

Syllabus of Industrial Management common as Mechanical Engg

INSTRUMENTATION



West Bengal State Council of Technical Education

(A Statutory Body under West Bengal Act XXI of 1995)
Kolkata Karigori Bhavan, 2nd Floor, 110 S. N. Banerjee Road, Kolkata - 700 013.

Syllabus for : INSTRUMENTATION

Name of the Course: INSTRUMENTATION				
Course Code:		Semester: 6th		
Duration: : Seventeen weeks		Maximum Marks: 100		
Teaching Scheme		Examination Scheme		
Theory: 3hrs./week		Mid Semester Exam.:20Marks		
Tutorial: Nil hrs./week		Attendance & Teacher's Assessment 10 Marks		
Practical: Nil hrs./week		End Semester Exam.:70Marks		
Credit: 3				
Aim:				
Sl. No.				
1.	Understand some basic principles of instruments used in chemical process Industry.			
2.	Analyze and compare logically the function of instruments			
3.	This course will help to learn working principles of various process instruments and measurement techniques of various parameters which have application in chemical industries.			
Objective:				
Sl. No.				
1.	Introduction: Elements, functions & characteristics of Instruments.			
2.	Pressure measurement: Study on pressure measuring devices.			
3.	Temperature measurement: Study on temperature measuring devices			
4.	Flow measurement: Study on Flow measuring devices			
5.	Liquid level measurement: Study on Level measuring devices			
6.	Study of some miscellaneous instruments.			
Pre-Requisite:				
Sl. No.				
1.	Elementary knowledge on physics and mathematics			
2.	Basic knowledge in Algebra and Differential Calculus			
Contents :		TOTAL PERIODS: 51 hrs /week	Hrs./Unit	Mark s
Unit: 1 Introduction	Importance of instruments in different chemical process industries. Elements of instruments & their functions & different characteristics.		5	

Unit: 2 Pressure measurement	Manometers – U tube, well tube, enlarged leg, inclined tube, inverted tube. Elastic type – Bourdon gauge, diaphragm element, bellows element & bell gauge. Vacuum type – McLeod gauge, Perini gauge & ionization gauge. Electrical type – resistive, inductive & capacitive.	10	
Unit: 3 Temperature measurement	Solid expansion type – bimetallic thermometer. Fluid expansion type – filled in thermometer, vapour pressure thermometer. Electrical type – Resistance thermometer, thermocouples, Radiation & optical pyrometer.	10	
Unit: 4 Flow measurement	Orifice meter, Venturi meter, Pitot tube, rotameter, notches & weirs – rectangular, vee & trapezoidal notches. Mass flow meter – positive displacement type, electrical type – turbine flow meter, electromagnetic, hot wire & hot film anemometer, ultrasonic flow meter.	10	
Unit: 5 Liquid level measurement	Float type, displacer type, hydrostatic type, thermal effect type, electrical types.	6	
Unit: 6 Other instruments	Chemical composition analyzer, oxygen analyzer, moisture meter, pH meter, refractometer, polarimeter, thermal conductivity meter, hydrometer.	10	
Total		51	
Text Books:			
Name of Authors	Title of the Book	Edition	Name of the Publisher
D. Patranobis	Principles of Industrial Instrumentation,		Tata McGraw Hill Pub. Co. Ltd., New Delhi.
Doebelin:	Measurement Systems-Application & Design,		McGraw-Hill Kogakusha, Ltd., New Delhi.
Eckman	Industrial Instrumentation		Wiley Eastern Pvt. Ltd., New Delhi
Reference Books:			
Name of Authors	Title of the Book	Edition	Name of the Publisher
Fribance	Industrial Instrumentation Fundamentals		Tata McGraw Hill Pub. Co. Ltd., New Delhi
Sl. No.	Question Paper setting tips		
A	Short questions: 20 marks, students will answer 20 questions out of 25 questions, each carrying 1 mark.		

