Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Technology
(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Structure & Syllabus of
B. Tech. (Chemical Engineering)

Pattern 'D26'

Effective from Academic Year 2026-27

Prepared by: Board of Studies in Chemical Engineering Department

Approved by: Academic Board, Vishwakarma Institute of Technology, Pune

Chairman – BOS Chairman **Chairman – Academic Board**

PROGRAM OUTCOMES:

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and

write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Rec`1ognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES STATEMENTS

Engineering Graduates will be able to:

1. Work in chemical engineering organizations demonstrating expertise in conventional chemical engineering design and operations.

2. Work in diverse, multidisciplinary fields such as biotechnology, nanotechnology, food, energy, environmental, product designs etc.

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Final Year Module – VII

Final Year Module – VIII

B.Tech. Chemical Structure Pattern D26 (applicable w.e.f. AY 26-27)

Final Year Module -VII

Subject head	Course code	Course name	Contact hours per week			Credits
			Theory	Lab	Tut	
S1	CH4259	INDUSTRIAL POLLUTION CONTROL	2	-		2
S2	CH4203	PLANT ENGINEERING AND PROJECT ECONOMICS	2			2
S3	CH4285	CHEMICAL PROCESS INTENSIFICATION	2	-	-	2
S4	CH4289	MAJOR PROJECT	-	20	-	9
S5	CH4290	DESIGN THINKING-7			1	1
OR						
S1	CH4293	INDUSTRY INTERNSHIP	-	-	-	16
	CH4291	RESEARCH INTERNSHIP				
	CH4294	INTERNATIONAL INTERNSHIP				
	CH4292	PROJECT INTERNSHIP				
		Total				16

FF No.: 654-A

CH4203: PLANT ENGINEERING AND PROJECT ECONOMICS

Teaching Scheme	Examination Scheme
Credits : 2	CVV:20
Lectures : 2 Hrs/week	GD/PPT/HA: 20 Marks
Practical : **0** Hours/Week	MSE (W/O): 30 Marks
Tutorial: **0** Hours/Week	ESE (W/O): 30 Marks

Prerequisites:	**Process Calculations, Chemical Technology, Process equipment design**
Course Objectives:	The student will be able to
1	Understand capital cost estimation, product cost estimation
2	Understand different interest rates, cash flows, taxes and insurance
3	Understand depreciation and profitability analysis
4	Understand general consideration: health and safety hazards
Course Outcomes:	
	After completion of the course, student will be able to
1.	Estimate & predict capital investment of chemical plant
2.	Estimate & predict total product cost of chemical plant.
3.	Describe and calculate depreciation
4.	Describe different health and safety measures in chemical industry

Section1:	**Topics/Contents**
Chemical Plant Cost Estimation; Cash flow for industrial operations: Cumulative cash position, Factors Affecting Investment and Production Costs, Capital Investments: Fixed-Capital Investment, Working Capital, and Estimation of Capital Investment: Types of Capital Cost Estimates, Cost Factors in Capital Investment, Estimation of Total Product Cost: Manufacturing Costs, General Expenses. Estimation of various components of project cost as per recommended practice by India Financial Institutes, Plant & machinery estimate, Cost of Production. Cost Indexes	
Section2:	**Topics/Contents**
Depreciation: purpose of depreciation as a cost, types of depreciation, depletion, service value, salvage value, present value, depreciation in chemical project, methods for determining depreciation, depreciation rates. Health and Safety Considerations; General Design Considerations: Health and Safety Hazards, Loss Prevention: Hazard Assessment Techniques: HAZOP, HAZAN, Fault Tree Analysis, etc.	

Text Books: ***(As per IEEE format)***	
1	Peters, M.S., Timmerhaus, K.D. “Plant design and economics for chemical engineers”, 4th Edition, McGraw Hill, 1990.
Reference Books: ***(As per IEEE format)***	
1	Mahajani V.V., Mokashi S. M. “Chemical Project Economics”, Macmillan India Publication, 1st Edition, 2005.
2	Bausbacher E. and Hunt R. “Process Plant Layout and Piping Design”, 1st Edition, Prentice Hall Publication, 1993.

