derivatives.

P5105- Language. (2 h/w)

- 1- Introduction.
- 2- Characteristics of the technical English.
- 3- Review of the English grammar.
- 4- Active sentences and its characteristics.
- 5- Some of the common errors in writing technical English sentences.
- 6- Phrasing: (Main idea – Methods of explaining the main idea – Types of phrases – Reading and analyzing some of the technical writing to develop the communication skills).

Note: This Course of Language is to be taught to all specialties.

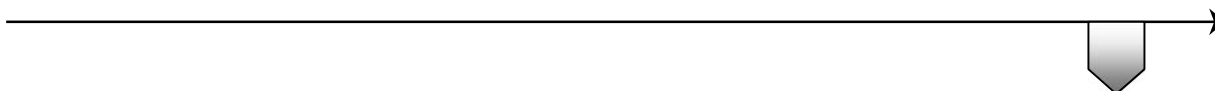
Elective Courses
(First Year - First Semester)List (A)

P5106- Physical and Mechanical Properties of Wood. (2h/w)

- wood drying.
- Wood treatment fire retardants, protection from organisms, wood preservation.
- Granulation boards (hard board, LDF, MDF&HPE, particle board.
- Processing.

P5107- Organic Chemistry of Pulp and Paper Processes: (2h/w)

Introduction to the complex chemistry of processes specific to the pulp and paper industry. Complex organic reactions encountered in pulp production and downstream processing. Structures of the numerous organic chemicals that make up wood.



P5108- Process Control Engineering: (2h/w)

Frequency response analysis; advanced control techniques; multivariable control systems; mathematical tools for computer control systems; design of computer control systems; engineering design of industrial control applications; plant wide control, concert distributed control systems.

Elective Courses
(First Year - First Semester)List (B)

P5109- Colloids and Surface Chemistry: (2h/w)

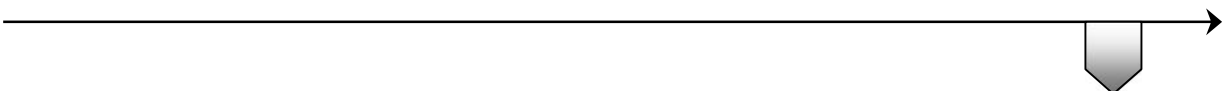
- Thermodynamics of interface, surface tension.
- Electrical properties of interfaces.
- Electokinetic phenomena, electrophoresis, electro osmosis.
- Interaction between colloidal particles and surfaces.
- Stabilization and flocculation of colloids using macromolecules.
- Surfactants, liquid crystals, adsorption of macromolecules on surfaces.

P5110- Heat and Thermodynamics: (2h/w)

Thermodynamics systems, work, transfer of heat, properties of pure substances, the steam engine and refrigerator, applications of thermodynamics to pure substances, applications of thermodynamics to special systems.

P5111- Secondary Fibers and Non-Wood Pulp: (2h/w)

- The importance of non-wood plant fibers.
- Data on the future of non-wood plant fibers.
- Bagasse, bamboo, cereal, straw, reeds, and a fiber that is currently of great interest, kenaf.
- Papyrus, cotton linters, flax, esprto, jute, sabai grass, hemp and corn satalks.



First Year: Second Semester

P5201- Pulp Manufacturing Processes: (2h/w)

- The pulp industry worldwide.
- Wood and other raw materials.
- Chemical pulping processes.
- Mechanical pulping processes.
- Characterization and comparison of properties.

