PRAVARA RURAL EDUCATION SOCIETY
PRAVARA RURAL ENGINEERING COLLEGE
LONI

CHEMICAL ENGINEERING

ACADEMIC BOOK

S.E. CHEMICAL

SEMESTER-I

Content:

Vision and Mission of the institute

Vision: Enrich the youth with skills and values to enable them to contribute in the development of society; nationally and globally.

Mission: To provide quality technical education through effective teaching-learning and research to foster the youth with skills and values to make them capable of delivering significant contribution in local to global development.

Vision and Mission of the Department

Vision: The department is committed to provide quality technical education to students in the field of Chemical engineering to meet the global expectations of industry and society.

Mission: To prepare the students to hold authority in Chemical Engineering, pursue their education through advanced study & endow to the betterment of society.

PROGRAM OUTCOMES (POs)

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**: Recognize 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 (PSOs)

- **PSO1:** Apply the knowledge of basic science and basic courses of the Chemical Engineering in industry.
- **PSO 2:** Acquire the skills of design and analysis of the Chemical process or system to meet the desired needs within the practical limits.
- **PSO3:** Ability to use the innovative techniques, skills and modern engineering tools necessary to industry and society.

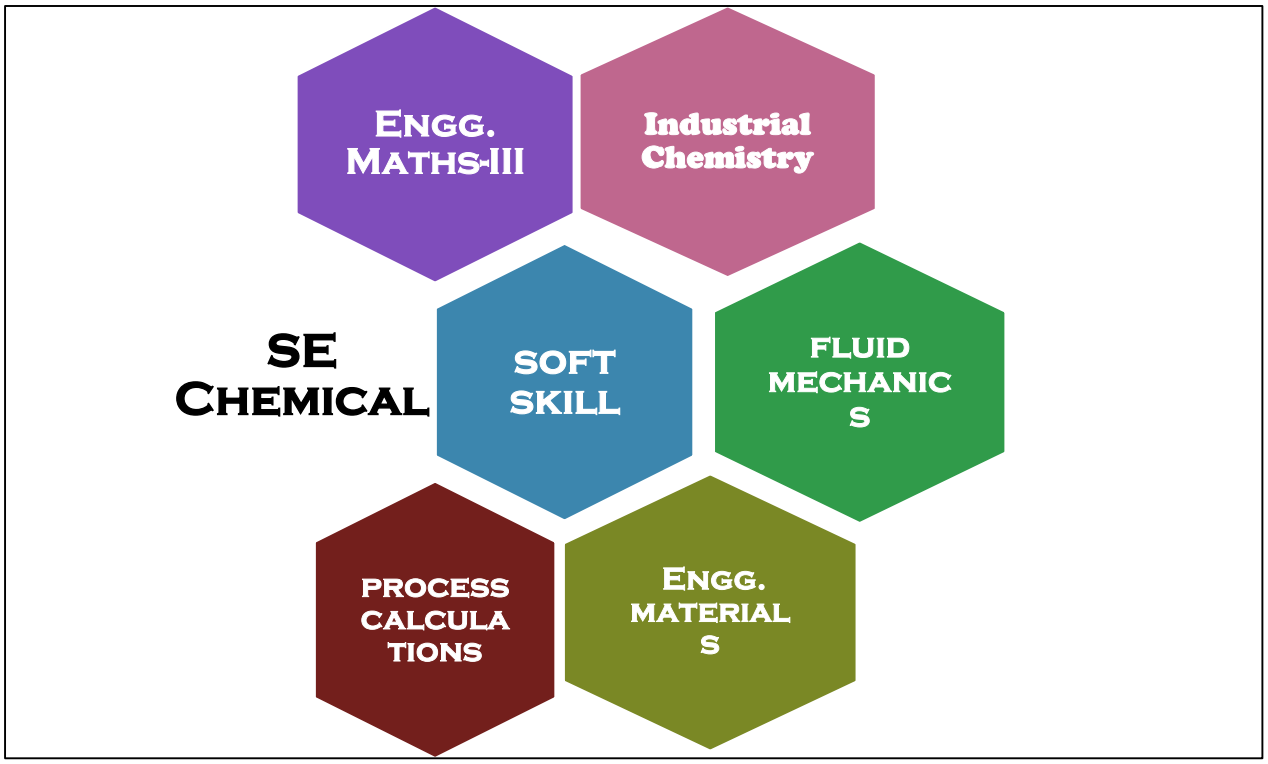
Program Educational Objectives (PEOs)

Graduates would demonstrate ability to,

- **PEO1:** To impart strong knowledge of fundamentals to the students so that they can be good practicing engineers in Chemical Engineering.
- **PEO2:** To teach basic concepts, knowledge through experimentation, scientific literature & prediction of system behavior by models & simulations.
- **PEO3:** To develop overall personality, inculcate team spirit & capability of shouldering responsibility of nation building.

Syllabus Structure

Course code	Course Title	Total number of contact hours				Total Credits
		Lecture (L)	Tutorial (T)	Practical (p)	Total	
Second Year						
207004	**Engineering Mathematics-III**	03	01	-	04	**04**
209341	**Industrial Chemistry I**	03	-	04	07	**05**
209342	**Fluid Mechanics**	03	-	02	05	**04**
209343	**Engineering Materials**	03	-	02	05	**04**
209344	**Process Calculations**	03	01	-	04	**04**
209345	**Soft Skills**	-	-	02	02	**01**
209346	**Audit Course 3**	-				
	Total	**15**				**22**



Academic Calendar

Regular Activity

- HOD, Staff meeting – Twice Every Month 2nd and 4th Saturday
- Submission of monthly student Class Attendance and list of defaulter students to Dean Academic on first working day of every month
- Conduction of Test I,II and III (FE TO BE)

  Test – I - After 40 Days of Commencement of Teaching
  Test –II - After 70 Day of Commencement of Teaching
  Test – III - Before Conclusion of Semester
- Students feedback Report (FE,SE,TE and BE) submission to Principal (Twice in semester – 1st at mid semester and 2nd before the end of semester)
- Parent meets report submission by department to Principal at the mid semester.
- One week Soft skill training programme (FE,SE,TE and BE)
- Department Level Research meet of all department on 4th Saturday of every month
- Minimum one Industrial Visit per class per semester. (FE,SE,TE and BE)
- Organization of National/International level Seminar/Workshop/Conference by Departmental once in a semester.

Course: 03

Fluid Mechanics

(209342)

S.E. Chemical (2019 Pattern)

[Theory & Practical]

Course Syllabus

Fluid Mechanics (209342)

Unit I Introduction **(07)**

Fluid, Properties of fluid, classification of fluids, Newton's law of viscosity and numerical, rheological classification of fluids, types of flow, lines to describe the flow, application of fluid flow in Chemical Engineering.

