

West Bengal State Council of Technical &
Vocational Education and Skill
Development
(Technical Education Division)



Syllabus
of

Diploma in Chemical Engineering [CHE]

Part-III (6th Semester)

2023

**CURRICULAR STRUCTURE FOR PART-III (SEMESTER 6) OF THE
FULL-TIME DIPLOMA COURSES IN CHEMICAL ENGINEERING**

BRANCH: CHEMICAL ENGINEERING					SEMESTER 6					
SL No	Category	Code No	Course Title	L	P	Total Class per week	Credit	Full marks	Internal Marks	ESE Marks
1	Program Core	CHEPC302	Process Equipment Design and Drawing	3	-	3	3	100	40	60
2	Program Elective	CHEPE302	Petrochemicals/ Waste Management	3	-	3	3	100	40	60
3	Humanities and Social Science	HS302	Entrepreneurship and start-ups	3	-	3	3	100	40	60
4	Open Elective	CHEOE302	Open Elective (Compulsory)	3	-	3	3	100	40	60
5	Open Elective	CHEOE304	Open Elective	3	-	3	3	100	40	60
6	Major Project	PR302	Major Project	-	6	6	3	100	60	40
7	Seminar	SE302	Seminar	3	-	3	1	100	60	40
Total				18	6	24	19	700	320	380

Student contact hours per week: 24hours (Lecture-18 hours; Practical-6 hours)
Theory and Practical Period of 60 minutes each.
Full marks-700 (Internal Marks-320; ESE Marks-380)
L-Lecture, P-Practical, ESE- End Semester Examination

Credit Distribution	Credit
Program Core	3
Program Elective	3
Open Elective	6
Major Project	3
Seminar	1
Humanities and Social Science	3
Total	19

Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately in each subject.

Sl. No.	Program Elective	Credit
1.	Petrochemicals [Sub code: CHEPE302/1]	3
2.	Waste Management [Sub code: CHEPE302/2]	

Total = 6

Sl. No.	Open Elective	Credit
1.	Engineering Economics and Project Management (<i>Compulsory for all Branches</i>) [Sub code: CHEOE302]	3
2.	Environmental Science & Engineering [Sub Code: CHEOE304/1]	3
3.	Industrial Management [Sub Code: CHEOE304/2]	
4.	Renewable Energy [Sub Code: CHEOE304/3]	

Name of the Course: Diploma in Chemical Engineering	
Category: Program core	Semester: Sixth
Code no.: CHEPC302	Theory: 100 Marks
Course Title: Process Equipment Design and Drawing	(i) External Assessment: 60 Marks (End Semester Examination) (ii) Internal Assessment: 40 Marks [Class Test: 20 Marks Assignment/viva voce/ Quizzes: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks	
Total lecture class/week: 3	
Credit: 3	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course Objectives:

1	Discover basic symbols used instrumentation diagrams.
2	Enhance the knowledge on the mechanical aspects of equipment design.
3	Transform mechanical design specifications in to fabrication drawings for plant erection.
4	Basic ideas on the design of pressure vessels, heat exchangers, evaporators, plate and packed columns and reactors.

2. Course Outcomes:

On completion of the course, students are expected to:	
CO1	Describe the aspects of design, flow sheets and scale up in chemical plant design.
CO2	Design pressure vessels by selecting a suitable material of construction.
CO3	Design heat exchangers.
CO4	Design tray towers and packed towers.
CO5	Design batch and continuous reactors

3. Pre-Requisites:

1.	Knowledge of basic concept on Physics, Chemistry and Mathematics.
2.	Knowledge on basic Chemical Engineering.
3.	Knowledge on basic Strength of Materials.