P5202- Chemistry in Pulp and Paper: (4h/w)

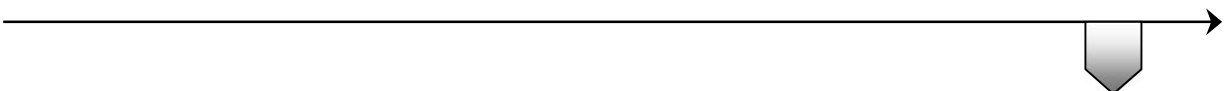
- ***Chemical composition and analysis of wood.***
Extractive isolation and determination of cellulose, polyoses and lignin, their distributions in different wood species.
- ***Cellulose.***
Molecular properties, molecular weight and chain length, hydrogen bonding, crystallinity.
- ***Polyoses.***
Hard wood and softwood polyoses, xylans, mannans, supra molecular structure.
- ***Lignin.***
Monomeric lignin units, lignin distribution in the cell wall, chemical composition and molecular weight, UV spectroscopic characterization.
- ***Chemical pulping.***
Sulfite pulping, kraft pulping, solvent pulping, endwise degradation of carbohydrates, reaction of lignin.

P5203- Process Control in Pulp Mill: (2h/w)

- introduction, external description of invariant continuous linear systems.
- First and second order response – applications.
- Precision and stability.
- Control and identification in open and closed loops.

P5204- Pulp bleaching and chemical recovery: (2h/w)

- Pulping and chemical recovery processes.
- Delignification, energy, and liquor reoptimization.
- Air and water pollution minimization.
- Pulp bleaching and formation of paper/board productions.
- Testing, end uses, chemical treatment of pulp.
- Non-wood, and recycled fiber utilization.



P5205- Technical Writing*: (2 h/w)**

- Elements of technical reports.
- Methods of engineering writing.
- Methods of analyzing the engineering data.
- Correct expressions and analytical reading.
- Report of projects.
- Report of experiments.
- Assignment reports.

Note: This Course of Technical Writing is to be taught to all specialties.

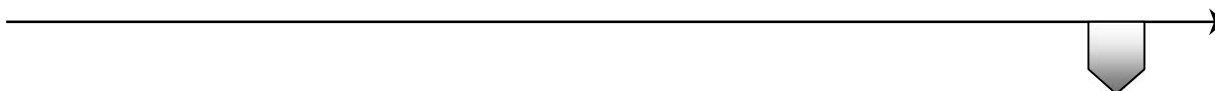
Elective Courses
(First Year - Second Semester)List (A)

P5206- Polymer: (2h/w)

- Introduction to principles of polymer chemistry, terminology.
- Polymer structure, molecular weight systems, and an introduction to the relationship of chemical structure and properties.
- Vinyl polymers. Free radical polymerization, cationic polymerization, anionic polymerization, Ziegler-Natta polymerization, and recently developed polymerization methods.
- Non-vinyl polymers. Polyethers, polyamides, polyurethanes, heterocyclic polymers, etc.
- Heterochain polymers. Polysiloxanes, etc.
- Traditional thermoset polymers. Phenolics, etc.
- More information on relationship of structure to polymer properties, elastomers, etc.

P5207- Alkaline Pulping: (2h/w)

- Chemistry of alkaline pulping.
- Pulping mill operations.
- Kraft bleaching.
- Kraft recovery.
- Utilization of chemical pulp.



P5208- The ISO Standards, Paper, Board and Pulps: (2h/w)

- Terminology, sampling and conditioning.
- Chemical tests (composition & constituents, descriptive properties).
- Physical test, (test on pulp bales, laboratory beating test on pulps, test on cores).
- Standard dealing with dimensions of materials, drainage test on pulp, optical test, strength test on paper or board, surface test on paper or pulp, structural properties.

Elective Courses
(First Year - Second Semester)List (B)

P5209- Pulp Engineering: (2h/w)

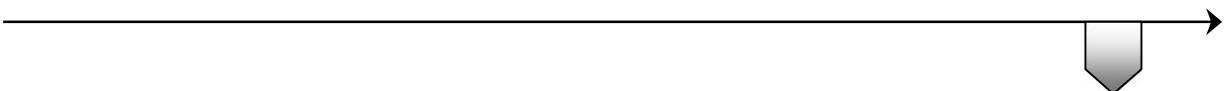
- Principles with practical mill operations.
- Stone Groundwood.
- Refiner Pulping.
- Pulp processing.
- Pulpstones.
- Grinder operation, grinder load control, and pulp quality.