Unit II Fluid Pressure and Measurement **(07)**

Pascal's law, Hydrostatic law, concept of atmospheric, gauge, vacuum and absolute pressure, manometers, and pressure measurement by simple and differential manometer.

Unit III Basic Equations of Fluid Flow and Flow Measuring Devices **(07)**

Basic equations of fluid flow: continuity equation, equation of motion, flow measurement using venturimeter, orifice meter, rotameter, pitot tube.

Unit IV: Flow of Incompressible Fluids in Conduits **(07)**

Laminar flow through circular pipe: Hagen Poiseuille equation, relation between average and maximum velocity, friction factor chart, Darcy Weisbach equation, major and minor losses.

Unit V: Dimensional Analysis and Boundary Layer Theory **(07)**

Fundamental dimensions of quantities, dimensional homogeneity, types of similarities dimensional analysis by Rayleigh's method and Buckingham's method, dimensionless numbers; Concept of hydrodynamic boundary layer, growth over a flat plate, different thickness of boundary layer, drag on a flat plate, drag coefficient.

Unit VI: Fluidization and Transportation of Fluids **(07)**

Fluidization, types of Fluidization, minimum Fluidization velocity, entrainment in Fluidization, Operating characteristics of gas-solid, liquid –solid and liquid – gas, fluidized beds; different types of valves and pumps, blowers and compressors cavitation.

Reference Books:

1. McCabe,W. L, J. Smith, and P. Harriot, Unit Operations of Chemical Engineering, McGraw Hill International Edition, Seventh edition,(2004).
2. Modi, L.P., Seth, S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2002 .
3. Noel de Nevers; Fluid Mechanics for Chemical Engineers, Third Edition; McGraw Hill, (2005).
4. M. Coulson, J.F. Richardson, with J.R. Backhurst and J.H. Harker, Coulson, Richardson Chemical Engineering, Volume-1", 6th ed., Butterworth-Heinemann,1999

209342: Fluid Mechanics

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 Hrs/ Week	Paper: (30+70) 100 Marks
Practical: 2 Hrs/ Week	In semester Assessment: 30 Marks
	End Semester Assessment: 70 Marks.
	TW: 25 Marks OR :50 Marks
	Credits: Theory: 3 Practical: 1 Total: 4 Credits

Course Outcomes (COs Process Dynamics and Control

After successful completion of this course, students will be able to:

Course Outcome	Statements	Bloom's Taxonomy	
		Level	Descriptor
C242.1	Describe fluid properties and rheological behaviour of fluids	2	Understand
C242.2	Classify the equation of fluid statics and select manometers for the pressure measurement.	2	Classify
C242.3	Apply basic equations of fluid flow and their applications to determine fluid flow rate by different devices.	3	Apply
C242.4	Mathematical equations for flow of fluid through different systems, calculate different losses occurring in pipelines by applying mathematical equation of fluid flow.	4	Calculate
C242.5	Select correlations amongst the system variables using dimensional analysis and to study concept of boundary layer theory.	4	Select
C242.6	Analyse valves and pumps for transportation of fluid through pipelines and concept of fluidization.	4	Analyse

Mapping of Course Outcomes to POs and PSOs

CO-PO CORRELATION MATRIX															
COs	**PROGRAM OUTCOMES (POs)**												**PSO**		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	2	1	-	-	-	-	-	-	-	1	3	3	1
2	3	2	-	1	-	-	-	-	-	-	-	1	3	2	1
3	3	2	-	2	-	-	-	-	-	-	-	1	3	2	1
4	3	2	-	2	-	-	-	-	-	-	-	1	3	2	1
5	3	2	-	1	-	-	-	-	-	-	-	1	3	2	1
6	3	2	-		-	-	-	-	-	-	-	1	3	2	1

Levels: 3 for ≥60 ; 2 for < 60 ≥ 40; 1 for < 40

CO Assessment Tools

Course Outcomes (CO)	Assessment Tools							
	Continuous Internal Evaluation, CIE					CIE by SPPU, Pune	Semester End Exam (SEE) by SPPU, Pune	
	T1	T2	T3	Assignment	PR	Insem	OR	Endsem
C242.1	√			√	√	√	√	
C242.2	√			√	√	√	√	
C242.3		√		√	√		√	√
C242.4		√		√	√		√	√
C242.5			√	√	√		√	√
C242.6			√	√	√		√	√

Chemical Engineering Department

Teaching Plan

Fluid Mechanics (209342)

Teaching Scheme:
Theory: 03 h/week

Practical: 2 h / week

Examination Scheme:
Insem: 30
Endsem: 70 : Credit = 3
Tw: 25 OR: 25 : Credit = 1

Lect No.	Topics / Sub- Topics	CO mapped
1	PO,PSO,CO & Subject orientation	-
2	Unit I Introduction Fluid, Properties of fluid,	1
3	Classification of fluids,	1
4	Newton's law of viscosity and numerical	1
5	Rheological classification of fluids,	1
6	Types of flow	1
7	Lines to describe the flow	1
8	Application of fluid flow in Chemical Engineering	1
9	Unit II Fluid Pressure and Measurement Pascal's law	1
10	Hydrostatic law	2
11	Concept of atmospheric, gauge, vacuum and absolute pressure	2
12	Manometers	2
13	Pressure measurement by simple and differential manometer.	2
14	Unit III Basic Equations of Fluid Flow and Flow Measuring Devices Basic equations of fluid flow:	3
15	Continuity equation,	3
16	Equation of motion,	3
17	Flow measurement using venturimeter,	3
18	Orifice meter,	3
19	Rotameter,.	3
20	Pitot tube	3
21	Unit IV: Flow of Incompressible Fluids in Conduits Laminar flow through circular pipe	4
22	Hagen Poiseuille equation,	4
23	Relation between average and maximum velocity,	4
24	Friction factor chart, ,	4
25	Darcy Weisbach equation	4
26	Major and minor losses.	4
27	Dimensional Analysis and Boundary Layer Theory Fundamental dimensions of quantities, dimensional homogeneity	4
28	Types of similarities by dimensional analysis Rayleigh's method	5
29	Buckingham's method,;	5
30	Dimensionless numbers	5
31	Concept of hydrodynamic boundary layer,	5

32	Growth over a flat plate,	5
33	Different thickness of boundary layer	5
34	Drag on a flat plate	5
35	Drag coefficient	5
36	Numericals	5
37	Unit VI: Fluidization and Transportation of Fluids	5
38	Transportation of Fluids fluidization, types of Fluidization	6
39	Minimum Fluidization velocity	6
40	Entrainment in Fluidization	6
41	Operating characteristics of gas-solid	6
42	liquid –solid and liquid – gas	6
43	Fluidized beds	6
44	Different types of valves and pumps.	6
45	Blowers and compressors cavitation	6