B	Long questions: 50 marks, students will answer 5 questions out of 8 questions, each carrying 10 mark.
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Syllabus for CHEMICAL TECHNOLOGY II

Name of the Course: CHEMICAL TECHNOLOGY II	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Exam.:20Marks
Tutorial: Nil hrs./week	Attendance & Teacher's Assessment 10 Marks
Practical:3 hrs./week	End Semester Exam.: 70 Marks
Credit: 3	
Aim:	
Sl. No.	
1.	This subject will provide the knowledge of Chemical process & industry.
2.	It will help a student to deal with the manufacturing process & process development in his professional career.
3.	This subject will provide adequate information about the raw materials requirement, chemistry involved & process details of important chemical products
4.	It will impart knowledge on the analysis of chemical process from engineering & technical view points.
Objective:	
Sl. No.	The students will be able to Learn :
1.	Origin, classification & composition of crude oil. About ADU & VDU process. Catalytic and Thermal Cracking process. Names of Petrochemicals.
2.	Manufacturing of Sugar. Process flow sheet. Inversion of Sugar.
3.	Manufacturing of Industrial Alcohol, Acetic Acid , Citric Acid Process flow sheet.
4	Production Vegetable oil like Soybean oil Hydrogenation of oil. Process flow sheet.
5	Manufacturing of DDT &BHC. Process flow sheet.
6	Manufacturing of Calcium Carbide & Silicon Carbide. Process flow sheet.
7	Process of Polymerisation. Manufacturing of Polyethylene & PVC with flowchart.

8	Raw materials & manufacturing of Paint & Varnish.			
Pre-Requisite:				
Sl.No.				
1.	Knowledge of basic concepts of sciences such as physics, chemistry .			
2.	Knowledge of the names of equipment related to chemical Engineering field.			
3	Knowledge of unit operations & unit processes			
Contents :		TOTAL PERIODS: 51 hrs /week	Hrs./Unit	Mark s
Unit: 1 PETROLEUM INDUSTRY	Origin, Classification, Composition of Crude Oil. Atmospheric and Vacuum distillation of crude oil Petroleum products and its uses. Thermal cracking processes like Vis breaking, Coking. Catalytic Cracking Processes like Single stage Fluidised Bed Process, Hydro Cracking. Names of some important Petrochemicals and their uses. (Only name, manufacturing process details and flow sheet are not necessary).		12	
Unit: 2: SUGAR INDUSTRY	Manufacturing of Sugar from its raw materials with flow sheet Refining of raw sugar. Inversion of Sugar.		4	
Unit 3: FERMENTATION INDUSTRY	Manufacturing of Industrial Alcohol with flow sheet. Manufacturing of Acetic Acid with flow sheet. Manufacturing of Citric Acid with flow sheet.		8	
Unit 4: OIL & FAT INDUSTRY	Vegetable oil production and refining like Soybean oil. Hydrogenation of Vegetable oil. Property changes on Hydrogenation.		8	
Unit 5 : PESTICIDES INDUSTRY :	Concept of Pesticides. Manufacturing of DDT with flow chart, Manufacturing of BHC with flow sheet.		5	
Unit 6: ELECTRO THERMAL INDUSTRY	Manufacturing of Silicon Carbide with flow sheet, Uses of Silicon Carbide. Manufacturing of Calcium Carbide with flow sheet, Uses of Calcium Carbide.		5	
Unit 7 : POLYMER INDUSTRY	Concept of Polymer, Classification of Polymer Methods of Polymerisation : Addition , Condensation, Emulsion. Manufacturing of LDPE by ICI process with flow sheet. Manufacturing of HDPE by Ziegler's process with flow sheet. Manufacturing of PVC by emulsion polymerization method with flow sheet.		5	

Unit 8 : Paint Industry :	Concept of paint, types of paint, raw materials of paint, paint manufacturing. Classification of Varnish, Manufacturing of Varnish.	4	
Total		51	

Text and reference books:			
Sl. No.	Title of the Book	Name of Authors	Publisher
1.	Chemical Process Industries	Shreve	McGraw-Hill Book Co. Ltd., New York and Kogakusha Co. Ltd., Tokyo.
2.	A Text Book of Chemical Technology, Vol. 1 & 2	Sukla and Pandey	Vikas Publishing House Pvt. Ltd., New Delhi.
3.	Outlines of Chemical Technology	Dryden	Affiliated East-West Press Pvt. Ltd., New Delhi
4.	Introduction to Chemical Engineering	Ghosal, Sanyal, Dutta	Tata McGraw-Hill Pub. Co. Ltd., New Delhi

Question Paper Setting Tips :

Short questions :20 marks, Students will answer 20 questions out of 25 questions ,each carrying 1 mark

Long question :50 marks ,Students will answer 5 questions , out of 8 questions, each carrying 10 marks.



