Final

DIPLOMA CURRICULUM OF CHEMICAL ENGINEERING (SECOND YEAR) (3rd Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
Block – FC, Sector – III, Salt Lake City, Kolkata – 700106

Vetted by:
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State Council for Technical Education & Vocational Training
Near Raj Bhawan, Unit-VIII, Bhubaneswar, Odisha

Table of Contents

PROGRAMME TITLE: CHEMICAL ENGINEERING

SEMESTER – III

SL. No	Category of Course	Code No	Course Title	Teaching Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	**Programme core**	CHEPC201 TH:1	Introduction to Chemical Engineering		3	0	0	70	30	-	-	100	3
2		CHEPC203 TH:2	Industrial Chemistry		3	0	0	70	30	-	-	100	3
3		CHEPC205 TH:3	Chemical Process Calculations		3	0	0	70	30	-	-	100	3
4		CHEPC207 TH:4	Momentum Transfer		3	0	0	70	30	-	-	100	3
5		CHEPC209 TH:5	Mechanical Operations		3	0	0	70	30	-	-	100	3
6		CHEPC211 PR:1	Industrial Chemistry Lab		0	0	4	-	-	15	35	50	2
7		CHEPC213 PR:2	Momentum Transfer Lab		0	0	4	-		15	35	50	2
8		CHEPC215 PR:3	Mechanical Operations Lab		0	0	4	-	-	15	35	50	2
9		CHEPC217 PR:4	Chemical Engineering Drawing Lab		0	0	4		-	15	35	50	2
	Summer Internship	SI201	Summer internship – I*		0	0	0	-	-	15	35	50	2
TOTAL					**15**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**25**

*3-4-weeks after 2nd Semester

CONTENT DETAILS OF SEMESTER - III

TH:1- INTRODUCTION TO CHEMICAL ENGINEERING

L	T	P		
3	0	0		**Course Code: CHEPC201**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

The course is intended to provide students a clear overview of the field of chemical engineering and introduce them to the elementary knowledge of process design, operations, relationship with other disciplines and challenges involved in the analysis of chemical processes.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe the role, duties and responsibilities of Chemical Engineers in various fields
- Explain fundamentals of unit operations and unit processes
- Illustrate the utility of Chemical Engineering with other engineering disciplines.
- Interpret the opportunities and challenges in Chemical Engineering.
- Identify different Chemical Engineering industries in India and World.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Understanding Chemical Engineering:** Definition of Chemical Engineering and Chemical Industry; Role of Physical Sciences (Physics & Chemistry), Life Sciences (Biology & Biochemistry), Mathematics and Economics in Chemical Engineering; Duties and Responsibilities of Chemical Engineer; Difference between Chemical Engineering and Chemistry	**4**
II	**Process Design and Engineering:** Unit Operations: Definition and brief description of various unit operations; Unit Processes: Definition and brief description of various unit processes; Batch and Continuous Process; Block Diagram, Flowsheet, PFD,P&ID of process plants (Only concepts and example); Role of Process Control Engineering and commonly used control systems in chemical plants like DCS, PLC, SCADA, etc; Use cases of Model, Prototype and Pilot plant; Engineering, Procurement and Construction (EPC) contract of an Industry (Concept)	**14**

III	**Relationship of Chemical Engineering with other disciplines**: Role of Chemical Engineers in the area of Food, Pharmaceutical, Energy, Environmental, Biochemical, Electronics, etc.; Importance of Quality Check and Quality Control in Chemical and allied industries; Simulation and Modeling: Definition, Importance, Applications and use of different software like ASPEN, ANSYS, HYSYS, CHEMCAD, PRO/II, DWSIM; Role of IOT and AI in Chemical Engineering	**12**
IV	**Opportunities and challenges in Chemical Engineering:** Traditional vs Modern Chemical Engineering; Opportunities for a Chemical Engineer; Scope and Future of Chemical Engineering	**4**
V	**Chemical Engineering in India and World:** Greatest achievements in Chemical Engineering; Role of Professional bodies/societies in Chemical Engineering (AIChE, ACS, IIChE, etc); Chemical Engineering Industries in India; Chemical Engineering Industries in Odisha: Raw Materials, Products and End uses	**11**
	Total	**45**