P5210- Structure of the Paper Sheet: (2h/w)

- Paper structure and its modeling.
- Specific physical properties of fibers and fibrous networks.
- Fluid flow through fibrous structures.
- Beating of paper pulps: analysis of the beating effects on fibers, fibrous suspension and physical properties of papers.

P5211- Modelling, Simulation and Control of Pulp and Paper Processes: (2h/w)

- Modelling principles of pulp and paper processes.
- Analytical and numerical techniques.
- Optimization methods.
- Transient response analysis.
- Industrial controller design for selected pulp and paper processes.



Second Year: First Semester

P5301- Stock Preparation and Papermaking: (4h/w)

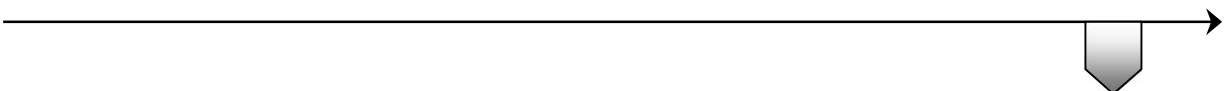
- ***introduction.***
Characterization of softwood and hardwood, pulp and paper properties, over view of pulping and papermaking processes, requirements for different grades of paper and board.
- ***Stock preparation.***
Repulping, theory and practice of beating and refining, white water recirculation.
- ***Application of fluid mechanics.***
Fiber flocculation, rheological properties of pulp suspensions, stock piping principles, hydrocyclone, pulp screening, tapered flow spreader, head boxes, drainage of pulp suspensions.
- ***Web-end chemistry.***
Function of additives, zeta potential, pitch control, fillers and resins.
- ***Wet-end papermaking.***
Retention, internal sizing, wet-end additives.

P5302- Unit Processes: (2h/w)

- Characterization of particles.
- Comminution, screening and classification.
- Filtration, sedimentation, centrifugal separations and fluidization.
- Thermal operations including evaporation and crystallization.
- Introduction to stage-wise mass transfer operations.
- Extraction and absorption.
- Single and stage-wise binary and multicomponent distillation.
- Principles and equipment design for continuous contact mass transfer operation including absorption.
- Binary distillation and other such as extraction, drying, humidification, membrane separations, etc.

P5303- Pollution Control in the Pulp and Paper Industry: (2h/w)

- Pollutants of concern in the pulp and paper industry.
- Environmental impact of the industry.
- Technologies used for the control of solid.
- Liquid and gaseous wastes.



P5304-Research Project*: (2h/w) (to be continued)**

The project must be in one of the chemical problems concerned with the pulp and paper industries.

P5305-Computer Programming: (2h/w)

- Computer components. (computer generation - components - input and output units - control unit - microprocessor - memory decimal operational system and special letters and characters).
- Basic Programming
- Fortran Programming
- Cobol Programming

Elective Courses
(Second Year - First Semester)List (A)

P5306- Process Control in Paper Mill: (2h/w)

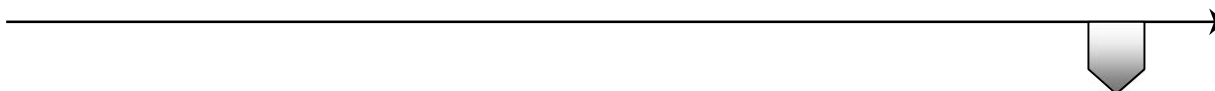
- Pulp and pulp testing.
- Evaluation of raw materials and processing variables.
- Pulp properties.
- Mechanical properties of paper; dimensional stability and curl.
- Optical properties of paper.
- Testing and predicting print quality.

P5307- Physical Properties of Fibrous Networks: (2h/w)

- Influence on paper properties of sheet forming on paper machines.
- Influence on paper properties of wet pressing on paper machines.
- Influence on paper properties of drying on paper machines.
- Influence on paper properties of coating and calendaring on paper machines.