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Syllabus for : SEPARATION PROCESS II

Name of the Course: <u>SEPARATION PROCESS II</u>	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Exam.:20Marks
Tutorial: Nil hrs./week	Attendance & Teacher's Assessment 10 Marks
Practical: 3 hrs./week	End Semester Exam.:70Marks
Credit: 5	
Aim:	
Sl. No.	
1.	This subject will provide the students the basic concept of mass transfer.
2.	It will impart knowledge to understand working of mass transfer equipment used in chemical process industries.
3.	This subject will provide adequate information about the unit operation involved in Drying, Humidification , Adsorption , Crystallisation..
Objective:	
Sl. No.	The students will be able to Learn :
1.	Concept of moisture content – equilibrium, bound, unbound & free moisture & their graphical representation. Concept of drying, drying rate, initial adjustment, constant rate, falling rate, Calculation of drying time for batch drying, constant drying condition. Simple numerical problems

2.	<p>Concept of absolute humidity, Dry & wet bulb temperature, relative & percentage saturation, humid volume, humid heat, enthalpy. Application of Psychometric chart. Concept of humidification & dehumidification. Basic idea about cooling tower, spray chamber & spray pond. Simple numerical problems</p>		
3.	<p>Concept of adsorption, adsorbent, factor affecting the adsorption, Concept of percolation & elution. Basic idea about fixed bed & continuous adsorbers. Simple numerical problems</p>		
4.	<p>Concept of magma, Crystal geometry, crystal size & shape factor. Concept of crystallization & nucleation, crystallization rate & its controlling technique, Effect of temperature & impurities on crystal formation. Basic concept about vacuum, draft & growth type crystalliser. Simple numerical problems.</p>		
Pre-Requisite:			
Sl. No.			
1.	Knowledge of basic concepts of sciences such as physics, chemistry .		
2.	Knowledge of the names of equipment related to chemical Engineering field.		
3	Knowledge of unit operations.		
4.	Knowledge of solving numerical problems.		
Contents : TOTAL PERIODS: 51 hrs /week		Hrs./Unit	Mark s
Unit I : DRYING	<p>Concept of moisture content – equilibrium, bound, unbound & free moisture & their graphical representation. Concept of drying, drying rate, initial adjustment, constant rate, falling rate, Calculation of drying time for batch drying, Constant drying condition.</p>	13	

	Simple numerical problems		
Unit 2: HUMIDIFICATION:	<p>Concept of absolute humidity,</p> <p>Dry & wet bulb temperature,</p> <p>Relative & percentage saturation, humid volume, humid heat, enthalpy.</p> <p>Application of Psychometric chart.</p> <p>Concept of humidification & dehumidification.</p> <p>Basic idea about cooling tower, spray chamber & spray pond..</p> <p>Simple numerical problems</p>	13	
Unit 3: ADSORPTION :	<p>Concept of adsorption, adsorbent, factor affecting the adsorption,</p> <p>Concept of percolation & elution.</p> <p>Basic idea about fixed bed & continuous adsorbers.</p> <p>Simple numerical problems.</p>	12	
Unit 4 CRYSTALLIZATION :	<p>Concept of magma, crystal geometry, crystal size & shape factor.</p> <p>Concept of crystallization & nucleation, crystallization rate & its controlling technique,</p> <p>Effect of temperature & impurities on crystal formation.</p> <p>Basic concept about vacuum, draft & growth type crystalliser.</p> <p>Simple numerical problems.</p>	13	
Total		51	

Text and reference books:			
Sl. No.	Title of the Book	Name of Authors	Publisher
1.	Mass Transfer Operations,	Treybal	McGraw-Hill Book Co. Ltd., New York and Kogakusha Co. Ltd., Tokyo.
2.	Unit Operations of Chemical Engineering.	McCabe and Smith	McGraw-Hill Book Co. Ltd., New York and Kogakusha Co. Ltd., Tokyo.
3.	Introduction to Chemical Engineering,	Badger and Banchero	McGraw-Hill Book Co. Ltd., New York and Kogakusha Co. Ltd., Tokyo
4.	Introduction to Chemical Engineering	Ghosal, Sanyal, Dutta	Tata McGraw-Hill Pub. Co. Ltd., New Delhi
5.	Chemical Engineering, Vol. 1, 2, 4 & 5,.	Coulson and Richardson	Pergamon Press, Oxford
6.	Transfer processes	Gearkoples	
<p>Question Paper Setting Tips :</p> <p>Short questions :20 marks, Students will answer 20 questions out of 25 questions ,each carrying 1 mark</p> <p>Long question :50 marks ,Students will answer 5 questions , out of 8 questions, each carrying 10 marks.</p>			