Question Bank

Fluid Mechanics (209342)

	Unit-I	CO
Q.1	Draw shear stress – shear rate diagram and explain rheological behavior of different fluid	CO1
Q.2	List out the properties of fluid .explain any two in details	CO1
Q.3	Draw Shear stress – shear rate diagram and explain rheological behavior of different fluids	CO1
Q.4	Define the following and given their SI units i. Vapour pressure ii. Specific gravity iii. Kinematic viscosity	CO1
Q.5	Distinguish between the following. i. Steady flow and unsteady flow ii. Uniform and non-uniform flow iii. Laminar flow and turbulent flow	CO1
Q.6	The density of substance is 2900 kg/m^3, calculate its i. Relative density ii. Specific volume iii. Specific weight	CO1
Q.7	If density of a liquid is 837 kg/m^3 find its specific weight, specific gravity, and specific volume if kinematic viscosity of this liquid is 1.73cm^2/s obtain its dynamic viscosity.	CO1
Q.8	The density and kinematic viscosity of oil at 20˚c are 850 kg/m3 and 5.882×10^{-6} m^2/s respectively calculate its relative density and dynamic viscosity.	CO1
	Unit-II	
Q.1	Classify the various type of manometers explain any one in detail	CO2
Q.2	state and prove Prove $P = \frac{[Px+Py+P2]}{3}$	CO2
Q.3	State and prove Hydrostatic law	CO2
Q.4	Distinguish clearly between a simple manometer and a differential manometer	CO2
Q.5	Classifies the various type of manometer, explain any one in detail	CO2
Q.6	What is limitation of Bernoulli's equation	CO2

Q.7	A pipe continues an oil of specific gravity 0.9 a differential manometer contained at the two points A & B shows a differences in mercury level as 15 cm. Find the difference of pressure at 2 point.	CO2
Q.8	The right limb of simple U-tube manometer containing mercury is open to the atmosphere while the left limb connected to a pipe in which a fluid of sp. gr. 0.9 is flowing. The center of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm.	CO2
Q.9	U-tube manometer contain mercury was used to find the negative pressure in the pipe containing water the right limb is open to atmosphere find the vacuum pressure in the pipe if the difference of mercury level in the two limbs was 100mm and height of the water in the left limb from the center of the pipe was found to be 40mm below.	CO2
	Unit-III	
Q.1	Derive the expression for continuity equation in 3-D flow?	CO3
Q.2	Derive Euler's equation of motion	CO3
Q.3	explain working principles of i. Rote meter ii. Pitot tube	CO3
Q.4	Draw a net sketch and explain the working of venturimeter derive and equation to calculate flow rate by using Venturimeter.	CO3
Q.5	Derive expression for Pitot tube and explain and working principle.	CO3
Q.6	An oil of sp.gr.0.8 is following through a venturimeter having inlet diameter 20cm and throat diameter 10cm. The oil mercury differential manometer shows a reading of 25 cm calculate the discharge of oil through the horizontal venturimeter. Take Cd=0.98	CO3
Q.7	An orifice meter with orifice diameter 15cm is inserted in a pipe of 30cm diameter the pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury .Find the rate of flow of oil of sp.gr 0.9 when the coefficient of discharge of the meter = 0.64	CO3
Q.8	A pitot static tube placed in the center of a 300mm pipe lines has orifice pointing upstream and other perpendicular to it the mean velocity in the pipe is 0.80 of the central velocity find the discharge through the pipe if the pressure difference between the two orifices is 60mm of water take co-efficient of Pitot tube as CV=0.98	CO3
	Unit-IV	
Q.1	Derive Hagen-Poiseuille Equation, highlighting the assumptions made.	CO4
Q.2	Prove that expression for laminar flow of fluid, $f=\frac{16}{Re}$	CO4
Q.3	Derive “Darcy Weisbach" equation to find head loss due to friction? Prove $h_f=\frac{4fLV2}{d*2g}$	CO4

Q.4	Derive the relation between the maximum and average velocities along with their position in the cross section of, circular horizontal pipe.	CO4
Q.5	Explain friction factor plot for laminar and turbulent flow of fluids, Explain its use in calculations of head loss in friction for laminar and turbulent flow of fluids.	CO4
Q.6	A fluid of viscosity 0.7 Ns/m^2 and specific gravity 1.3 is flowing through a circular of diameter 100mm.The maximum shera stress at the pipe wall is given as 196.2 N/m^2 Find : a)Pressure gradient b)Average velocity c)Reynolds no. of the flow	CO4
Q.7	Water at 15°C flow between two large parallel plates at a distance of 1.6mm apart. Determine a)maximum velocity =0.3m/s b)The pressure per unit length c)The shear stress at the wall of the plate	CO4
		CO4
	Unit-V	
Q.1	With suitable example, describe in detail the Rayleigh's Method of dimensional analysis?	CO5
Q.2	Explain Buckingham's π-theorem in detail.	CO5
Q.3	What are the methods of dimension analysis? Describe the Rayleigh's Method for dimension analysis?	CO5
Q.4	Explain the term dimensional homogeneous equation? With suitable example.	CO5
Q.5	Explain the following term: 1) Geometric Similarity. 2) Kinematic Similarity. 3) Dynamic Similarity	CO5
Q.6	Define and explain boundary layer and its property?	CO5
Q.7	Explain growth over a flat plate?	CO5
Q.8	The efficiency 'η' of a fan depends on the density 'ρ' the dynamic viscosity 'μ' of the fluid, the angular velocity 'ω', diameter 'D' of the rotor and the discharge 'Q'. Express 'η' in terms of dimensionless parameter.	CO5
Q.9	State Buckingham's π-theorem, show that the velocity through a circular orifice is given by $r=\sqrt{2gh}\ \varphi\left[\frac{D}{h},\frac{\mu}{\rho v h}\right]$ where, h=head causing flow μ=co-efficient of viscosity g= acceleration due to gravity D= Diameter of orifice ρ=mass density	CO5
Q.10	A partially submerged body is towed in water, length 'L' of body, velocity 'v' of body resistance 'R' and acceleration due to gravity to its motion depends on the density 'ρ' show that the resistance to motion can be express in the form	CO5

	$R = \rho L^2 v^2 \varphi \left[\frac{\mu}{\rho v L}, \frac{lg}{v\text{^}2}\right]$ by Rayleigh's method	
	Unit-VI	
Q.1	Explain operating characteristic of centrifugal pump? Define pump.	CO6
Q.2	Explain phenomenon of cavitation's in centrifugal pumps. How it can be prevented?	CO6
Q.3	Explain value and its type with application?	CO6
Q.4	Define displacement thickness. Derive an expression for the displacement thickness.	CO6
Q.5	Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{v}=2\left(\frac{y}{\delta}\right)-\left(\frac{y}{\delta}\right)^2$	CO6