List of Home Assignments:

Design:

1. Estimation of profitability
2. HAZOP analysis of Urea manufacturing plant
3. Fault Tree analysis of Distillation column
4. Estimation of total product cost
5. Estimation of depreciation

Case Study:

1. Personal safety and industrial safety

2. Recent trends in cost estimation of chemical plant
3. Sustainable energy sources
4. Capital cost estimation of the chemical plant
5. Safety consideration in a particular plant.

Blog

1. Safety-A major issue in chemical industry
2. New trends in chemical industries
3. Importance of pilot plant in chemical industry
4. Cash flow in the chemical industry.
5. Importance of depreciation.

Surveys

1. Market survey of a particular chemical.
2. Various cost indices used in Chemical industry cost estimation
3. Various types of annuities in India
4. Different types of taxes in India
5. Different types of methods for calculation of depreciation

CO – PO / PSO Articulation Matrix

Correlation: 1 = Low (Slight), 2 = Medium (Moderate), 3 = High (Substantial), '-' = no correlation.

CO	Program Outcome (PO)											PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	1	1	1	1	1	3	3	3	1
CO2	1	1	2	1	1	1	1	1	1	1	3	3	3	1
CO3	1	1	2	1	1	1	1	1	1	1	2	2	3	1
CO4	1	1	3	1	1	3	2	1	1	1	2	2	3	1
CO5														
CO6														
Avg	1	1	2.5	1	1	1.5	1.2	1	1	1	2.5	2.5	3	1

FF No.: 654-A

CH4259:INDUSTRIAL POLLUTION CONTROL

Teaching Scheme	Examination Scheme
Credits : 2	CVV: 20 Marks
Lectures : 2 Hrs/week	GD/PPT/HA: 20 Marks
Practical : **0** Hours/Week	MSE (W/O): 30 Marks
Tutorial: **0** Hours/Week	ESE (W/O): 30 Marks

Prerequisites:		**Process Calculations, Chemical Technology, Process equipment design**
Course Objectives:		The student will be able to
1	Understand capital cost estimation, product cost estimation	
2	Understand different interest rates, cash flows, taxes and insurance	
3	Understand depreciation and profitability analysis	
4	Understand general consideration: health and safety hazards	
Course Outcomes:		
	After completion of the course, student will be able to	
1.	Understand the various methods of monitoring and various techniques used in the control of Environmental pollutants	
2.	Focus on the principles and mechanisms of pollutant removal	
3.	Design the conventional and advanced technologies applied in treatment and control	
4.	Understand solid Chemical wastes health and environmental effects, treatment and disposal	

Section1:	Topics/Contents
Air pollutant sampling and measurement: Types of air pollution, types of emissions from chemical industries, and effects of the environment legislation, Effluent guidelines and standards. Sources and characteristics of pollutants in various industries such as fertilizer, paper and pulp industry, petrochemical and petroleum industry; Particle size distributions. Ambient air sampling: collection of gaseous air pollutants, collection of particulate air pollutants. Stack sampling: Sampling system, particulate sampling, and gaseous sampling Monitoring of air pollutants; Principles of industrial air pollution control methods for gaseous and particulate; Air pollution control methods and equipment: Preventive Techniques: Shift of the sources, Substitution of raw material and fuels, Process modification. Cleaning of gaseous effluents particulate emission control: collection efficiency, air pollution control equipment like gravitational settling chambers, Cyclone separators, fabric filters, ESP and their constructional and design aspects. Scrubbers: wet scrubbers, spray towers, centrifugal scrubbers, packed beds and plate columns, venturi scrubbers, and their design aspects. Control of gaseous emissions: absorption by liquids, absorption equipment, adsorption by solids, equipment and the design aspects.	

Section2:	Topics/Contents
Characterization of effluent streams, oxygen demands and their determination (BOD, COD, and TOC). Introduction to wastewater treatment, Methods of primary treatments: screening, sedimentation, flotation, neutralization. Secondary treatment of wastewater, bacterial and bacterial growth curve, aerobic processes, suspended growth processes, activated aerated lagoons and stabilization ponds, Attached growth processes, trickling filters and anaerobic processes. Methods of tertiary treatment: carbon adsorption, ion exchange, membrane filtration, chlorination, Advanced oxidation treatment. municipal solid waste sources, and control methods hazardous waste management:. Chemical wastes: health and environmental effects, treatment and disposal: treatment and disposal by industry, off-site treatment and disposal, treatment practices in various countries. Nuclear wastes: health and environment effects, sources and disposal methods Biomedical wastes: types of wastes and their control.	