REFERENCES:

1.	S. K. Ghosal, S. K., Sanyal and S. Datta, "Introduction to Chemical Engineering", Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2.	Pushpavanam.S., "Introduction to Chemical Engineering", PHI Learning Pvt. Ltd., New Delhi,
3.	Badger W. L. and Banchero J. T., "Introduction to Chemical Engineering", 6th Edition, Tata McGraw Hill, 1997.
4.	Dryden, C. E., "Outlines of Chemicals Technology", Edited and Revised by Gopala Rao, M. and M. Sittig, 2nd Edition, Affiliated East-West press, 1993.

TH:2- INDUSTRIAL CHEMISTRY

L	T	P		
3	0	0		**Course Code: CHEPC203**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

Study of organic chemistry as a separate subject is more practical and fruitful. The knowledge of structure and function of a large number of compounds built of relatively few elements is important for future bio-technologist, food technologist and chemical engineer. The purpose of the Industrial Chemistry is to provide the key knowledge base, laboratory resources and industrial knowledge to prepare students for careers as professionals in various industries and research institutions.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- List the name mono and poly-functional organic compound in IUPAC system.
- Describe various reaction mechanisms for alkanes, alkenes.
- Familiarise themselves with methods preparation, properties and use of common aromatic and aliphatic compounds.
- Understand the concept of colloids, gel and emulsion
- Know different types of Polymers.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Organic Chemistry**: Nomenclatures of organic compounds, functional groups, Classification of organic compounds, aliphatic Compounds, closed chain compounds, un-saturated. Alkanes, alkenes, alkanes, cycloalkanes.	**6**
II	**Aliphatic compounds**: Chemical reactions, methods of preparation, chemical properties, physical properties, industrial applications of ethane, methane, ethylene, alcohols (methanol, ethanol), acetic acid, formaldehyde, acetone.	**8**
III	**Aromatic Compounds**: Alkyl halides, alcohol and phenols. Concept of aromaticity, structure of benzene, properties of benzene, reactions of benzene, halogenation, hydrogenation, pyrolysis, Classification of alkyl halides, isomerism in alkyl halides, properties of alkyl halides, substitution reaction,	**14**

	elimination reaction, alcohols. Classification, preparation, properties, reaction of phenols	
IV	**Colloids, Emulsion and Gel:** Types of colloidal systems; Characteristics and properties of colloids; Methods of preparation of colloids; Purification of colloids; Applications of Colloids; Types and properties of Emulsion; Role of Emulsifier; Preparation of Emulsion; Applications of Emulsion; Gel: Types, Properties and Applications	**10**
V	**Polymer:** Physical structure and functionality of Polymers; Addition Polymerization and Condensation Polymerization; Methods of Polymerization: Bulk, Suspension, Emulsion and Solution; Thermosetting and Thermoplastic Polymers; Properties and Applications: Polyethylene, Polyvinyl Chloride, Phenol Formaldehyde, Polyurethane, SBR, Polyamide, Polyester, Polypropylene	**7**
	Total	**45**

REFERENCES:

1.	R. T. Morrison, R. N. Boyd and S.K Bhattacharjee, „Organic Chemistry" Pearson.
2.	Raghavan, "Material Science & Engineering" PHI Learning Pvt. Ltd.,
3.	P. L. Soni and H. M. Chawla, "Text book of organic Chemistry", Sultan Chand & Sons – Tb
4.	B. R. Puri, L. R. Sharma and M. S. Pathania, "Principles of physical chemistry" Vikas Publishing House Pvt Ltd.,
5.	K. S. Tewari, S. N Mehrotra, N. K. Vishnoi , "Textbook of organic chemistry" Vikas Publishing House Pvt Ltd.,