Fluid Mechanics (209342)

List of Practical:

Expt. No.	Name of Experiment	CO Mapped
1	Redwood Viscometer	01
2	To calculate coefficient of discharge of Venturimeter.	03
3	To calculate coefficient of discharge of Orifice meter.	03
4	To verify Bernoulli's equation experimentally.	03
5	Losses in pipe friction.	04
6	Reynolds Apparatus.	04
7	Flow through fluidized bed.	06
8	Characteristic of centrifugal pump.	06
9	Verification of stroke's law.	03
10	To calibrate and find accuracy of Rota meter.	03

Course: 04

Engineering Materials

(209343)

S.E. Chemical (2019 Pattern)

[Theory & Practical]

Course Syllabus

Engineering Materials (209343)

Unit I: Introduction: **(07)**
Scope of engineering materials, Definition and explanation of- Melting point, Boiling point, Specific heat, Thermal, conductivity, Thermal expansion, Thermal insulation, Stresses, Strain, Yield stress, Fatigue, Creep.

Unit II: Testing of Engineering Materials: **(07)**
Testing of materials, destructive and nondestructive tests, structure of atom and chemical bonds, crystal structures and their influence on material properties, Deformation and slip processes.

Unit III: Metals and Organic Materials: **(07)**
Iron – Carbon diagram high and low temperature material, insulation, refractories.
Definition and importance of Polymer Addition and condensation Polymerization Plastics: definition, classification, general properties and uses Rubbers : definition, classification, general properties and uses Compare natural and synthetic rubber Vulcanizing of rubber

Unit IV: Corrosion and Its Prevention: **(07)**
Definition of corrosion, Types of corrosion: Direct corrosion, Electro-chemical corrosion, galvanic corrosion, High temperature corrosion, Factors affecting corrosion rate Methods for control and prevention of corrosion.

Unit V: Nanomaterial: **(07)**
Classification, synthesis, characterization and application of Nanomaterial – Fullerenes, Bucky balls, carbon Nano tubes, fullerenes. Nano particles – silver Nano-particles. Applications of Nano materials in Chemical Industry

Unit VI: Experimental Techniques: **(07)**
Electron Microscopes; scanning electron microscopy (Basics, Principal Elements, working), transmission electron microscopy (Basics, Principal Elements, working). Scanning probe microscopes; scanning tunneling microscopy, atomic force microscopy, other kinds of microscopes; X-ray diffraction.

Reference Books:

1. James F. Shacketford, introduction to material science, McMillan publishing company, NewYork ISBN 1990.
2. D.Z. Jestrazebaski, properties of Engg. Materials, 3rd Ed. Toppers. Co. Ltd.
3. J.L. Lee and Evans, Selecting Engineering materials for chemical and process plants, Business Works 1978.
4. A text book of machine design, Khurmi R.S. and Gupta J.K.
5. Introduction to Nano Technology, John Wiley & Sons by Charles P Poole, Frank J Owens.
6. Nano materials, synthesis, properties and applications, Institute of physics publishing,
7. Bristol and Philadelphia, by A.S. Edelstein and R.C. Kamarhati
8. R. A. L Jones, Soft Condensed Matter, Oxford University Press, 2002.
9. William D. Callister, David G. Rethwisch Materials Science and Engineering: Introduction, Wiley Publisher.
10. B. S. Mitchell An Introduction to Materials Engineering and Science for Chemical and Materials Engineers, John Wiley & Sons, 2004.

209343: Engineering Materials

Teaching Scheme: Lectures: 3 Hrs/ Week Practical: 2 Hrs/ Week	**Examination Scheme:** Paper: (30+70) 100 Marks In semester Assessment: 30 Marks End Semester Assessment: 70 Marks. Oral: 25 Marks **Credits:** Theory: 3 Practical: 1 Total: 4 Credits

Course Outcomes (Cos Engineering Materials)

After successful completion of this course, students will be able to:

Course Outcome	Statements	Bloom's Taxonomy	
		Level	Descriptor
C243.1	Describe scope of Engineering materials, properties of materials and Selection of materials	2	Describe
C243.2	Test different engineering materials and describe organic materials.	5	Test
C243.3	Understand the types of different metals and organic materials.	2	Understand
C243.4	Classify corrosion, describe its types, Control and prevention of corrosion.	2	Classify
C243.5	Understand the knowledge of Nanomaterial and its synthesis.	2	Understand
C243.6	Evaluate different experimental techniques for inspection of materials.	5	Evaluate

Mapping of Course Outcomes to POs and PSOs

CO-PO CORRELATION MATRIX															
COs	PROGRAM OUTCOMES (POs)												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	2	1						1		1	1		1
2	3	3	3	2	2					1		1	1	2	2
3	2	1	2	2						1		1	3	1	1
4	2	2	1	1						1		1	2	1	1
5	3	2	2	2						1		1	2	2	2
6	3	3	2	3	2					1		1	3	3	3

Levels: 3 for ≥60 ; 2 for < 60 ≥ 40; 1 for < 40

COAssessmentTools

Course Outcomes (CO)	Assessment Tools							
	Continuous Internal Evaluation, CIE					CIE by SPPU, Pune	Semester End Exam (SEE) by SPPU, Pune	
	T1	T2	T3	Assignment	PR	Insem	OR	Endsem
C243.1	√			√		√	√	
C243.2	√			√		√	√	
C243.3		√		√			√	√
C243.4		√		√			√	√
C243.5			√	√			√	√
C243.6			√	√			√	√

Chemical Engineering Department

Teaching Plan

Engineering Materials (209343)

Teaching Scheme:
Theory: 03 h/week

Practical: 2 h / week

Examination Scheme:
Insem: 30
Endsem:70 : Credit = 3
Oral: 25 OR: 50 Credit = 2

Lect No.	Topics / Sub- Topics	CO mapped
	Subject Orientation	
1	**UNIT I**-Scope of engineering materials	CO1
2	Definition of Melting and Boiling point	CO1
3	Specific Heat	CO1
4	Thermal Expansion, Thermal Insulation	CO1
5	Stress, Strain	CO1
6	Yield Stress	CO1
7	Fatigue, Creep, Thermal conductivity,	CO1
8	Innovative teaching methods	CO1
9	**UNIT-II**-Testing of materials	CO2
10	Destructive Testing	CO2
11	Non-Destructive Testing	CO2
12	Structure of atom	CO2
13	Chemical Bonds	CO2
14	Influence of Crystal Structure on material properties	CO2
15	Deformation Process ,Slip process	CO2
16	Innovative teaching methods	CO2
17	**UNIT III**-Iron carbon diagram	CO3
18	Insulation	CO3
19	Refractories	CO3
20	Polymer addition	CO3
21	Polymer condensation	CO3
22	Definition and classification of plastics	CO3
23	Definition and classification of rubber	CO3
24	Innovative teaching methods	CO3
25	**UNIT IV** -Definition Corrosion	CO4
26	Types of corrosion	CO4
27	Direct corrosion	CO4
28	Galvanic corrosion	CO4
29	High temperature corrosion	CO4
30	Effects of corrosion	CO4
31	Factors effecting corrosion rate , Prevention of corrosion	CO4
32	Innovative teaching methods	CO4
33	**UNIT V**-Nanomaterial Synthesis	CO5
34	Classification	CO5