Text Books: ***(As per IEEE format)***

1	Rao. C.S., "Environmental Pollution and Control Engineering", 2nd Edition, Revised, New Age International, 2007
2	Mahajan. S.P., "Pollution Control in Process Industries", Tata-McGraw Hill, New Delhi, 1985.

Reference Books: ***(As per IEEE format)***

1	Narayana Rao, M. and Datta, A.K., “WasteWater Treatment”, 2nd Edition, Oxford and IBH Publications, New Delhi, 2005.
2	Swamy, A.V.N., “Industrial Pollution Control and Engineering”, Galgotia Publications, Hyderabad, 2005.

List of Home Assignments:
Design:
1. Design a sedimentation tank for an industrial wastewater treatment plant.
2. Design an activated sludge process for a medium-sized chemical industry.
3. Design a packed tower scrubber for SO_2 removal from industrial flue gases.
4. Design a cyclone separator for particulate removal from industrial exhaust gases.
5. Design a bag filter system for a cement or chemical industry.
6. Design an oil-water separator for refinery wastewater.

Case Study:

1 Study the industrial pollution control system of a sugar industry.

2 Analyze wastewater treatment practices in a textile dyeing industry.

3 Case study on air pollution control in a thermal power plant.

4 Study hazardous waste management in a pharmaceutical manufacturing plant.

5 Analyze pollution control measures adopted by a petroleum refinery.

6 Case study on Zero Liquid Discharge (ZLD) implementation in a chemical industry.

7 Study pollution generated during pulp and paper manufacturing and its treatment.

8 Analyze the environmental impact and pollution control measures in fertilizer industries.

9 Case study on accidental chemical release (e.g., Bhopal Gas Tragedy) focusing on pollution prevention and lessons learned.

10 Study wastewater treatment and sludge management in a dairy processing plant.

Blog:

1. Why Industrial Pollution Control is Essential for Sustainable Development
2. Future Trends in Industrial Wastewater Treatment Technologies
3. Role of Chemical Engineers in Environmental Protection

4. Green Chemistry: A Sustainable Solution to Industrial Pollution

Surveys :

1. Survey on industrial air pollution control equipment used in manufacturing industries.
2. Comparative survey of effluent discharge standards prescribed by CPCB and MPCB
3. Survey on hazardous waste management practices in nearby industries
4. Survey of cleaner production techniques adopted by chemical industries
5. Survey of industrial noise pollution and its control methods.

Text Books:

1. Rao. C.S., "Environmental Pollution and Control Engineering", 2nd Edition, Revised, New Age International, 2007

2. Mahajan. S.P., "Pollution Control in Process Industries", Tata-McGraw Hill, New Delhi, 1985.

References:

1. Narayana Rao, M. and Datta, A.K., "WasteWater Treatment", 2nd Edition, Oxford and IBH Publications, New Delhi, 2005.

2. Swamy, A.V.N., "Industrial Pollution Control and Engineering", Galgotia Publications, Hyderabad, 2005.

FF No.: 654-A

CH4285: Chemical Process Intensification

Teaching Scheme	Examination Scheme
Credits :	CP: 20 Marks
Lectures : 1 Hrs/week	GD/PPT/HA: 20 Marks
Practical : 0 Hrs/week	MSE (W/O): 30 Marks
Tutorial : 0 Hrs/week	ESE (W/O): 30 Marks

Prerequisites:	Fluid mechanics, heat transfer, mass transfer, chemical reaction engineering
1.	
Course Objectives:	
1	Understand the concepts, principles, and strategies of Process Intensification for chemical process industries.
2	Analyze various Process Intensification techniques for enhancing reaction, separation, and transport processes.
3	Explain the role of Process Intensification in sustainable and energy-efficient process design.
4	Apply advanced Process Intensification technologies to improve process performance.
5	Utilize optimization and computer-aided tools for intensified process design and analysis.
6	Evaluate industrial applications of Process Intensification for improving safety, economics, and sustainability.
Course Outcomes:	
	After completion of the course, student will be able to
1.	Comprehend the principles, mechanisms, and strategies of Process Intensification in chemical engineering.
2.	Analyze intensified reaction, mixing, heat transfer, and mass transfer processes.
3.	Evaluate sustainable process designs using Process Intensification concepts.
4.	Comprehend design of intensified reactors and separation systems for chemical processes.
5.	Apply optimization techniques and computational tools to intensified process design.
6.	Recommend suitable Process Intensification technologies for industrial applications based on technical, economic, and environmental considerations.