TH:3- CHEMICAL PROCESS CALCULATIONS

L	T	P		
3	0	0		**Course Code: CHEPC205**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

Diploma Engineers are responsible for supervising production processes to achieve production targets. For this purpose, knowledge about various chemical calculations including material balance concept for unit operations and unit processes is required in chemical industry. The students are to be trained with adequate knowledge about chemical process calculations, stoichiometry ratio and proportions and the process conditions to achieve maximum product formation and recycle of the unused materials for better economy.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Develop ideas about different unit systems and conversion from one set of system to another
- Describe fundamentals concept of stoichiometry, stoichiometric equations and perform basic chemical calculations using the concepts
- Apply fundamentals of stoichiometric to calculate percent excess, yield, conversion, selectivity for various reactions.
- Explain unit operations and unit processes performed in chemical industry and apply material balance concept with and without chemical reaction to calculate the amount of materials required
- Identify applications of energy balance equations and calculate energy requirements for unit operation or process involved.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Unit Systems:** Introduction to process calculation; Dimensions and systems of units; Fundamental quantities of units, Derived quantities; Unit conversions in MKS and SI systems; Solve numerical on unit conversion	**5**
II	**Fundamental Concepts of Stoichiometry**: Importance of basis of calculation; Concept of mole, atom, atomic weight, molecular weight; Composition of solid, liquid and gas in terms of mass,	**10**

	mole and volume by expressing in percentage, ratio and fraction; Molarity, Molality, Normality; Solve simple numerical	
III	**Laws of gas, gas mixture and solution**: Concept of Partial pressure and Vapour pressure; Different Gas Laws: Boyle‟s Law, Charle's Law, Avogadro's Law, Gay Lussac's Law, Amagat's Law, Dalton's Law, Ideal Gas Law; Difference between Ideal solution and Real solution;Raoult's Law and Henry's Law; Solve numerical on gas laws and solutions	**11**
IV	**Material Balance**: Law of conservation of mass; Material balance equation for unit operations: Principles, Block diagram and simple numerical based on distillation, evaporation, drying, mixing; Concept of Excess and Limiting reactant, Conversion, Yield and Selectivity and solve simple numerical	**14**
V	**Heat Effects in Chemical Reaction**: Standard Heat of Reaction; Standard Heat of Combustion; Standard Heat of Formation; Hess Law of Constant Heat Summation; Solve simple numerical	**5**
	Total	**45**

REFERENCES:

1.	V. Narayanan and B. Lakshmikutty, "Stoichiometry and Process Calculations", Prentice Hall of India Ltd, New Delhi.
2.	Hougen and Watson, "Chemical process principle", CBS Publication, New Delhi
3.	Bhatt & Vora, "Stoichiometry", TMH Publication, New Delhi.
4.	K. A. Gavhane, "Introduction to Process Calculation", Nirali Prakashan, Pune

TH:4- MOMENTUM TRANSFER

L	T	P		
3	0	0		**Course Code: CHEPC207**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

Momentum transfer is a branch of fluid mechanics, study of which includes Fluid statics, fluid flow phenomena, properties of fluid, laws governing flow of fluids, working principles of fluid machineries and knowledge of control of machine movements.