P5308- Instrumental Analysis: (2h/w)

- Electromagnetic radiation and interaction with matter.
- Instruments for optical spectroscopy.
- UV and visible absorption spectroscopy.
- Atomic absorption and emission spectroscopy.



- Infrared spectroscopy.
- Nuclear magnetic resonance, electron spin resonance.
- Mass and fluorescence spectroscopy.
- Conductometry, potentiometry, polarography.

Elective Courses
(Second Year - First Semester)List (B)

P5309- Energy Coast Reduction in the Pulp and Paper Industry: (2h/w)

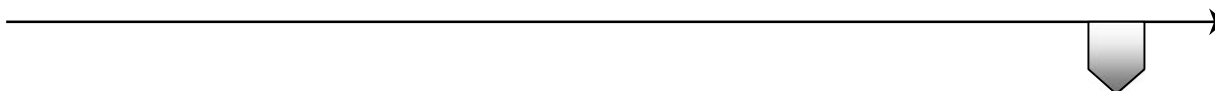
- The principles and practice of mill energy conversion for mill engineering.
- Energy, like fiber and water.
- The most efficient and economical.
- The mills (old or new), improving the energy efficiency of pulp and paper operations.

P5310- Papermaking Wetend Chemistry: (2h/w)

- Fundamental principles of colloid and surface chemistry as they related to the interaction of papermaking materials and chemical additives in the wetend of a papermachine system.
- The topics of retention of fine solids and dewatering are addressed in detail.
- Application of the various topics presented during the course are made during a pilot papermachine trial.

P5311- Resin in Pulp and Paper Production: (2h/w)

- Resin during storage and in biological treatment.
- Deresination in pulping and washing.
- Resin reactions and deresination in bleaching.
- Resinous compounds in effluents from pulp mills.
- Pitch control in pulp mills.
- Analysis of resin deposits.
- Pitch control in paper mills.



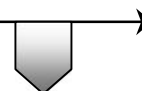
Second Year: Second Semester

P5401- Pulp and Paper Testing and evaluation of Print Quality:
(4h/w)

- *Analysis of lignin in chemical.*
Kappa number; Hypo number.
Klason and UV lignin.
- *Analysis of carbohydrate in chemical pulp.*
Copper number; Cupriethylenediamine viscosity.
- *Analysis of pulping liquors.*
White liquor; Green liquor; Black liquor.
- *Analysis in bleach plant I.*
Chlorine solution; Chlorine dioxide solution.
- *Analysis in bleach plant II .*
Hydrogen peroxide solution; Ozone.
- *Effluent Testing.*
AOX; COD/BOD.
- *Optical Properties of paper.*
Brightness; Opacity; Brightness reversion.
- *Strength properties of paper.*
Tear; Tensile; Burst; zero-span.
- definitions of perceptual and technical print quality.
- Basics of human vision.
- How to perform subjective evaluation – panels, environment, strategies for small and large series of samples.
- Extracting print quality factors – univariate and multivariate methods (MDS, proscale etc.).
- Technical measurements of parameters like color gamut, print mottle, gloss mottle.
- Relation to paper structural parameters like coating thickness, porosity, surface roughness.

P5402- Corrosion Chemistry: (2h/w)

- The various types and forms of corrosion.
- Electrochemical theories of corrosion.
- Corrosion testing methods.
- Corrosion behaviour of iron, steel, and other common engineering metals.
- Corrosion of steel and aluminum in reinforced concrete.
- Passivity, atmospheric corrosion, underground corrosion.
- Seawater corrosion.



- Effects of stress.
- Corrosion in the chemical process industries.
- The use of Pourbaix diagrams and methods of corrosion protection and control (selection of materials, coatings, corrosion inhibitors, cathodic protection, anodic protection).