35	Application	CO5
36	Fullerenes	CO5
37	Carbon Nano Tubes	CO5
38	Bucky Balls	CO5
39	Application of Nanomaterial , Silver Nano material	CO5
40	Innovative teaching methods	CO5
41	**UNIT VI**- Electron microscope	CO6
42	Scanning electron microscopy	CO6
43	Transmission electron microscopy	CO6
44	Scanning probe microscope	CO6
45	Scanning tunnel microscopy	CO6
46	Atomic Force microscopy	CO6
47	X-Ray Diffraction , Application	CO6
48	Innovative teaching methods	CO6

Question Bank

Engineering Materials (209343)

	Unit-I	
Q.1	Define Melting point	CO1
Q.2	Define and explain Boiling point	CO1
Q.3	What is Specific heat	CO1
Q.4	Define thermal conductivity and explain.	CO1
Q.5	What is stress and strain	CO1
Q.6	Explain Fatigue	CO1
Q.7	What is creep and explain	CO1
Q.8	What is yield stress	CO1
		CO
	Unit-II	
Q.1	What is testing of materials	CO2
Q.2	Explain destructive and non-destructive testing	CO2
Q.3	Explain the structure of atom	CO2
Q.4	How crystal structure influences the material properties	CO2
Q.5	What is deformation of materials	CO2
Q.6	Explain Slip process	CO2
	Unit-III	
Q.1	Explain Iron-Carbon diagram	CO3
Q.2	What are Insulators and refractories	CO3
Q.3	Define polymer addition and condensation	CO3
Q.4	What is polymerization of Plastics	CO3
Q.5	State the classification of Plastics	CO3
Q.6	Compare natural and synthetic materials	CO3
Q.7	What is vulcanization of rubbers	*CO3*
	Unit-IV	*CO*
Q.1	Define corrosion	CO4
Q.2	Explain direct corrosion	CO4
Q.3	What is Electrochemical corrosion	CO4
Q.4	Explain Galvanic corrosion	CO4
Q.5	What is high temperature corrosion	CO4
Q.6	What are the factors effecting corrosion	CO4
Q.7	Explain the methods for control and prevention of corrosion	CO4

	Unit-V	
Q.1	What are nanomaterial	CO5
Q.2	What are the applications of nanomaterial	CO5
Q.3	What are Bucky balls explain.	CO5
Q.4	Explain Carbon nano tubes	CO5
Q.5	What is fullerenes	CO5
Q.6	What are silver nano particles	CO5
Q.7	Explain the application of nano materials in chemical industry	CO5
Q.8	Classify Nano materials	CO5
	Unit-VI	
Q.1	What are electron microscopes	CO6
Q.2	Write the basic principle and working of scanning electron microscopes	CO6
Q.3	Explain transmission electron microscope	CO6
Q.4	What is scanning tunnel microscopy	CO6
Q.5	Explain atomic force microscope	CO6
Q.6	Explain X-ray diffraction	CO6
Q.7	What is scanning probe microscopes	CO6
		CO6

Engineering Materials (209343)

List of Practical:

Expt. No.	Name of Experiment	CO Mapped
1	Liquid penetration test	CO2
2	Ultrasonic inspection	CO6
3	Brinell Hardness Test	CO2
4	Rockwell Hardness Test	CO2
5	Hardening and Tempering of Steel	CO2
6	Sulphur Print Test	CO6
7	Impact Testing	CO2
8	Study of Microstructure	CO6
9	Study of Flaw lines in Forged Steel	CO3
10	Study of Vulcanizing of Rubber	CO2

Course: 05

Process Calculations

(209344)

S.E. Chemical (2019 Pattern)

[Theory & Practical]

Course Syllabus

Process Calculations (209344)

Unit I: **(07)**

Mathematical Principles Introduction to unit processes and operations and their symbols, process flow sheet, Concept of steady and unsteady state operations, Units and dimensions: basic and derived units, different ways of expressing units and quantities, conversion of units, properties of pure substances, PVT behavior, ideal and real gas laws. Mole fractions and partial pressures, application of Dalton's, Amagat's, Henry's laws, concept of vapor pressure, Raoult's law and its applications, vapor pressure plots and effect of temperature on vapor pressure.

Unit II: **(07)**

Material Balance for Physical Systems Concept, material balance calculations, recycling and bypassing operations, introduction to unsteady state processes with examples like batch reactor, accumulation of inert components, etc.

Unit III: **(07)**

Material Balance for Reacting Systems Concept, material balance calculations, electrochemical reactions, recycling and By-passing Operations.

Unit IV: **(07)**

Energy Balance Concept, energy and Thermo chemistry, energy balances, heat capacity of pure substances and mixtures, latent heats, enthalpy of pure substances and mixtures, absolute enthalpy, heat of reaction, adiabatic reactions, thermo chemistry of mixing processes, dissolution, liquid-liquid mixtures, gas-liquid systems.

Unit V: **(07)**

Stoichiometry and Unit Operations Distillation, humidification, absorption and stripping, extraction and leaching, crystallization, Psychrometry, drying, evaporation, introduction to stoichiometry and industrial problems.

Unit VI: **(07)**

Fuels and Combustion Calorific values, coal, liquid fuels, gaseous fuels, air requirement and flue gases, combustion calculations. (L07).

Tutorial (TW) Guideline of University

To apply the knowledge of the software like ChemCad /ASPEN/DWSIM to solve at least five industry problems of chemical engineering unit operations or processes based on material balance with and without chemical reactions and energy balance.

Reference Books:

1. Bhatt B.I. and Vora S.M., "Stoichiometry", 2nd Edition, Tata McGraw Hill, New Delhi, 2004.
2. Hougen O.A., Watson R.M. and Ragatz R.A., "Chemical Process Principles Part I", 2nd Edition, CBS Publications, 1976. (ISBN: 9798123909539)
3. David M. Himmelblau, "Basic Principles and Calculations in Chemical Engineering", 8th Edition, Prentice Hall of India, New Delhi, 2012. (ISBN: 0132346605)
4. Narayanan. K.V. and Lakshmikutty. B, "Stoichiometry and Process Calculations", 2nd a. Edition, Prentice Hall of India, New Delhi, 2009. (ISBN: 8120329929)
5. Venkatramani V, Ananatharaman N, Sheriffa Begum, "Process Calculations", 2nd Edition, Prentice Hall of India, 2011.
6. Richard M. Felder, Ronald W. Rousseau, "Elementary Principles of Chemical Processes", 3rd Edition, John Wiley and Sons, 2005.