4. Theory Components:

Unit	Topics & Sub-topics	Teaching Hours
Unit I: Introduction to Plant Design and Process Design Development	Introduction to Design. The anatomy of a chemical manufacturing process, factors of safety (design factors). Basic idea on project documentation. Introduction to flow-sheeting. Introduction to piping and instrumentation (including basic symbols and layout, no detailed calculation).	6
Unit II: Mechanical Design of Process Equipment	Pressure vessels – calculation of thickness of cylindrical and spherical shells subjected to internal pressure. Supports for vessels – bracket or lug supports, leg supports, skirt supports, saddle supports (only description).	6
Unit III: Valves, Pumps and Piping Network	Different types of valves – Gate valves and globe valves – Plug cocks and ball valves – Check valves. Pumps: Classification of pumps – Centrifugal and positive displacement pumps – reciprocating pump (piston pump, and plunger pump), rotary pump (gear pump and lobe pump). Suction lift and cavitation, NPSH. Priming of centrifugal pump. Fans, Blowers, and Compressors – reciprocating compressor and centrifugal compressor (Description of construction only, detailed design not required). General pipe fittings used in piping network. Analysis of Piping Network (Description of construction only, detailed design not required).	12
Unit IV: Heat Transfer Equipment Design	Design of double pipe heat exchangers, Design of shell and tube heat exchangers (1-2, 2-4). Design of single and multiple effect evaporators without boiling point elevation.	9
Unit V: Mass Transfer Equipment Design	Basic concept on bubble cap tray, sieve tray and valve tray units, Calculation of maximum allowable vapour velocities, plate, and column efficiency. Continuous contactors – types of packing, liquid distribution, pressure drop, packing efficiencies. Relative merits of plate and packed towers.	8
Unit VI: Reactor Design	Design of heterogeneous catalytic reactor (for packed bed and mixed flow reactors).	4
Sub Total: Total Lecture Classes		45
No. of classes required for conducting Internal Assessment examination		06
Grand Total:		51

5. Suggested Home Assignments/Students' Activities: The concerned teacher may collect assignments from the students on different units of Chemical Reaction Engineering. He/ She may also conduct viva voce or Quizzes for the students based on the different units of Chemical Reaction Engineering.

6. Suggested scheme for question paper design for conducting internal assessment examination:
(Duration: 45 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	Total
Class Test - 1	4	8	8	20
Class Test - 2	4	8	8	20

7. Suggested Scheme for End Semester Examination: [Duration 3 hours]

Question Paper Type		Marks
1.	Objective type questions carrying 1 mark for 20 questions out of 25 questions throughout the syllabus.	1×20=20
3.	Questions carrying 8 marks for 5 questions (Subjective type) out of 8 questions (at least one question from each unit).	5×8=40

8. Rubrics for the Assessment of Students Activity: (20 marks)

Sl No.	Performance Indicators
1	Originality of completing the assigned task
2	Presentation Skill
3	In Time submission of Assignment report / micro-project task
4	Viva-voce or Quizzes

9. Suggested Learning Resources:

Sl. No.	Title of Book	Name of Authors	Publisher
1	Process Equipment Design	M.V. Joshi, V.V.Mahajani	Macmillan Publishers,
2	Introduction to Chemical Equipment design	B.C. Bhattacharya,	CBS Publications
3	Applied Process Design for Chemical and Petrochemical Plants, Vol. 1 and 2	E.E Ludwig	Gulf Publishing Co.
4	Coulson Richardson's Chemical Engineering Vol.6 Chemical Engineering	R. K. Sinnott	ELSEVIER
5	Chemical Reaction Engineering	Octave Levenspiel	Wiley Easter Ltd., New York.
6	Process Heat Transfer	D. Q. Kern	McGraw-Hill
7	Mass Transfer Operations	R. E. Treybal	McGraw-Hill
8	Machine Design	Sharma and Aggarwal	S K Kataria and Sons

Name of the Course: Diploma in Chemical Engineering	
Subject: Petrochemicals	Semester: Sixth
Category: Programme Elective	Theory: 100 Marks
Code no.: CHEPE302/1	Examination Scheme: (i) External Assessment: 60 Marks (End Semester Examination) (ii) Internal Assessment: 40 Marks [Class Test: 20 Marks Assignment/Viva voce/Quizzes: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks	
Total lecture class/week: 3	
Credit: 3	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. **Course Outcomes:** On completion of the course, students will be able to:

Sl No	Course Outcomes
CO1	Classify the different feedstock of Petrochemicals
CO2	Describe the production of ethylene by naphtha cracking and discuss about some petrochemicals based on ethylene
CO3	Describe the production and separation of BTX aromatics and discuss about some BTX based petrochemicals
CO4	Define detergent and describe some synthetic detergent production process
CO5	Define polymer and describe the production process of some important polymer

2. **Theory Components:**

Unit	Topics & Sub-topics	Teaching Hours
Unit 1: Introduction	Concept of Petrochemicals Feed stocks for petrochemicals. Manufacture of Methanol from Synthesis Gas Production of Formaldehyde from methanol.	4
Unit 2: Production of Ethylene & some of its derivatives	Production of Ethylene, Propylene and Butadiene by Naphtha Cracking. Production of some important Petrochemicals based on Ethylene: Vinyl chloride monomer (VCM), Vinyl acetate monomer (VAM), Ethylene oxide, Ethanol amines, Acrylonitrile.	12
Unit 3: Production & Separation of BTX Aromatics	Important reactions involved in BTX formation. Production of BTX by catalytic reforming of Naphtha BTX separation from reformate. Separation of BTX aromatics to Benzene, Toluene and Xylene. Concept of Pyrolysis Gasoline. Pyrolysis Gasoline hydrogenation. Recovery of Benzene, Toluene and Xylene by extractive distillation method.	12

	Production of Styrene, Cunenene, Phenol, Phthalic anhydride.	
Unit 4: Synthetic Detergent	Concept of Detergent. Classification of Detergent. Production of synthetic detergent like Dodecyl Benzene Sulphonate and Keryl Benzene Sulphonate (Surf).	3
Unit 5: Polymerisation Technology	Concept of polymer, Types of Polymers Concept of polymerization. Methods of Polymerization: Addition and Condensation; Methods of production: Bulk, Solution, Emulsion, and Suspension. Production of Polyethylene (LDPE& HDPE) Production of Poly Vinyl Chloride(PVC) Production of Styrene- Butadiene Rubber (SBR) Production of Viscose Rayon Production of Phenol formaldehyde resin Production of Nylon 6,6 and Nylon 6.	14
Sub Total: Total Lecture Classes		45
No. of classes required for conducting Internal Assessment examination		06
Grand Total:		51

3. Suggested Home Assignments/Students' Activities: The concerned teacher may collect assignments from the students on different units of Petrochemicals. He/she may also conduct Viva-Voce or Quizzes for the students based on the different units of Petrochemicals.

4. Suggested scheme for question paper design for conducting internal assessment examination :
(Duration: 45 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	Total
Class Test - 1	4	8	8	20
Class Test - 2	4	8	8	20

5. Suggested Scheme for End Semester Examination: [Duration 3 hours]

Question Paper Type		Marks
1.	Objective type questions carrying 1 mark for 20 questions out of 25 questions throughout the syllabus.	1×20=20
3.	Questions carrying 8 marks for 5 questions (Subjective type) out of 8 questions (at least one question from each unit).	5×8=40

6. Rubrics for the Assessment of Students Activity: (20 marks)

Sl No.	Performance Indicators
1	Sketch Flow sheet for different processing of Petrochemicals
2	Accomplishing assigned problem
3	Presentation Skill
4	In Time submission of Assignment report / micro-project task
5	Viva-voce or Quizzes

7. Suggested Learning Resources:

Sl. No.	Title of the Book	Author	Publication
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	Khanna Publishers, Delhi
4.	Petrochemical processes, Vol. 1 & 2 (2 nd ed.),	Chauvel and Lefebvre	EditionsTechnip, Paris
5.	Trends in Petrochemical Technology	Brownstein	The Petroleum Pub. Co., Tulsa, Oklahoma, U. S. A.

Name of the Course: Diploma in Chemical Engineering	
Subject: Waste Management	
Subject Code: CHEPE302/2	Semester: Sixth
Duration: 17 weeks	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hours/week	Mid Semester Exam: 20 Marks
Tutorial: Nil	Attendance, Assignment & Interaction: 10+10 Marks
Practical: Nil	End Semester Exam: 60 Marks
Credit: 3	Aim: To recognize and learn about waste management, waste treatment and recycling To understand the impacts on our environment. To learn about pollution, pollutants, waste disposal processes.

1. Course Outcomes:

On completion of the course, the students will be able to	
CO 1	Identify solid and hazardous waste.
CO 2	Sample and arrange for storage of waste and design the facility
CO 3	Process solid and biomedical waste and perform quantitative estimation
CO 4	Determine suitable place and method for landfill
CO 5	Identify legal provisions regarding violations of waste disposal

2. Course Content

Unit	Description	Contact hours
Unit1: Sources and Classification of Solid Waste	Types and Sources of Solid and Hazardous Wastes - Need for Solid and Hazardous Waste Management, Waste Generation Rates - Composition – Hazardous Characteristics,	7
Unit2: Sampling and handling of Waste	Waste Sampling - Source Reduction of Wastes - Recycling and Reuse - Handling and Segregation of Wastes at Source - Storage and Collection of Municipal Solid Wastes - Analysis of Collection Systems - Need for Transfer and Transport - Transfer Stations - Labelling and Handling of Hazardous Wastes.	12
Unit3: Waste Processing	Waste Processing - Processing Technologies - Biological and Chemical Conversion Technologies - Composting - Thermal Conversion Technologies - Energy Recovery - Incineration – Solidification and Stabilization of Hazardous Wastes - Treatment of Biomedical Wastes -	12
Unit4: Landfill Technology	Disposal in Landfills - Site Selection - Design and Operation of Sanitary Landfills - Secure Landfills and Landfill Bioreactors - Leachate and Landfill Gas Management - Landfill Closure and Environmental Monitoring - Closure of Landfills - Landfill Remediation –	8
Unit5: Legislation and Management	Legislations on Management and Handling of Municipal Solid Wastes, Hazardous Wastes, and Biomedical Wastes - Elements of Integrated Waste Management.	6
Sub Total: Total Lecture Classes		45
No. of classes required for conducting Internal Assessment examination		06
Grand Total:		51

3. Suggested Home Assignments/Students' Activities: The concerned teacher may collect assignments from the students on different units of Waste Management. He/she may also conduct Viva-Voce or Quizzes for the students based on the different units.

4. Suggested scheme for question paper design for conducting internal assessment examination :(
Duration: 45 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	Total
Class Test - 1	4	8	8	20
Class Test - 2	4	8	8	20

5. Suggested Scheme for End Semester Examination: [Duration 3 hours]

Question Paper Type		Marks
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6. Rubrics for the Assessment of Students Activity: (20 marks)

Sl No.	Performance Indicators
1	Originality of completing the assigned task
2	Presentation Skill
3	In Time submission of Assignment report / micro-project task
4	Viva-voce or Quizzes

7. Suggested Learning Resources:

Sl. No	Book Title	Author	Publisher
1	Elements of Solid Waste Hazardous Management	O.P. Gupta	Khanna Publishing House, New Delhi, 2018
2	Integrated Solid Waste Management	George Tchobanoglous, Hilary Theisen and Samuel A, Vigil	
3	Manual on Municipal Solid waste management	-	Central Public Health and Environmental Engineering Organization, Government of India, New Delhi

Course Title	Entrepreneurship and Start-ups
Course Code	HS 302
Number of Credits	3
Pre-Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours
1.	ENTREPRENEURSHIP – INTRODUCTION AND PROCESS Concept, Competencies, Functions and Risks of entrepreneurship Entrepreneurial Values& Attitudes and Skills Mindset of an employee/manager and an entrepreneur Types of Ownership for Small Businesses Sole proprietorship Partnerships Joint Stock company- public limited and private limited companies Difference between entrepreneur and Intrapreneur	10
2.	PREPARATION FOR ENTREPRENEURIAL VENTURES Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan Project Report- Concept, its features and components Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They may not be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	20
3.	ESTABLISHING SMALL ENTERPRISES Legal Requirements and Compliances needed for establishing a New Unit- NOC from Local body Registration of business in DIC Statutory license or clearance Tax compliances	03
4.	START-UP VENTURES Concept & Features Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical Problems and challenges faced by start-ups. Start-up Ventures in India – Contemporary Success Stories and Case Studies to be	04

	discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. <u>No questions are to be set from the case studies.</u>	
5.	FINANCING START-UP VENTURES IN INDIA Communication of Ideas to potential investors – Investor Pitch Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups Govt Initiatives including incubation centre to boost start-up ventures MSME Registration for Start-ups –its benefits	06
6.	EXIT STRATEGIES FOR ENTREPRENEURS Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – Basic Concept only	02

Examination Scheme

End Semester Examination: 60 marks

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	Number of questions to be set	Number of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

Internal Assessment: 40 marks

Class test: 20 marks

Assignment: 10 marks

Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of India Learning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Cases on Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd

6.	How to Start a Business in India	Simon Daniel	Buoks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

SYLLABUS OF ENGINEERING ECONOMICS & PROJECT MANAGEMENT

Course Code:	CHEOE302
Course Title:	Engineering Economics & Project Management
No. of Credits:	3
Number of theoretical class/weeks	3(L:3, T:0, P:0)
Course Category:	Open Elective (Compulsory for all branches)

Course Learning Objectives

1	To acquire knowledge of basic economics to facilitate the process of economic decision making.
2	To acquire knowledge on basic financial management aspects.
3	To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
4	To develop an understanding of key project management skills and strategies.

Detailed Course Content:

Unit	Name of the Topic	Hours
Unit-I Introduction, theory of demand & supply	Introduction to Engineering Economics, the relationship between Engineering and Economics. Resources, scarcity of resources, and efficient utilization of resources. Opportunity cost, rationality costs, and benefits. Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand. Theory of Supply: determinants of supply, supply function. Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)	9

Unit-II Theory of Production & Costs	Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and long run production function (returns to scale). Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc. Economic concept of profit, profit maximization (numerical problems)	10
Unit-III Different Types of Market and Role of Government	Perfect Competition: Features of Perfectly Competitive Market. Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly. Role of government in Socialist, Capitalist and Mixed Economy structure with example	4
Unit-IV Concept of Project	Definition and classification of projects Importance of Project Management. Project life Cycle [Conceptualization→Planning→Execution→Termination]	4
Unit-V Feasibility analysis of project	Economic and Market analysis. Financial analysis: Basic techniques in capital budgeting – Payback period method, Net Present Value method, Internal Rate of Return method. Environmental Impact study–adverse impact of the project on the environment. Project risk and uncertainty: Technical, economical, socio-political, and environmental risks. Evaluation of the financial health of a project – Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only). <u>N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.</u>	10
Unit-VI Project administration	Gantt Chart – a system of bar charts for scheduling and reporting the progress of a project (basic concept). Concept of Project Evaluation and Review Technique (PERT)and Critical Path method (CPM): basic concept and application with real-life examples.	8

Examination Scheme:

Semester Examination pattern of 60 marks:

Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [total marks: 20]

Subjective questions: Eight questions to be answered taking at least three from each group. (Two questions should be given from each unit). [total marks:40]

Assignment (10 Marks)

Guidelines for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

**Class Test: Two examinations 20 marks each. Take best of two.
Attendance: 10 Marks**

Suggested reference books:

- 1) Principles of Economics – Case and Fair, Pearson Education Publication
- 2) Principles of Economics–Mankiw, Cengage Learning
- 3) Project planning, analysis, selection, implementation, and review –Prasanna Chandra–Tata McGraw Hill.
- 4) Project Management–Gopalakrishnan –Macmillan India Ltd

SYLLABII FOR OPEN ELECTIVE SUBJECTS ARE AVAILABLE SEPARATELY

1. Environmental Science & Engineering [Sub Code: CHEOE304/1]
2. Industrial Management [Sub Code: CHEOE304/2]
3. Renewable Energy [Sub Code: CHEOE304/3]

Name of the Course: Diploma in Chemical Engineering	
Category: Programme Core	Semester: Sixth
Code no.: PR302	Laboratory: 100 Marks
Course Title: Major Project	Examination Scheme: (i) <input type="checkbox"/> External Assessment: 40 Marks (End Semester Examination) (ii) Internal Assessment: 60 Marks [Class Test: 40 Marks Assignment/viva voce: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks	
Total practical class/week: 6	
Credit: 3	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately. Students should submit a report on the assigned project work.	

1. Course Outcomes:

On completion of the course, the students will be able to	
CO 1	Understand and apply the concept of designing experiments
CO 2	Analysis of generated data
CO 3	Compare the generated data with related findings available in the literature
CO 4	Display the findings in form of technical report and presentation

2. Contents

Sl. No	Name of Experiment
1	Performing experiments/simulations related to assigned projects

3. Suggested Home Assignments/Students' Activities: Will be decided by the respective Lecturer

4. Suggested scheme for question paper design for conducting internal assessment examination : (Duration: 30 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply& above)	Total
Internal Viva- Voce	8	16	16	40

5.Suggested Scheme for End Semester Examination:

6. Rubrics for the Assessment of Students Activity:

7. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1	Research Methodology: Methods and Techniques	C.R. Kothari Gaurav Garg	New Age International Publishers

Name of the Course: Diploma in Chemical Engineering	
Category: Programme Core	Semester: Sixth
Code no.: SE302	Laboratory: 100 Marks
Course Title: Seminar	Examination Scheme:
Duration: 17 weeks	(i) <input type="checkbox"/> External Assessment: 40 Marks (End Semester Examination)
Total Practical class/week: 3	(ii) Internal Assessment: 60 Marks [Class Test: 40 Marks Assignment/viva voce: 10 Marks Class attendance: 10 Marks]
Credit: 1	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately. Students should submit a report on the seminar presented.	

1. Course Outcomes:

On completion of the course, the students will be able to	
CO 1	represent tabulated data via presentation
CO 2	represent diagram via presentation

2. Contents

Sl. No	Task
1	Technical Presentation on topics relevant to Chemical Engineering

3. Suggested Home Assignments/Students' Activities: Will be decided by the respective Lecturer.

4. Suggested scheme for question paper design for conducting internal assessment examination : (Duration: 30 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Marks			Total
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	
Internal Viva-Voce	8	16	16	40

5. Suggested Scheme for End Semester Examination:

6. Rubrics for the Assessment of Students Activity: (20 marks)

7. Suggested Learning Resources: Various online resources.