Section1:	**Topics/Contents**

Introduction to Process Intensification: history, philosophy, concepts, principles, key features, strategies, and domain-based techniques; mechanisms of Process Intensification through fluid flow, mixing, and reactive systems; role of Process Intensification in sustainable development, including concepts, issues, challenges, and sustainable process design strategies; design techniques, scales and stages of Process Intensification, methods and computer-aided tools for sustainable process design; stochastic optimization, optimization algorithms, and their applications; Process Intensification by cavitation, including cavitation mechanisms, reactor configurations, and parametric effects.	
Section2:	**Topics/Contents**
Process Intensification using hydrodynamics, and transport phenomena; interfacial area-based Process Intensification using ejector-induced downflow systems, hydrodynamics, and transport processes; Process Intensification in distillation through intensified and membrane-assisted distillation; Process Intensification in extraction using supercritical fluid extraction; membrane-based Process Intensification, membrane principles, and membrane engineering; microprocess technology, including microreactors, microchannel hydrodynamics, transport phenomena, and industrial applications.	
Text Books: *(As per IEEE format)*	
1	David Reay, Colin Ramshaw, Adam Harvey ,Process Intensification: Engineering for Efficiency, Sustainability and Flexibility, 3rd Edition , Butterworth-Heinemann (Elsevier), 2013
2	Gavin Towler, Ray Sinnott, Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design, 3rd Edition, Elsevier, 2021.
3	Gilbert F. Froment, Kenneth B. Bischoff, Juray De Wilde, Chemical Reactor Analysis and Design, 3rd Edition , John Wiley & Sons, 2011
Reference Books: *(As per IEEE format)*	
1	Bird Byron, Stewart Warren, Lightfoot Edwin, Transport Phenomena, 2nd Edition , John Wiley & Sons, 2007
2	Warren D. Seider, J. D. Seader, Daniel R. Lewin, Soemantri Widagdo , Product and Process Design Principles: Synthesis, Analysis, and Evaluation, 4th Edition , John Wiley & Sons, 2017
3	Klavs F. Jensen , Process Intensification Technologies for Green Chemistry , 1st Edition , Wiley-VCH, 2012

List of Home Assignments:

Design:

1. Design and simulation of a reactive distillation column for esterification or etherification process.
2. Design of a hydrodynamic cavitation reactor for wastewater treatment or oxidation process.
3. Design of a monolith catalytic reactor for gas-phase reaction (e.g., CO oxidation or NOx reduction).
4. Design of a membrane-based separation system for gas or liquid purification.
5. Design of a microreactor system for highly exothermic fast chemical reactions with heat removal analysis.

Case Study:

1. Case study of industrial implementation of Process Intensification in BASF or Dow Chemicals.
2. Analysis of energy savings using intensified distillation vs conventional distillation columns.
3. Case study of supercritical fluid extraction in pharmaceutical or food industries.
4. Industrial application of microreactor technology in fine chemicals or pharmaceutical synthesis.
5. Case study of membrane bioreactors in wastewater treatment and sustainability performance.

Blog

1. "Why Process Intensification is the Future of Sustainable Chemical Engineering?"
2. "How Microreactors Are Transforming Pharmaceutical Manufacturing?"
3. "Cavitation Technology: A Green Solution for Industrial Wastewater Treatment"
4. "Membrane Technology vs Conventional Separation: A Sustainability Perspective"
5. "From Large Plants to Compact Systems: The Evolution of Chemical Process Design"

Surveys

1. Recent advances in Process Intensification technologies for sustainable chemical industries (last 10 years).
2. Literature review on cavitation-based chemical and environmental applications.
3. Review of monolith and structured reactors in catalytic process industries.
4. Study of hybrid separation systems (membrane + distillation / extraction).
5. Review of optimization techniques used in Process Intensification (GA, PSO, ANN, ML-based methods).

CO – PO / PSO Articulation Matrix

Correlation: 1 = Low (Slight), 2 = Medium (Moderate), 3 = High (Substantial), '-' = no correlation.

CO	Program Outcome (PO)											PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	2	1	0	0	0	1	0	0	0	0	2	0	0
CO2	2	3	2	2	1	0	1	0	0	0	0	3	2	1
CO3	2	2	2	1	2	2	3	0	0	0	0	2	2	1
CO4	1	2	3	2	2	0	2	0	0	0	0	3	3	2
CO5	2	2	3	3	3	0	1	0	0	0	0	2	3	2
CO6	2	3	2	1	2	2	3	1	1	1	2	3	2	2
Avg	2	2.3	2.2	1.5	1.7	0.7	1.8	0.2	0.2	0.2	0.4	2.5	2	1.3

FF No.: 654-A

CH4289::MAJOR PROJECT

Teaching Scheme	**Examination Scheme**
Credits : 10	
Lectures : 0 Hrs/week	
Practical/Lab : 20 Hrs/week	MSE (review): 30 Marks
Tutorial : 0 Hrs/week	ESE (review): 70 Marks

Prerequisites:	Fluid mechanics, heat transfer, mass transfer, chemical reaction engineering
Course Objectives:	
1	To understand the fundamental concepts, principles, mechanisms, and strategies of Process Intensification in chemical engineering systems.
2	To analyze intensified reaction, mixing, heat transfer, mass transfer, and separation processes using engineering principles.
3	To evaluate sustainable and energy-efficient process design approaches using Process Intensification concepts.
4	To design and assess advanced intensified systems such as cavitation reactors, monolith reactors, membrane systems, microreactors, and intensified separation units.
5	To apply computational tools and optimization techniques for improving performance and industrial applicability of Process Intensification systems.
6	Present work effectively with concrete results
Course Outcomes:	
	After completion of the course, student will be able to
1.	Do literature search appropriately with available tools
2.	Defining of project title/idea
3.	Allocation of tasks among the team members
4	Execute the task with desired accuracy
5.	Development of Team spirit
6.	Write a report, research paper with required format

Section1:	**Topics/Contents**
This stage will include a complete report consisting of synopsis, the summary of the literature survey carried out, Details of experimental/theoretical work and results and discussion and conclusion. *Students may undertake studies in application chemical engineering knowledge for manufacturing project, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing*	

process/system, development of computer programs, solutions, modeling and simulation related to the subject. Topics of interdisciplinary nature may also be taken up. A detailed literature survey is expected to be carried out as a part of this work. The group of students is required to choose the topic in consultation with the Guide.	
Section2:	**Topics/Contents**
A technical report of 15 pages is required to be submitted at the end of the term and a presentation made based on the same. Modern audio-visual techniques may be used at the time of presentation. *The external from Industry/research organization is invited to evaluate the projects done by students.*	

List of Project areas:

1. Agriculture
2. Personal Health
3. Social health
4. Hygiene
5. Energy
6. Environment
7. Potable Water
8. Solar based
9. Modeling and Simulation
10. Waste water treatment
11. Air pollution
12. Solid waste management
13. Low-cost product development

Suggest an assessment Scheme:

Assessment of project includes three reviews spread across 4 months, where research innovative ideas, strategy of execution, actual execution, teamwork is assessed.

Every review is based on report writing, presentation of results and team work demonstration.

First reviews are with internal faculty members
Second review is with an external industry expert.

Review 1: Literature search and deciding appropriate topic and Progress of work on decided topic i.e setting experimental setup, developing methodology of solving the opted problem.
Review 3: Overall assessment of project work with team efforts.