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CHEMICAL PROCESS EQUIPMENT DESIGN- II

Name of the Course : Chemical Process Equipment Design (Part-II)	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 50
Practical: 3 hrs./week	
Credit: 3	
Sl. No.	Skills to be developed
1	Concept of Design of an equipment.
2.	Useful guidelines in designing the process equipment.
3.	Principles of design of various Unit Operation Equipments.
4.	Fabrication aspects.

NAME OF THE COURSES	COURSES OFFERED IN	MARKS ALLOTTED
Chemical Process Equipment Design -I	Part – III First Semester	Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the semesters where marks allotted for assessment of sessional work undertaken in each semester is 25. Distribution of Marks: Class Performance –10, Report –15. External Assessment of 50 marks shall be held at the end of the Part – III Second Semester on the syllabi of Chemical Process Equipment Design –II.
Chemical Process Equipment Design -II	Part – III Second Semester	Viva-voce – 25.

(Only Chemical Design , Mechanical Design and Drawing are not necessary)

JOB NO.	TOPIC
Chemical Process Equipment Design-II	
1	DESIGN OF A DISTILLATION COLUMN.
2	DESIGN OF AN ABSORPTION TOWER.
3.	DESIGN OF A REACTOR

REFERENCE BOOKS

1. Ludwig: Applied Process Design for Chemical and Petrochemical Plants, Vol. 1, 2 & 3, Gulf Publishing Co. Houston, Texas.
2. Brownel and Young: Process Equipment Design, John Wiley & sons, Inc., New York.
3. Joshi: Process Equipment Design, Macmillan India, New Delhi.
4. Bhattacharya: Chemical Equipment Design-Mechanical Aspects Chemical Engineering Education Development Centre, IIT, Madras.
5. Code for unfired pressure vessels, Bureau of Indian Standards.
6. TEMA: Standards of Tubular Exchanger Manufacturers Association.



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Syllabus for PETROCHEMICALS (Elective II)

Name of the Course: <u>PETROCHEMICALS (Elective II)</u>	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 150
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Exam.:20Marks
Tutorial: Nil hrs./week	Attendance & Teacher's Assessment 10 Marks
Practical : hrs./week	End Semester Exam.: 70 Marks
Credit: 5	Practical: 50
Aim:	
Sl. No.	
1.	This subject will provide the knowledge of Petroleum & Petrochemical industry.
2.	This subject will give the idea about the feedstocks of Petrochemicals , the products of petrochemical industry ,their derivatives and utilization.
3.	It will help a student to deal with the manufacturing process of petrochemicals & process development in his professional career.
3.	This subject will provide adequate information about the raw materials requirement, chemistry involved & process details of important petrochemical products
4.	It will impart knowledge on the analysis of chemical process from engineering & technical view points.
Objective:	
Sl. No.	The students will be able to Learn :
1.	About Petrochemical Industry & their feedstocks. Names of major Petrochemical products & their application.
2.	Production of Ethylene by naptha cracking and the petrochemicals based on ethylene.
3.	Production and separation of BTX aromatics. Production of Styrene, cumene , phenol, phthalic anhydride.
4.	Concept of detergent & their classification. Production of Dodecyl benzene sulphonate & Keryl benzene sulphonate.
5	Methods of polymerization Production of LDPE, HDPE, PVC , Phenol formaldehyde resin , Nylon -6 , Nylon 6,6.
Pre-Requisite:	
Sl. No.	
1.	Knowledge of basic concepts of sciences such as physics, chemistry .