209344: Process Calculations

Teaching Scheme: Lectures: 3 Hrs/ Week Tutorial : 1 Hrs./Week	**Examination Scheme:** Paper: (30+70) 100 Marks In semester Assessment: 30 Marks End Semester Assessment: 70 Marks. Tutorial (TW): 25 Marks **Credits:** Theory: 3 Tutorial: 1 Total: 4 Credits

Course Outcomes (COs Process Dynamics and Control

After successful completion of this course, students will be able to:

Course Outcome	Statements	Bloom's Taxonomy	
		Level	Descriptor
C244.1	Apply the various laws of governing solid, liquid, gas phases and knowledge of basic concepts.	**3**	**Apply**
C244.2	Calculate the material balance for various unit operations.	**4**	**Calculate**
C244.3	Calculate the material balance for various unit processes.	**4**	**Calculate**
C244.4	Determine the energy requirement for various unit operations and processes in chemical engineering.	**4**	**Determine**
C244.5	Determine the material balance for various industrial problems in chemical engineering.	**4**	**Determine**
C244.6	Determine the calorific values of fuel, air requirement and compositions of flue gases.	**4**	**Determine**

Mapping of Course Outcomes to POs and PSOs

CO-PO CORRELATION MATRIX															
COs	PROGRAM OUTCOMES (POs)												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	2	1									3	2	
2	3	2	2	2	2								3	2	2
3	3	2	2	2	2								3	2	2
4	3	2	2	2	2								3	2	2
5	3	2	2	2	2								3	3	2
6	3	2	2	2									3	3	

Levels: **3 for ≥60 ;** **2 for < 60 ≥ 40;** **1 for < 40**

CO Assessment Tools

Course Outcomes (CO)	Assessment Tools							
	Continuous Internal Evaluation, CIE					CIE by SPPU, Pune	Semester End Exam (SEE) by SPPU, Pune	
	T1	T2	T3	Assignment	PR	Insem	TW	Endsem
C244.1	√			√		√		
C244.2	√			√		√	√	
C244.3		√		√			√	√
C244.4		√		√			√	√
C244.5			√	√			√	√
C244.6			√	√				√

Chemical Engineering Department

Teaching Plan

Process Calculations (209344)

Teaching Scheme:
Theory: 03 h/week

Tutorial: 01 h / week

Examination Scheme:
Insem: 30
Endsem: 70 : Credit = 3
Tw: 25 : Credit = 1

Lect No.	Topics / Sub- Topics	CO mapped
1	PO,PSO,CO & Subject Orientation	-
2	**Mathematical Principles:** Introduction to unit processes and operations.	1
3	Concept of steady and unsteady state operations	1
4	Units and dimensions, conversion of units	1
5	Ideal and real gas laws, Amagat's, Dalton's and Henry's laws, numerical	1
6	Mole fractions, weight fractions and partial pressures	1
7	Average molecular weight, numerical	1
8	Density of gas mixtures, numerical	1
9	**Material Balance for Physical Systems:** Introduction to unsteady state processes	2
10	Recycling and bypassing operations	2
11	Distillation, numerical	2
12	Evaporation, numerical	2
13	Mixing, Crystallization numerical	2
14	Drying, numerical	2
15	Extraction and Gas absorption, numerical	2
16	Revisions	1,2
17	**Material Balance for Reacting Systems:** Introduction	3
18	Material balance calculations	3
19	Stoichiometric coe., ratio and equation	3
20	Concept of conversion, yield and selectivity	3
21	Numerical based on conversion and yield	3
22	Numerical based on composition of product.	3
23	Numerical based on conversion, yield % excess and composition of product combine	3
24	**Energy Balance:** Introduction	4
25	Energy balances calculations	4
26	Heat capacity of pure substances and mixtures	4
27	Latent heats, enthalpy of pure substances and mixtures	4

28	Heat of reaction, adiabatic reactions	4
29	Heat of reaction, Hess law, numerical	4
30	Calculations of heat of formation and combustion	4
31	Revision	3,4
32	**Stoichiometry and Unit Operations: Introduction**	5
33	Distillation	5
34	Humidification	5
35	Absorption and stripping	5
36	Extraction and leaching	5
37	Crystallization	5
38	Introduction to stoichiometry and industrial problems	5
39	**Fuels and Combustion:** Introduction	6
40	Calorific values	6
41	Coal, liquid fuels, Gaseous fuels	6
42	NCV and GCV calculations	6
43	Air requirement and flue gases	6
44	Proximate analysis of fuel	6
45	Ultimate analysis of fuel	6

Question Bank

Process Calculations (209344)

	Unit-I	CO
Q.1	Find N content of 100 kg Urea Sample contains 96.43% of pure Urea.	CO1
Q.2	How many moles of sulphur contains in 100 kg Sulphuric acid.	CO1
Q.3	How many moles of Sulphuric acid contains 64 kg sulphur.	CO1
Q.4	Find Equivalent Weight of following components. 1. HCl 2. NaOH 3. NaCl 4. Na2CO3 5. H2SO4 6. CaCl2	CO1
Q.5	98 gm of Sulphuric acid dissolve in water to prepare 1 L solution. Find Normality and Molarity of solution.	CO1
Q.6	Sulphuric acid solution has molality of 11.24 and molality 94. Calculate density of solution.	CO1
Q.7	Solution of NaCl is prepared by dissolving 25 kg of NaCl in 100 kg water. Express solution on mole and weight basis.	CO1
Q.8	An aqueous of Acetic acid of 30 % concentration (by mass) has density 1040 kg/m3. Find Molality, Normality and Molality of the solution.	CO1
Q.9	Calculate the weight of sulphur dioxide in a vessel having 2 m3 volume, the pressure and temperature being 97.33 KPa and 120 0C.	CO1
Q.10	Calculate the density of air containing 79 % N2 and 21 % of O2 by volume at NTP.	CO1
	Unit-II	
Q.1	Define following terms i) Bypass Operation. ii) Recycle Operation. iii) Combined feed ratio. iv) Purge ratio.	CO2
Q.2	An evaporator feed with 15000 kg/hr. of solution containing 10% NaCl, 15 % NaOH and rest water. In the operation, water evaporated and NaCl precipitated as crystal. The hick liquor leaving the evaporator contains 45 % NaOH, 2 % NaCl and rest water. Calculate - a. kg/hr. water evaporated. b. kg/hr. salt precipitated c. kg/hr. thick liquor.	CO2
Q.3	10000 kg/hr. solution containing 20 % methanol is feed to distillation column. Distillate is found to contain 98 % methanol and waste solution contains 1 % methanol by weight. Calculated a. Mass flow rate of distillated and bottom product. b. % Recovery and % loss of methanol.	CO2
Q.4	The waste acid contains 30% H2SO4, 35% HNO3 and rest water. The acid is to be concentrate to contain 39% H2SO4 and 42 % HNO3 by addition of concentrated 98 % H2SO4 and 72 % HNO3 by weight. Calculate the quantities of acid to be mixed to get 1000 kg desired mixed acid.	CO2
Q.5	It is desired to makeup 1000 Kg of a solution containing 35 % by weight of a substance A. Two solutions are available, one containing 10 weight % A & other containing 50 weight % A. How many kilograms of each solution will be required?	CO2
Q.6	The waste acid from a nitrating process contains 30 % Sulphuric acid, 35 % Nitric acid, and 35 % water by weight. The acid is to be concentrated to contain 39 % Sulphuric acid & 42 % Nitric acid by addition of concentrated	CO2