This course allows the students to develop the knowledge and understanding of the operational requirements of fluid transportation system and able to recognize various components, operations and build their specific applications needed in industries and in daily life.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Apply basic principles of fluid mechanics.
- Identify and obtain the values of fluid properties and relationship between them
- Explain the principles of continuity, momentum, and energy as applied to fluid motions.
- State use of Bernoulli's equation and solve hydrostatic and fluid flow problems using Newton's laws of motion
- Analyse frictional flow in pipes and piping networks and to compute the head Loss and power requirements for chemical process equipment.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Fluid Mechanics:** Difference between Solids and Fluids; Properties of Fluid: Mass Density, Weight Density, Specific Volume, Specific Gravity, Surface Tension and Viscosity (Dynamic and Kinematic); Newton's Law of Viscosity, Simple numerical problems; Type of Fluid: Ideal and Real Fluid, Newtonian and Non-Newtonian Fluid; Fluid Pressure and its measurement: Pascals Law, Hydrostatic Equilibrium, Manometer (Piezometer, U-Tube, Differential), Barometer, Concept of buoyancy and Archimedes" Principle	**13**
II	**Fluid Flow Phenomena and Flow Measurement**: Types of Fluid Flow: Steady vs. Unsteady, Uniform vs. Non-Uniform, Compressible vs. Incompressible, Rotational vs. Irrotational;	**17**

	Equation of Continuity, Mass Flow Rate, Volumetric Flow rate, Simple numerical problems; Reynolds Experiment and its significance, Laminar, Transition and Turbulent Flows, Critical Velocity; Bernoulli's Theorem and its practical applications, Derivation of Bernoulli's equation for ideal fluid and real fluid, Simple numerical problems; Pressure drop and Frictional losses in pipes: Skin and Form Friction, Effect of Roughness, Friction Factor, Fanning Equation, Hagen-Poiseuille Equation, Simple numerical problems; Flow Measurement: Venturimeter (Principle, Construction, Working, Co-efficient, Formula for flow rate measurement); Orificemeter (Principle, Construction, Working, Co-efficient, Formula for flow rate measurement); Working Principle and diagram of Pitot Tube and Rotameter; Simple numerical problems on flow rate measurement	
III	**Pipe, Fitting and Valves**: Difference between pipe and tube; Standard sizes of pipes, Wall Thickness, Schedule Number, Nominal Diameter, BWG Number; Different types of Joints and Fittings; Valves and their applications: Gate Valve, Globe Valve, Ball Valve, Needle Valve, Non-return Value, Butterfly Valve, Diaphragm Valve, Pressure Relief Valve	**5**
IV	**Pumps**: Classification of Pumps; Centrifugal Pump: Definition, Construction, Working, Advantages & Disadvantages, Characteristic Curves (Head, Power Input & Efficiency as a function of discharge at a particular speed), Priming, NPSH, Cavitation and losses encountered;Applications of Reciprocating Pump, Piston Pump, Plunger Pump, Diaphragm Pump and Gear Pump	**7**
V	**Fluidisation**: Conditions for fluidization; Types of Fluidisation; Application of Fluidisation	**3**
	Total	**45**

REFERENCES:

1.	W. L. McCabe, J.C. Smith and P. Harriott, "Unit operations of Chemical Engineering", McGraw Hill, International Edition
2.	J. M. Coulson and J. F. Richardson, "Chemical Engineering", Vol 1, Butterworth Heinemann.
3.	M. Narayanan & B. C Bhattacharya, „Unit operations and Processes" Vol-I, CBS Publishers & Distributors
4.	K A Gavhane, "Unit Operation-I" Nirali Prakashan,

TH:5- MECHANICAL OPERATIONS

L	T	P		
3	0	0		**Course Code: CHEPC209**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