P5403- Paper recycling: (2h/w)

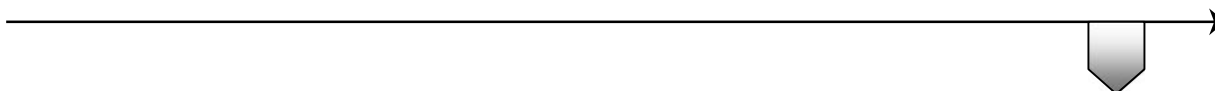
- Stock preparation operations of paper recycling.
- Process technology details.
- repulping, screening, cleaning, flotation deinking, washing, kneading and dispersion.

P5404-Research Project: (2h/w)

The project must be in one of the chemical problems concerned with the sugar research and chemical technology.

P5405-Statistical Analysis: (2h/w)

- ***Descriptive statistics:***
Classifications of data - graphic presentation - central mean Measurement - measure of variation - examples using the computer.
- ***Linear regression and correlation:***
Scattering graph - Linear and nonlinear curve fitting for two groups of data function in two variables - prediction - linear correlation coefficient (berson) and its relation to the linear regression coefficient - meaning of linear correlation coefficient, examples using computer.
- ***Distribution:***
Binomial – Poisson - Normal distribution, properties and its use.
- ***Estimation and Hypotheses Testings:***
population “sample -parameter - Point and interval estimation - confidence interval -difference between two means of normal distributions - confidence interval around of unit proportion, difference between two proportions - minimum and alternative hypothesis - significance level - mean hypothesis test has one difference between two means of normal distribution - unit mean hypothesis test and difference between two means - examples using computer.



Elective Courses
(Second Year - Second Semester)List (A)

P5406- Industrial Economics and Production Management: (2h/w)

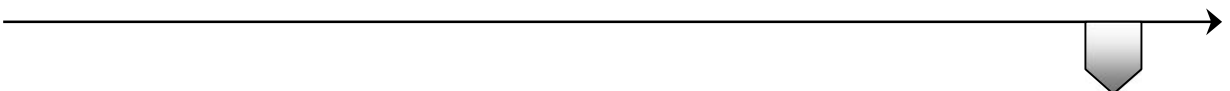
- Corporate planning.
- Competitiveness analyses.
- Timing of investments and comparison of various alternative production programs.

P5407- Paper Machine Operations: (2h/w)

- Hydrodynamics of fibrous suspensions.
- Dynamics of sheet formation and water removal.
- Fundamentals of pressing.
- Analysis of drying process in terms of heat and mass transfer.
- Engineering calculations performed on full scale production paper machines.
- Field trips to paper mills and affiliated industries.

P5408- Paper Coating: (2h/w)

- Pigment coating materials and processes.
- Converting operations including lamination, corrugation, extrusion and hot metal coating; functional coatings.



Elective Courses
(Second Year - Second Semester)List (B)

P5409- Quality Control and Management: (2h/w)

- Quality processes throughout the world.
- Management principles.
- Quality management principles.
- ISO 9000 and ISO 14000 registration.
- Quality function deployment.
- Certification and communication.

P5410- Dyestuff: (2h/w)

- Introduction.
- Colour and light, dye and dyestuffs.
- Classification of dyestuffs.
- Natural dyestuffs.
- Mordant and mordanting.
- The dyeing of fibres.

P5411- Sheet Forming Process, Pressing: (2h/w)

- Fundamentals of the sheet forming process with water.
- Formation on a single wire papermachine: principles, constant and pulsating pressure. Hybrid units.
- Pressing process – Technology of process – press felts – press roll covers.

P5412- Project Economics: (2 h/w)

- 1- An overview, the role of projects in economic development.
- 2- Economic Environment.
- 3- Determinants of project efficiency and its indicators.
 - Kinds of efficiency – industry viz project, technical viz economic.
 - Determinants of efficiency.
 - Indicators of efficiency (Productivity & Profitability).
- 4- Pricing methods in theory & practice.
- 5- Demand analysis.
- 6- Project appraisal (financial and commercial studies).
- 7- Cases.