2.	Knowledge of the names of equipment used in chemical Engineering field.		
3	Knowledge of unit operations & unit processes		
Contents :		TOTAL PERIODS: 51 hrs /week	Hrs./Unit
Unit 1 INTRODUCTION	Petrochemical industry and Feedstocks for petrochemicals. Names of some major petrochemical products and their application.	5	Mark s
Unit 2: PRODUCTION OF ETHYLENE & SOME OF ITS DERIVATIVES	Production of Ethylene, Propylene and Butadiene By Naptha / Gas Cracking. Production of Petrochemicals based on Ethylene like VCM , VAM , Ethylene oxide, Ethanol amines, Acrylonitrile.	13	
Unit 3: PRODUCTION & SEPARATION OF BTX AROMATIC	Production of BTX by catalytic reforming of Naptha and separation of BTX aromatics. Pyrolysis Gasolene hydrogenation, Separation of BTX by extractive distillation. Isomerisation of Xylene Production of Styrene , Cumene ,Phenol, Phthalic anhydride.	13	
Unit 4: SYNTHETIC DETERGENT	Concept of Detergent. Classification of Detergent. Production of synthetic detergent like Dodecyl Benzene Sulphonate and Keryl Benzene Sulphonate (Surf).	6	
Unit 5: METHODS OF POLYMERISATION	Concept of polymerization. Methods of Polymerisation like : Addition , Condensation , Emulsion . Production of LDPE by ICI process with flow sheet. Production of HDPE by Ziegler's process with flow sheet. Production of PVC by emulsion polymerization polymerization method. Production of Phenol formaldehyde resin. Production of Nylon 6,6 and Nylon 6.	14	
Total		51	

Text and reference books:			
Sl. No.	Title of the Book	Name of Authors	Publisher
1.	A Text On Petrochemicals	Dr. B.K. Bhaskararao	Khanna Publishers , Delhi--110006

2.	A Text Book of Chemical Technology, Vol. 1 & 2	Sukla and Pandey	Vikas Publishing House Pvt. Ltd., New Delhi.
3.	Outlines of Chemical Technology	Dryden	Affiliated East-West Press Pvt. Ltd., New Delhi
4.	Introduction to Chemical Engineering	Ghosal, Sanyal, Dutta	Tata McGraw-Hill Pub. Co. Ltd., New Delhi
5	Petrochemical processes, Vol. 1 & 2 (2 nd ed.),	Chauvel and Lefebvre	Editions Technip, Paris
7.	Trends in Petrochemical Technology,	Brownstein	The Petroleum Pub. Co., Tulsa, Oklahoma, U. S. A.

Question Paper Setting Tips :

Short questions :20 marks, Students will answer 20 questions out of 25 questions ,each carrying 1 mark

Long question :50 marks ,Students will answer 5 questions , out of 8 questions, each carrying 10 marks.



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Syllabus for CERAMIC TECHNOLOGY (Elective II)

Name of the Course: <u>CERAMIC TECHNOLOGY (Elective II)</u>	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 150
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Exam.:20Marks
Tutorial: Nil hrs./week	Attendance & Teacher's Assessment 10 Marks
Practical : hrs./week	End Semester Exam.: 70 Marks
Credit: 5	Practical: 50
Aim:	
Sl. No.	
1.	This subject will provide the knowledge of Ceramic industry.
2.	This subject will give the idea about the raw materials and products of Ceramic industry .
3.	It will help a student to deal with the of Fabrication methods of ceramic products.
4.	It will impart knowledge on the analysis of chemical process from engineering & technical view points.
Objective:	
Sl. No.	The students will be able to Learn :
1.	Classification , Composition , Properties and application of Ceramic materials.
2.	Beneficiation and Comminution of ceramic materials.
3.	Different ceramic Fabrication and Forming processes.
4.	Raw materials , properties and application of Refractories.
5.	Raw materials and manufacturing of Portland cement. Cement making kilns
6.	Raw materials and properties of Glass. Melting ,Refining and Forming of Glass. Raw materials and Composition of Whitewares. Fabrication methods
Pre-Requisite:	
Sl. No.	
1.	Knowledge of basic chemistry .
2.	Knowledge of the names of equipment used in chemical Engineering field.

3		Knowledge of unit operations & unit processes	
Contents :		TOTAL PERIODS: 51 hrs /week	
		Hrs./Unit	Marks
Unit 1 INTRODUCTION	Concept of ceramic materials Classification of ceramic materials . Composition , properties & application of ceramic Materials.	4	
Unit 2: BENEFICIATION PROCESSES & COMMUNITION	Beneficiation :The operations involved in the beneficiation step of ceramic materials . Comminution : Equipments used , milling operations involved in Comminution.	6	
Unit 3: PRINCIPLES OF CERAMIC FABRICATION & FORMING PROCESSES	Principles of ceramic fabrication : Size reduction, Size separation , Body preparation , Filtration. Forming processes : Dry pressing , Cold isostatic pressing , Plastic forming : Extrusion , Jiggering , Jolleying . Casting process : Slip casting . Drying -- Drying processes , Mechanism in Drying. Defects shaping, surface finishing, and glazing . Firing system , Pre sintering processes , sintering, vitrification and cooling.	13	
Unit 4 : REFRACTORIES	Raw materials of refractory materials. Properties of refractory materials. Firing technique. General manufacturing techniques. Applications of some following refractories : Acid (Silica) Refractories , Basic Refractories , Burnt Refractories --- Sintered and Fused Refractories --- Chemically bonded and Direct bonded, Insulating Refractories .	12	
Unit 5: CEMENT TECHNOLOGY	Concept of cement. Types of Cement. Raw materials of Cement and manufacturing processes of Portland cement. Cement making Kilns : Rotary and Shaft kiln. Refractory used in Rotary Kiln. Reactions occurred in different zones of Rotary Kiln.	8	

Unit 6: GLASS & WHITEWARES :	Definition of Glass. Types of Glass. Elementary properties of Glass (Details not necessary). Glass transition conditions of vitrification. Glass processing : Raw materials , Melting in glass tank furnace , Refining of Glass. Forming Processes : Blowing , Moulding , Shaping. (Testing of properties are not necessary). Definition of Whitewares. Raw materials and Composition of Whitewares. Fabrication methods : Drying , Firing , Glazing & Decorations (Details not necessary)	8	
Total		51	

Text and reference books:			
Sl. No.	Title of the Book	Name of Authors	Publisher
1.	Elements of Ceramics	F.H Norton	_____
2.	Introduction to Ceramics	W.D. Kingery	_____
3.	Industrial Ceramics	Singer & Singer	_____
4.	Hand Book of Ceramics (Vol I & II)	S.Kumar	_____
5.	The Technology of Ceramics and Refractories	P.P Budnikov.	_____
6.	Cement Chemistry	F.W.H. Taylor	_____
<p>Question Paper Setting Tips :</p> <p>Short questions :20 marks, Students will answer 20 questions out of 25 questions ,each carrying 1 mark</p> <p>Long question :50 marks ,Students will answer 5 questions , out of 8 questions, each carrying 10 marks.</p>			



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Name of the Course : SEPARATION PROCESS-II LABORATORY	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 50
Practical: 3 hrs./week	
Credit: 2	

Sl. No.	Skills to be developed
1	Proper handling of instruments.
2.	Measuring physical quantities accurately.
3.	To observe the phenomenon and to list the observations in proper tabular form.
4.	To adopt proper procedure and precautions while performing the experiment.
5.	To plot the graphs
6	To verify the principles, laws, using given instruments under different conditions.

NAME OF THE COURSES	COURSES OFFERED IN	MARKS ALLOTTED
Separation Process Laboratory (PART I)	Part – III First Semester	Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the two semesters where marks allotted for assessment of sessional work undertaken in each semester is 25.
Separation Process Laboratory (PART II)	Part – III Second Semester	Distribution of marks for each semester: Class Performance – 20, Notebook –5. External Assessment of 25 marks shall be held at the end of the Part – III Second Semester on the entire syllabi of Separation Process Laboratory PART II. Distribution of marks: , Viva-voce – 25.

MODULAR DIVISION OF THE SYLLABUS & DETAIL COURSE CONTENT

Laboratory Experiments	DETAIL COURSE CONTENT
Sl no.	Separation Process Laboratory (PART II)
1	TO STUDY DRYING CHARACTERISTICS OF A MATERIAL IN AN ATMOSPHERIC TRAY DRIER.
2	TO STUDY DRYING CHARACTERISTICS OF A WET SOLID IN A STEAM-HEATED TRAY DRYER UNDER VACUUM.
3	TO STUDY CRYSTALLIZATION CHARACTERISTICS.
4	TO STUDY OPERATION OF A SPRAY DRYER.
5	TO STUDY ADSORPTION CHARACTERISTICS- ADSORPTION ISOTHERM.



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Name of the Course : CHEMICAL TECHNOLOGY LABORATORY	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 100
Practical: 3 hrs./week	
Credit: 2	

Sl. No.	Skills to be developed
1	Proper handling of instruments.
2.	Measuring physical quantities accurately.
3.	To observe the phenomenon and to list the observations in proper tabular form.
4.	To adopt proper procedure and precautions while performing the experiment.
5.	To plot the graphs
6	To verify the principles, laws, using given instruments under different conditions.

Examination scheme: Maximum marks: 100

1. **Continuous Internal Assessment of 50 marks** is to be carried out by the teachers throughout the Part – III 2nd Semester. **Distribution of marks:** Performance of Job – 35, Report– 15.
2. **External Assessment of 50 marks** shall be held at the end of the 3rd Year Second Semester on the entire syllabus. Viva-voce – 50.

Laboratory Experiments :

Sl. No.	
1	To determine the acid value of an given oil sample.
2	To determine the saponification value of an oil sample.
3	Standardisation of Sodium Thiosulphate using Potassium Dichromate Solution.
4	Determination of iron as Ferric ion in a sample of cement.
5	Determination of percentage of available chlorine present in Bleaching powder.
6	Determination of percentage of available oxygen in pyrolusite.
7	To determine the iodine value of an oil



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Name of the Course : PETROCHEMICALS LABORATORY (Elective II)	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 50
Practical: 3 hrs./week	
Credit: 2	

Sl. No.	Skills to be developed
1	Proper handling of instruments.
2.	Measuring physical quantities accurately.
3.	To observe the phenomenon and to list the observations in proper tabular form.
4.	To adopt proper procedure and precautions while performing the experiment.
5.	To plot the graphs
6.	To verify the principles, laws, using given instruments under different conditions.

Examination scheme: Maximum marks: 50

- Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Part – III SECOND Semester. **Distribution of marks:** Performance of Job – 15, Report– 10.
- External Assessment of 25 marks** shall be held at the end of the 3rd Year SECOND Semester on the entire syllabus. **Distribution of marks:** Viva-voce – 25.

Laboratory Experiments :

Sl. No.	
1	Preparation of Acid Catalysed Phenol formaldehyde resin and Determination of its properties (Softening point , Solubility in acetone, alcohol , petroleum ether etc.)
2	Preparation of Base Catalysed Phenol formaldehyde resin and Determination of its properties (Solubility in acetone, alcohol , petroleum ether etc.).
3	Determination of Surface tension of Detergent.
4	Preparation of Phenol.
5	Preparation of Urea Formaldehyde resin.
6	To determine the saponification value of a plastic material.



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Name of the Course : CERAMIC TECHNOLOGY LABORATORY (Elective II)	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 50
Practical: 3 hrs./week	
Credit: 2	

Sl. No.	Skills to be developed
1	Proper handling of instruments.
2.	Measuring physical quantities accurately.
3.	To observe the phenomenon and to list the observations in proper tabular form.
4.	To adopt proper procedure and precautions while performing the experiment.
5.	To plot the graphs
6	To verify the principles, laws, using given instruments under different conditions.

Examination scheme: Maximum marks: 50

- Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Part – III Second Semester. **Distribution of marks:** Performance of Job – 15, Report– 10
- External Assessment of 25 marks** shall be held at the end of the 3rd Year Second Semester on the entire syllabus. **Distribution of marks:** Viva-voce – 25

Laboratory Experiments :

Sl. No.	
1	Determination of Initial and Final Setting time of cement.
2.	Determination of Aparent Porosity, Bulk density and Cold crushing strength of refractory specimen (1 inch cube blocks)
3	Melting of glass samples with different compositions.
4	Determination of Strain in glass.
5.	Determination of drying behaviour of ceramic samples.
6.	Complete chemical analysis of : a) Silica or Acid refractories . b) Basic or Magnesia refractories. c) Ordinary Portland cement / Blast furnace slag cement. d) Glass pieces.



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GENERAL VIVA-VOCE

Name of the Course : General Viva - Voce	
Course Code:	Semester: Sixth
Maximum Marks: 50	

COURSE CONTENT

The syllabi of all the theoretical and sessional subjects taught in the three years of diploma education.

EXAMINATION SCHEME

The Final Viva-Voce Examination shall take place at the end of the Part – III Second Semester. It is to be taken by one External and one Internal Examiner. The **External Examiner** is to be from industry / engineering college / university / government organisation and he / she should give credit out of **25 marks**; whereas, the **Internal Examiner** should normally be the Head of the Department and he / she should give credit of **25 marks**. In the absence of the Head of the Department the senior most lecturer will act as the Internal Examiner.



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CHEMICAL ENGINEERING PROJECT WORK-I & II

Name of the Course : CHEMICAL ENGINEERING PROJECT WORK-I & II	
Course Code:	Semester: Fifth & Sixth
Duration : Seventeen weeks in each semester	Maximum Marks : 100(50 for each Semester)
Credit :2 (Part-I) , Credit : 2(Part-II)	

COURSE & EXAMINATION SCHEDULE

NAME OF THE COURSES	COURSES OFFERED IN	CONTACT PERIODS	MARKS ALLOTTED
Chemical Engineering Project Work (PART-I)	Part – III First Semester	3 Hrs./ week	Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the semester where marks allotted for assessment of sessional work undertaken in each semester is 25. Distribution of marks: Project Work –10, Project Report –5, Viva-voce –10.
Chemical Engineering Project Work (PART-II)	Part – III Second Semester	4 Hrs. / week	External assessment of 25 marks shall be held at the end of the Part – III First and Second Semesters on the entire syllabi of Chemical Engineering Project Work. The external examiner is to be from industry / engineering college / university / government organisation. Distribution of marks: Viva-voce –25.

OBJECTIVE

Sl. No.	Students will be able to learn
1	Understanding of the interrelationship between different courses learnt in the entire diploma programme and to apply the knowledge gained in a way that enables them to develop & demonstrate higher order skills.
2	The basic objective of a project class would be to ignite the potential of students' creative ability by enabling them to develop something which has social relevance, again, it should provide a taste of real life problem that a diploma-holder may encounter as a professional.
3	Interaction with local industry and local developmental agencies viz. different <i>Panchayet</i> bodies, the municipalities etc. for choosing topics of projects and / or for case study.
4	Preparation of a Project Report which, consists of technical description of the project.

GENERAL GUIDELINES

- Project Work is conceived as a group work through which the spirit of team building is expected to be developed. Students will be required to carry out their Project Works in groups under supervision of a lecturer of their core discipline who will work as a Project Guide. It is expected that most of the lecturers of the core discipline will act as project guide and each should supervise the work of at least two groups. Number of students per group will vary with the number of lecturers acting as Project Guide and student strength of that particular class.
 - Each group has to undertake a single project which has to be executed in Part – III First & Second Semesters. The project work aims at giving exposure to the students to the considerations to be made and to the procedure to be followed in designing a process plant and equipment or in performing any type of chemical process that will be suitable for industry. This will provide the scope to learn how a chemical plant is set up on making a process selection. Students would collect information and technical data on their assigned projects from the departmental library or from elsewhere, and if necessary, they may visit a chemical plant to gather practical information.
 - The **Project Report** should incorporate the following: —
 - a. Introduction and objectives of the project;
 - b. Review of literature,
 - c. Outlines of the procedure followed,
 - d. Material & energy balance of the process,
 - e. Design calculations,
 - f. Discussions and conclusion, and,
 - g. The drawings of the process flow sheet & the major equipments with fabrication details.
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PROFESSIONAL PRACTICE

Name of the Course : PROFESSIONAL PRACTICE	
Course Code:	Semester: Sixth
Duration: : Seventeen weeks	Maximum Marks: 100
Practical: 3 hrs./week	
Credit: 2	

OBJECTIVE

Sl. No.	Students will have to
1	Visit some industry related to their course content under guidance of the teachers.
2	Be engaged in one month vocational training in some chemical Industry.
3	To present a seminar related to the plant visit and/or vocational training in front of technical personnel for 15-20 minutes.
4	Preparation of presentation documents like reports and Visual communication aids.
5	Interaction and answering the questions related to the specific seminar topic with Technical Personnel as well as other students.

DETAILS OF COURSE

NAME OF THE COURSES	COURSES OFFERED IN	MARKS ALLOTTED
Professional Practice	Part – III Second Semester	Continuous Internal Assessment of 50 marks for a particular student is to be awarded by Technical personnel. Distribution of marks: Representation, Interaction & Reports- 50 External assessment of 50 marks shall be held at the end of the Part – III Second Semester. The external examiner is to be from industry / engineering college / university / government organisation. Viva- Voce :50