Operations related to size reduction, size separation, filtration, mixing, transportation and storage are important in many chemical and hydro-metallurgical industrial practices from the point of view of consequence and process economy. It is therefore, important to study the principles governing the operations named above (known collectively as mechanical operations) the construction & operation of different equipment and selection of equipment for specific purpose from host of different alternatives.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe the basic principles of particles preparation and their characterization.
- Discuss about different size reduction and size separation.
- Explain an understanding on mixing of solids.
- Explain solid storage and their conveying in chemical process industries.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Size Reduction of Solids:** Objectives of size reduction; Size reducing methods: Impact, Compression, Attrition and Shear; Laws of Comminution: Kick's Law, Rittinger's Law and Bond's Law; Power consumption in crushing; Coarse Crushers: Operating principle, construction, working, diagram and applications of Jaw Crusher, Gyratory Crusher, Crushing Roll; Intermediate and fine grinders: Operating principle, construction, working, diagram and applications of Hammer Mill and Ball Mill; Applications of Ultrafine grinders; Closed and Open circuit grinding; Dry and wet grinding; Free and choke grinding; Solve simple problems	**15**
II	**Size separation of solids**: Characterization of solid particles: Sphericity, Sauter mean diameter, Mass mean diameter, volume mean diameter; Screening: Definition, Comparison between Ideal screen and actual screen, Types of standard screen sizes, factors affecting screening operation, Capacity and effectiveness of screen; Screening equipment: Grizzlies, Trommels, Vibrating and	**20**

	Gyratory screens; Operating principle, diagram and applications of Classifier, Jig, Froth Floatation Cell, Electrostatic Precipitator, Magnetic separator, Cyclone Separator, Scrubber, Clarifier, Thickener; Filtration: Constant rate and Constant pressure filtration	
III	**Mixing of solids**: Difference between mixing and agitation; Agitated vessel; Impeller, Propeller, Paddle and Turbine blade; Concept of swirling and vortex; Function of baffles; Power consumption in a stirred vessel	**4**
IV	**Transportation and Storage of solids**: Objective of transportation and storage of solids; Transportation of solids (Diagram, Working and application) by Belt Conveyor, Screw Conveyor, Bucket Elevator, Scrapper and Pneumatic Conveyor; Storage: Hopper, Bin and Silo; Angle of Repose	**6**
	Total	**45**

REFERENCES:

1.	Anup. K. Swain, Hemlata Patra, G. K. Roy., "Mechanical Operations", McGraw Hill Education
2.	McCabe and J. C. Smith," Unit Operation of Chemical Engineering", McGraw Hill., New York.
3.	C. M. Narayanan & B. C Bhattacharya, "Mechanical Operations for Chemical Engineers", Khanna Publishers
4.	Badger and Banchero, "Introduction to Chemical Engineering", McGraw Hill, New York.

PR:1- INDUSTRIAL CHEMISTRY LAB

L	T	P		
0	0	4		**Course Code: CHEPC211**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs		End Term Exam 15
			Total Marks: 50	Progressive Assessment 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course: PC

RATIONALE:

This course will provide a basic understanding of organic compounds and help them to detect different elements from an organic compound. They will be enabled to prepare different synthetic polymers.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe the detection test for elements present.
- Indicate the preparation of organic compounds and synthetic polymers.

LIST OF EXPERIMENTS:

Sl No.	Name of Experiments
1	Detection the following elements in the organic compound I. Nitrogen II. Sulphur III. Halogen
2	Determine different functional group of I.Carboxylic group II. Phenolic group III. Alcoholic group
3	Prepare in laboratory I. Oxalic acid II. Benzoic acid III. Methyl Orange
4	Laboratory preparation of Urea formaldehyde resin
5	Laboratory preparation of Bakelite(Phenol formaldehyde resin)
6	Laboratory preparation of Nylon 6-6.

REFERENCES:

1.	S K Bhasin & Sudha rani "Laboratory Manual on Engineering Chemistry" Dhanpat rai publishing company
2.	Dr S K Nayak " Practical Chemistry for +2 students" ABC Publication
	OP Pandey & D N Bajpai "Practical Chemistry for BSc students" S Chand

PR:2- MOMENTUM TRANFER LAB

L	T	P		
0	0	4		**Course Code: CHEPC213**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE:

This course will provide a basic understanding of flow measurements using various types of flow measuring devices, calibration and losses associated with these devices. Performance analysis will be carried out using characteristics curves.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain and analyse the laminar and turbulent flow
- Describe flow measurements using various types of flow measuring devices, calibration and losses associated with these devices.
- Apply knowledge of hydraulic turbines and pumps to draw characteristics