CO	Program Outcome (PO)											PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	1	1	1	0	1	1	1	1	1	1	1	1	1
CO2	0	0	0	0	0	0	0	3	3	1	3	1	0	0
CO3	3	1	1	1	1	1	1	1	1	1	1	1	1	1
CO4	1	3	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	3	1	1	1	1
CO6	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Avg	1.5	1.2	0.83	0.83	0.67	0.83	0.83	1.33	1.33	1.5	1.33	1.0	0.83	0.83

FF No.: 654-A

CH4293::INDUSTRY INTERNSHIP

Teaching Scheme	Examination Scheme
Credits : 24	
Lectures : 0 Hrs/week	
Practical/Lab : 40 Hrs/week	MSE (review): 30 Marks
Tutorial : 0 Hrs/week	ESE (review): 70 Marks

Prerequisites:	Heat Transfer, Mass Transfer, Fluid Flow Operations, Process Calculations, Mass Transfer Operation, Separation Techniques, Chemical Reaction Engineering, Instrumentation and Process Control, Transport Phenomena
Course Objective:	
1	To enable students to apply fundamental Chemical Engineering knowledge for analyzing and solving engineering problems in process systems.
2	To develop the ability to study, analyze, and design chemical engineering equipment and processes using core engineering principles.
3	To integrate core and multidisciplinary knowledge for research and development activities in chemical engineering applications.
4	Total Internship period is minimum 18 weeks or 4.5 months.
5	To develop technical writing skills for organizing, comprehending, and preparing structured engineering reports.
6	To inculcate professional ethics and adherence to organizational and industrial standards in engineering practice.
Course Outcomes:	
	After completion of the course, student will be able to
1.	Apply Chemical Engineering knowledge
2.	Study/Design equipment or process for chemical engineering system
3.	Apply knowledge in core and multidisciplinary field though research and development.
4	Work effectively as member or leader in team.
5.	Organize, comprehend and write technical report.
6.	Follow ethics and professional standards of organization/industry.

Section 1 & Section 2	Topics/Contents
	1. HOD to constitute a committee of four senior faculty members for Internship allocation. 2. Students need to maintain minimum attendance of 75% at the place of work and produce 3. digital record duly signed by competent authority. 4. Total Internship period is minimum 16 weeks or 4 months. 5. Internship undertaken is to be Research Internship. 6. Students need to submit monthly reports on Research Project. 7. Final presentation (CVV) would be conducted at the end of semester. 8. Distribution of credits and other guidelines are subject to change.

CO	Program Outcome (PO)											PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	1	1	1	0	1	1	1	1	1	1	1	1	1
CO2	0	0	0	0	0	0	0	3	3	1	3	1	0	0
CO3	3	1	1	1	1	1	1	1	1	1	1	1	1	1
CO4	1	3	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	3	1	1	1	1
CO6	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Avg	1.5	1.2	0.83	0.83	0.67	0.83	0.83	1.33	1.33	1.5	1.33	1.0	0.83	0.83

FF No.: 654-A

CH4291::RESEARCH INTERNSHIP

Teaching Scheme	Examination Scheme
Credits : 24	
Lectures : 0 Hrs/week	
Practical/Lab : 40 Hrs/week	MSE (review): 30 Marks
Tutorial : 0 Hrs/week	ESE (review): 70 Marks

Prerequisites:	Heat Transfer, Mass Transfer, Fluid Flow Operations, Process Calculations, Mass Transfer Operation, Separation Techniques, Chemical Reaction Engineering, Instrumentation and Process Control, Transport Phenomena

Course Objective:	
1	To enable students to apply fundamental Chemical Engineering knowledge for analyzing and solving engineering problems in process systems.
2	To develop the ability to study, analyze, and design chemical engineering equipment and processes using core engineering principles.
3	To integrate core and multidisciplinary knowledge for research and development activities in chemical engineering applications.
4	Total Internship period is minimum 18 weeks or 4.5 months.
5	To develop technical writing skills for organizing, comprehending, and preparing structured engineering reports.
6	To inculcate professional ethics and adherence to organizational and industrial standards in engineering practice.

Course Outcomes:	
	After completion of the course, student will be able to
1.	Apply Chemical Engineering knowledge
2.	Study/Design equipment or process for chemical engineering system
3.	Apply knowledge in core and multidisciplinary field though research and development.
4	Work effectively as member or leader in team.
5.	Organize, comprehend and write technical report.
6.	Follow ethics and professional standards of organization/industry.