	Sulphuric acid containing 98 % Sulphuric acid and concentrated Nitric acid containing 72 % Nitric acid (by weight).Calculate the quantities of three acids to be mixed to get 1000 Kg of desired mixed acid ?	
	Unit-III	
Q.1	Ethylene Oxide is produce from oxidation of ethylene. 100 kmoles of ethylene feed to reactor. The product stream contains 80 kmoles ethylene and 20 kmoles of CO2. Calculate % conversion of ethylene and % yield of ethylene oxide.	CO3
Q.2	Mixture of CO2 and H2 feed to reactor gas leaving from reactor contains 57.1% CO2, 41% of H2, 1.68% CH4 and 0.12% CO. reaction as follows, CO2 + 4H2 = CH4 + H2O, CO2 + H2 = CO + H2O Find 1. % conversion of CO2 2. % Yield of CH4 3. Composition of feed on mole basis	CO3
Q.3	50 kmoles butane and 2000 kmol of air feed to reaction chamber. Assume combustion of butane is 100%. Calculate % of excess air used and composition of product gases leaving the chamber.	CO3
Q.4	A combustion chamber is fed with butane and excess air. Combustion of Butane is complete. The composition of the combustion gases on volume basis is given below: CO2 = 9.39%, H2O = 11.73%, O2 = 4.70% and N2 = 74.18% Determine percentage excess air used and mole ratio of air to butane used.	CO3
Q.5	In the production of sulphur trioxide, 100 Kmol SO2 and 200 Kmol O2 are fed to reactor. The product stream is found to contain 80 Kmol SO3. Determine the percent conversion of SO2.	CO3
Q.6	Formaldehyde is produced from methanol in a catalytic reactor. The production rate of formaldehyde is 1000 kg/hr. If the conversion of methanol is 65 %, calculate the required feed rate of methanol.	CO3
Q.7	A combustion chamber is fed with butane and excess air. Combustion of Butane is complete. The composition of the combustion gases on volume basis is given below: CO2 = 9.39%, H2O = 11.73%, O2 = 4.70% and N2 = 74.18%. Determine percentage excess air used and mole ratio of air to butane used.	CO3
Q.8	Formaldehyde is produced from methanol in a catalytic reactor. The production rate of formaldehyde is 1000 kg/hr. If the conversion of methanol is 65 %, calculate the required feed rate of methanol.	CO3
Q.9	Oxidation of ethylene to produce ethylene oxide is given by following reaction, $C_2H_4 + \frac{1}{2} O_2 \rightarrow C_2H_4O$. If air is used 20 % excess of that theoretically required, calculate the quantity of air supplied based on 100 Kmol of ethylene fed to the reactor.	CO3
	Unit-IV	
Q.1	A stream flowing at a rate of 15 kmol/hr. containing 25 % N2 and 75 % H2 by mole is heated from 298 k to 473 k. Calculate the heat that must be transfer using Cp data given as follows.	CO4
Q.2	N2 stream flowing at rate 100 kmol/hr. is heated from 303 k to 373 k. Calculate heat must be transfer. Cp for N2 as 29.5909-5.141*10-3T + 11.1829*10-6T2 – 4.968 * 10-9T3.	CO4
Q.3	Explain the Hess's law of constant heat summation with example.	CO4

Q.4	The heat capacity of Carbon dioxide is given by the following relation? Cp= 26.54 + (42.454X10-3) T - (14.298X10-6) T2 KJ/Kmol oK. How much heat is required to heat 1Kg of Carbon dioxide from 300 0K to 1000 0K.	CO4
Q.5	What is Energy? What are the different types & forms of Energy? Explain?	CO4
Q.6	State and explain Hess's Law of constant heat summation?	CO4
Q.7	The heat capacity of Carbon dioxide is given by the following relation? Cp= 26.54 + (42.454X10-3) T - (14.298X10-6) T2 KJ/Kmol oK. How much heat is required to heat 1Kg of Carbon dioxide from 300 0K to 1000 0K.	CO4
	Unit-V	
Q.1	Define 1. Dry Bulb Temperature 2. Absolute Humidity 3. Relative Humidity 4. Saturation Humidity. 5. Wet Bulb Temperature	CO5
Q.2	Define 1. Adiabatic saturation temperature 2. Absolute Humidity 3. Relative Humidity 4. Saturation Humidity.	CO5
Q.3	Crystallizer feed with saturated solution of MgSO4 at 353 K. The solution cooled to obtain MgSO4.7H2O crystal at 303 K. During cooling 4% of solution lost by evaporation of water. Estimate the quantity of solution that required to obtain the 1000 kg of MgSO4.7H2O crystals. Data Solubility of MgSO4 in water 1. At 353 K is 64.2 kg MgSO4/100 kg water. 2. At 303 K is 40.8 kg MgSO4/100 kg water. [Atomic weight Mg-24, S-32, H-1, O-16]	CO5
Q.4	Dry bulb temperature dew point of ambient air were found 302 K and 291 K. resp. at total pressure 100 KPa. Vapor pressure of water at 291 K is 2.0064 KPa and that of at 302 K is 4.004 KPa.	CO5
Q.5	1000 kg 30% solution of acetone by weight contacted with MIBK to extract acetone in extractor. Find quantity of MIBK must be feed to reduce the acetone concentration in water rich phase to 5 % by weight. Also calculate the % of acetone extracted and extracted. Composition of phases, Raffinate Phase- 5% Acetone, 92.5 % Water and 2.5% MIBK. Extract Phase- 10% Acetone, 3 % Water and 87% MIBK.	CO5
Q.6	CS2 is recovered from gas contains 15% CS2 and 85% N2 by mole using benzene as solvent. If solvent to feed ratio is 2. If gas leaving the tower contains 2% CS2 and 2% benzene on mole basis. Calculate 1. Fraction of CS2 removed in benzene outlet stream. 2. The mole fraction of CS2 in the benzene outlet stream. 3. Fraction of benzene feed to column lost in the gas leaving the absorber.	CO5
	Unit-VI	
Q.1	Define following Terms a. NCV b. GCV c. Excess Air	CO6
Q.2	Orsat analysis of flue gases from boiler house chimney by volume basis given as a CO2- 11.4%, O2- 4.2% and N2- 84.4%. Calculate % of excess air and C/H ratio by weight.	CO6
Q.3	Calculate the NCV at 298 k of a sample of fuel oil having C/H ratio 9.33 by weight and containing S to the extent of 1.3 % by weight. Data: - GCV of the fuel oil at 298k -41785 KJ/Kg. Latent heat of water vapor at 298k – 2442.5 KJ/Kg.	CO6
Q.4	The gross heating value of propane at 298 k is 2219.71 KJ/mol. Calculate net heating value for propane.	CO6
Q.5	Calculate the NCV at 298 k of a sample of fuel oil having C/H ratio 9.33 by weight and containing S to the extent of 1.3 % by weight. Data: - GCV of	CO6