LIST OF EXPERIMENTS:

Sl No.	Name of Experiments
1	Demonstration of operation of different types of manometers
2	Demonstration of Reynold‟s apparatus
3	Verification of Bernoulli‟s equation
4	Demonstration of operation of Venturimeter
5	Demonstration of operation of Orificemeter
6	Losses in pipe flow
7	Demonstration of operation of Centrifugal pump
8	Flow Through Fluidized Bed
9	Basic Plumbing Practice

REFERENCES:

1.	Dr Baljeet S Kapoor, “Experiments in fluid mechanics”, Khanna Publication
2.	S. K. Lekhi, “Hydraulics-Laboratory manual” Wiley eastern Limited

PR:3- MECHANICAL OPERATIONS LAB

L	T	P	Total Marks: 50	Course Code: CHEPC215	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	: 35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

To understand the importance of various mechanical operations used in process industry. To apply principles of basic sciences and chemical engineering for designing various size reduction, size separation and conveying equipment.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe the fundamentals involved in the Mechanical operations.
- State the application of the concept of Particulate properties and its measurements.
- Distinguish liquid-solid and gas-solid separations.

LIST OF EXPERIMENTS:

Sl No.	Name of Experiments
1	Demonstrate the operation of Blake Jaw Crusher
2	Demonstrate the operation of a Ball Mill and determine its critical speed.
3	Demonstrate the operation of Vibrating Screen.
4	Demonstrate the operation of a Gyratory Sieve Shaker
5	Demonstrate the operation of a Froth Floatation Cell
6	Demonstrate the operation of Cyclone separator
7	Demonstrate the operation of a Bucket Elevator
8	Demonstrate the operation of a Belt Conveyor
9	Demonstrate the operation of a Plate and Frame Filter Press.
10	Demonstrate the operation of a Paddle Mixer

REFERENCES:

1.	Lab Manual
2.	W. L. McCabe, J.C. Smith and P. Harriott, "Unit operations of Chemical Engineering", McGraw Hill, International Edn.
3.	G Chandrasekhar, Laboratory Experiments in Chemical and Allied Engineering, Penram International publishing (India) Pvt. Ltd.

PR:4- CHEMICAL ENGINEERING DRAWING

L	T	P	Total Marks: 50	Course Code: CHEPC217
0	0	4		
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs		End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE:

Chemical Engineering Drawing gives hands on practice of drawing the equipment, exposure to actual flow of material in a chemical plant and understanding of process utility and control system

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe how to draw the different pipe joints, fittings and valves essential for Chemical engineer.
- Develop student‟s imagination and ability to represent the shape size and specifications components of equipment of mechanical operation and heat transfer
- Draw various symbols of instrumentation
- Draw the flow diagram of chemical plant

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COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
SHEET-I	**Pipe Joints and Fittings**: Welded Joint, Screw Joint, Union Joint, Socket, Bends, Elbow, Tee, Expander, Plug, Welded neck flange and slip on flange	**5**
SHEET-II	**Valve symbols and schematic diagram**: Gate Valve, Globe Valve, Ball Valve, Diaphragm Valve, Butterfly valve, Plug Valve, Check Valve, Control Valve	**7**
SHEET-III	**Process Pipeline symbols**: Pipe, Thermally insulated pipe, Jacketed pipe, Cooled or Heated pipe, Flexible pipe	**2**
SHEET-IV	**Equipment symbols and sketch:** Centrifugal pump, Gear pump, Compressor, Turbine, Vacuum Pump, Screw conveyor, Elevator, Condenser, Boiler, Cyclone separator, Filter, Thickener, Crystallizer, Crusher, Dryer	**22**
SHEET-V	**Vessel symbols:** Vessel, Open tank, Closed tank, Column, Tank, Tray Column, Clarifier, Gas cylinder, Reaction vessel, Bin	**3**
SHEET-VI	**Instrumentation symbols:** Flow controller, Flow element, Flow indicator, Flow meter, Flow recorder, Flow transmitter, Level controller, Level alarm, Level indicator, Level recorder, Level transmitter, Pressure controller, Pressure indicator, Pressure	**3**