Section 1 & Section 2	Topics/Contents1
	HOD to constitute a committee of four senior faculty members for Internship allocation. Students need to maintain minimum attendance of 75% at the place of work and produce digital record duly signed by competent authority. Total Internship period is minimum 16 weeks or 4 months. Internship undertaken is to be Research Internship. Students need to submit monthly reports on Research Project. Final presentation (CVV) would be conducted at the end of semester. Distribution of credits and other guidelines are subject to change.

CO	Program Outcome (PO)											PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	1	1	1	0	1	1	1	1	1	1	1	1	1
CO2	0	0	0	0	0	0	0	3	3	1	3	1	0	0
CO3	3	1	1	1	1	1	1	1	1	1	1	1	1	1
CO4	1	3	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	3	1	1	1	1
CO6	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Avg	1.5	1.2	0.83	0.83	0.67	0.83	0.83	1.33	1.33	1.5	1.33	1.0	0.83	0.83

FF No.: 654 -A

CH4294::INTERNATIONAL INTERNSHIP

Teaching Scheme	Examination Scheme
Credits : 24	
Lectures : 0 Hrs/week	
Practical/Lab : 40 Hrs/week	MSE (review): 30 Marks
Tutorial : 0 Hrs/week	ESE (review): 70 Marks

Prerequisites:	Heat Transfer, Mass Transfer, Fluid Flow Operations, Process Calculations, Mass Transfer Operation, Separation Techniques, Chemical Reaction Engineering, Instrumentation and Process Control, Transport Phenomena
Course Objective:	
1	To enable students to apply fundamental Chemical Engineering knowledge for analyzing and solving engineering problems in process systems.
2	To develop the ability to study, analyze, and design chemical engineering equipment and processes using core engineering principles.
3	To integrate core and multidisciplinary knowledge for research and development activities in chemical engineering applications.
4	Total Internship period is minimum 18 weeks or 4.5 months.
5	To develop technical writing skills for organizing, comprehending, and preparing structured engineering reports.
6	To inculcate professional ethics and adherence to organizational and industrial standards in engineering practice.
Course Outcomes:	
	After completion of the course, student will be able to
1.	Apply Chemical Engineering knowledge
2.	Study/Design equipment or process for chemical engineering system
3.	Apply knowledge in core and multidisciplinary field though research and development.
4	Work effectively as member or leader in team.
5.	Organize, comprehend and write technical report.
6.	Follow ethics and professional standards of organization/industry.

Section 1 & Section 2	Topics/Contents
	1. HOD to constitute a committee of four senior faculty members for Internship allocation. 2. Students need to maintain minimum attendance of 75% at the place of work and produce 3. digital record duly signed by competent authority. 4. Total Internship period is minimum 16 weeks or 4 months. 5. Internship undertaken is to be Research Internship. 6. Students need to submit monthly reports on Research Project. 7. Final presentation (CVV) would be conducted at the end of semester. 8. Distribution of credits and other guidelines are subject to change.

CO	Program Outcome (PO)											PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	1	1	1	0	1	1	1	1	1	1	1	1	1
CO2	0	0	0	0	0	0	0	3	3	1	3	1	0	0
CO3	3	1	1	1	1	1	1	1	1	1	1	1	1	1
CO4	1	3	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	3	1	1	1	1
CO6	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Avg	1.5	1.2	0.83	0.83	0.67	0.83	0.83	1.33	1.33	1.5	1.33	1.0	0.83	0.83

FF No. : 654-A

CH4292::PROJECT INTERNSHIP

Teaching Scheme	Examination Scheme
Credits : 24	
Lectures : 0 Hrs/week	
Practical/Lab : 40 Hrs/week	MSE (review): 30 Marks
Tutorial : 0 Hrs/week	ESE (review): 70 Marks

Prerequisites:	Heat Transfer, Mass Transfer, Fluid Flow Operations, Process Calculations, Mass Transfer Operation, Separation Techniques, Chemical Reaction Engineering, Instrumentation and Process Control, Transport Phenomena
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CO3	3	1	1	1	1	1	1	1	1	1	1	1	1	1
CO4	1	3	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	3	1	1	1	1
CO6	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Avg	1.5	1.2	0.83	0.83	0.67	0.83	0.83	1.33	1.33	1.5	1.33	1.0	0.83	0.83