	the fuel oil at 298k -41785 KJ/Kg. Latent heat of water vapor at 298k – 2442.5 KJ/Kg.	
Q.6	Orsat analysis of flue gases from boiler house chimney by volume basis given as a CO2- 11.4%, O2- 4.2% and N2- 84.4%. Calculate % of excess air and C/H ratio by weight.	CO6
Q.7	Crude oil is found to contain 87.1% carbon, 12.5% hydrogen and 0.4% Sulphur (by mass). Its GCV at 298.15 K is measured to be 45071 kJ/kg oil. Calculate its NCV at 298.15 K. Data: Latent heat of water vapor at 298.15 K = 2442.5 kJ/kg.	CO6
Q.8	b. The gross heating value of gaseous propane is 2219.71 kJ/ mol at 298.15 K. Calculate its net heating value in kJ/mol c. Define adiabatic flame temperature and HCV and NCV. Is the actual adiabatic flame temperature different than that calculated theoretically?	CO6
Q.9	The orsat analysis of the flue gases from a boiler house chimney gives CO2 = 11.4%, O2 = 4.2% and N2 = 84.4% (mole %). Assuming that complete combustion has taken place. Calculate the % excess air, and also find the C/H ratio in the fuel b. Explain in detail about proximate analysis of coal	CO6

Process Calculations (209344)

List of Practical:

Tut. No.	Name of Experiment	CO Mapped
1	Introduction to Simulation Software	-
2	Simulation for Non Reacting System (Simple Distillation)	02
3	Simulation for Reacting System (Reactor)	03
4	Simulation for Non Reacting System (Heat Exchanger)	04
5	Simulation for Non Reacting System (Heat Exchanger)	04

Course: 06

Soft Skill

(209345)

S.E. Chemical (2019 Pattern)

[Practical]

Course Syllabus

Soft Skill (209345)

- With a view to meet the trained human resource requirements of the Chemical Process and allied industries, students of Chemical Engineering will go through soft skills. The training of students will be conducted in order to improve their personality. This course has an objective of helping them to find suitable jobs by inculcating soft skills components through appropriate training.

- Art of Communication, Importance of internal and external communication. General Communication process, verbal & Non-verbal Communication. Effective Listening skis.
- Interpersonal Skills, Effective presentation skills, Self-awareness. Dealing with emotions. Team work. Leadership qualities.

- Professional etiquettes, Importance of per-placement talks. How to prepare for a Campus interview. Asking right questions during and after pre-placement talks. Collecting relevant information about the visiting company.

- Preparation of resume Effective Interview and group discussion techniques. Effective body language. Understanding psychology of interviewers. NLP (Neuro-linguistic programming) & NAC (NeuroAssociative conditioning) techniques. Mock interviews and Group Discussion.

- Effective goal setting. Developing a vision mission and purpose for successful professional life (Designing your career). Creative visualization. Power of positive thinking. Art of Living and leaving for professional success. Eustress & distress. Management of stress and strain through meditation & yoga.

Reference Books:

1. Stephen R. Covey, The 7 habits of highly effective people, Free Press 1989.
2. Stephen R. Covey, The 8th habit, Free Press 1989.
3. Napoleon Hill, Think and grow rich, The Napoleon Hill Foundation, 2012.
4. Anthony Robins, Awaken the giant within, Free Press; New edition, 1992.
5. Nasha Fitter, You're hired, Penguin India, 2009

209345: Soft Skill

Teaching Scheme:	Examination Scheme:
Practical: 02 Hrs/Week	Total: 25 Marks Credits:1

Course Outcomes (Cos) Soft Skill

After successful completion of this course, students will be able to:

Course Outcomes	Statements	Bloom's Taxonomy	
		Level	Descriptor
C245.1	Understand and be aware of importance of role and contents of soft skills through instructions, knowledge acquisition, demonstration and practice.	2	Understand
C245.2	Developing self-motivation, raised aspirations and belief in one's own abilities, defining and committing to achieving one's goals.	3	Apply

Mapping of Course Outcomes to POs and PSOs

CO-PO CORRELATION MATRIX															
COs	PROGRAM OUTCOMES (POs)												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C245.1	**3**	**2**				**1**			**1**	**1**	**1**	**2**	**2**	**1**	**1**
C245.2	**3**	**2**				**1**			**1**	**1**	**1**	**2**	**2**	**1**	**1**
Total	6	4				2			2	2	2	4	4	2	2

Levels: **3 for ≥60 ;** **2 for < 60 ≥ 40;** **1 for < 40**

COAssessmentTools

Course Outcomes (CO)	Assessment Tools							
	Continuous Internal Evaluation, CIE					CIE by SPPU, Pune	Semester End Exam (SEE) by SPPU, Pune	
	T1	T2	T3	Assignment	TW	Insem	OR	Endsem
C245.1	--	--	--	--	√	--	-	--
C245.2	--	--	--	--	√	--	-	--

Practical Plan

Teaching Scheme:
Practical: 02 h/week

Examination Scheme:
TW=25 Marks Credit = 1

Practical No.	Name of Practical	CO Addressed
1	Interview Questions	CO1
2	Presentation skill	CO1
3	Resume	CO2
4	Letter Writing	CO1
5	Leadership Skill	CO2
6	Time Management	CO2
7	Group Discussion	CO2
8	Stress Management	CO2