	recorder, Pressure transmitter, Temperature controller, Temperature indicator, Temperature recorder, Temperature transmitter, Transducer, Thermometer,	
SHEET-VII	Schematic Diagram of Double Pipe and Shell & Tube Heat Exchangers	**8**
SHEET-VIII	Schematic Diagram of Distillation Column	**4**
SHEET-IX	PFD of any Chemical Engineering plant	**6**
	Total	**60**

REFERENCES:

1.	D. C. Sikdar, "Process Heat Transfer & Chemical Equipment Design", Revised Ed. Khanna Publishing House
2.	V. V. Mahajani and S. B. Umarjii, "Joshi's Process Equipment Design", Mac Millan Publishers India Limited, New Delhi,
3.	C. Dryden," Output lines of Chemical Technology" CBS Publishing company
4.	Dr Srikant D. Dawande," Process Equipment Design Vol 1 & Vol 2" Dennet Publication
5.	B.C. Bhattacharyya, "Introduction to Chemical Equipment Design Mechanical Aspects", CBS Publishers & Distributors, New Delhi
6.	K. A. Ghavane, "Chemical Engineering Drawing" Nirali Publication

SUMMER INTERNSHIP – I

L	T	P		
0	0	0		**Course Code: SI201**
Total Contact Hours				**Practical Assessment**
Practical		: 3-4 weeks	**Total Marks: 50**	End Term Exam : 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**: 2**		Category of Course : SI

Duration: 3-4 weeks during summer vacation after 2nd Semester.

RATIONALE:

Summer Internship - I is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hands-on industry experience.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Develop and refine specific skills relevant to the field.
- Gains hands-on experience in a professional network by interacting with mentors and industry professionals.
- Learn to manage their time effectively.
- Clarify career goals.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic
I	**Orientation:** • Introduction to the organization‟s mission, values, and culture. • Familiarization with workplace policies, procedures, and safety guidelines. • Orientation to the team and organizational structure.
II	**Project-Based Learning:** • Description of the main project or tasks the intern will be working on during the internship. • Detailed project goals and objectives. • Training and guidance on project-specific tools, technologies, or methodologies.

III	**Technical and Skill Development:** • Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory techniques). • Soft skills development, including communication, teamwork, problem solving, and time management
IV	**Mentorship and Supervision:** • Regular meetings with a designated mentor or supervisor for guidance, feedback, and support. • Mentorship objectives and expectations.
V	**Professional Development:** • Sessions on professional etiquette, networking, and building a personal brand • Resume writing and interview preparation workshops.
VI	**Industry and Field-Specific Knowledge:** • Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies. • Guest speakers from the field to share insights and experiences.
VII	**Reporting and Documentation:** • Training on how to document project progress, results, and findings. • Practice in creating reports, presentations, or other deliverables.
VIII	**Ethics and Professionalism:** • Discussions on ethical considerations within the field. • Scenarios and case studies related to ethical decision-making
IX	**Feedback and Evaluation:** • Regular performance evaluations and feedback sessions. • Self-assessment and goal-setting exercises.
X	**Networking and Industry Exposure:** • Opportunities to attend industry conferences, webinars, or networking events. • Encouragement to connect with professionals in the field.

NOTE

As per AICTE guidelines, in Summer Internship-I, students are required to be involved in Inter/ Intra Institutional Activities viz;

- Training with higher Institutions;
- Soft skill training organized by Training and Placement Cell of the respective institutions;

- Contribution at incubation/ innovation /entrepreneurship cell of the institute;
- Participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute‟s Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc