PPSU

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

DIPLOMA

CHEMICAL ENGINEERING

SYLLABUS BOOK

AY 2025-26

INSTITUTE VISION
To emerge as an Institute of Excellence by imparting value-based education aided with Research, Innovation and Entrepreneurial skills.

INSTITUTE MISSION	
1.	To impart the holistic engineering education of highest quality & prepare socially responsible professionals with entrepreneurial skills.
2.	To prepare value-aided engineering professionals to meet up global industry requirements by imparting cutting edge professional education.
3.	To inculcate the attitude of research and innovation among the stake holders through experiential and project-based teaching-learning pedagogy.
4.	To acquire global talent pool by providing world class amenities for teaching, learning & research.

Graduates will demonstrate ability to:

PEO No	PROGRAMME EDUCATIONAL OBJECTIVES
PEO 1	Solve real-world engineering problems, design and develop innovative and cost-effective solutions exhibiting engineering skills/fundamentals to cater needs of society.
PEO 2	Excel in Industry/technical profession, higher studies, and entrepreneurship exhibiting comprehensive competitiveness.
PEO 3	Exhibit professional ethics & values, effective communication, teamwork, multidisciplinary approach, and ability to relate engineering issues to broader societal framework.

PO No	PROGRAMME OUTCOMES
PO 1	Engineering Knowledge Apply knowledge of mathematics, science, engineering fundamentals, and engineering specialization to solve complex engineering problems.
PO 2	Problem Analysis Identify, formulate, review research literature, and analyze complex engineering problems using principles of mathematics, natural sciences, and engineering sciences to reach substantiated conclusions.
PO 3	Design/Development of Solutions Design solutions for complex engineering problems and develop system components or processes that meet specified needs with appropriate consideration for public health, safety, cultural, societal, and environmental factors.
PO 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 information to provide valid conclusions.
PO 5	Modern Tool Usage Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, for complex engineering activities with an understanding of their limitations.
PO 6	The Engineer and Society Apply contextual knowledge to assess societal, health, safety, legal, and cultural issues and understand
PO 7	Environment and Sustainability Understand the impact of engineering solutions in societal and environmental contexts and demonstrate knowledge of sustainable development principles.
PO 8	Ethics Apply ethical principles and commit to professional ethics, responsibilities, and norms of engineering practice.
PO 9	Individual and Team Work Function effectively as an individual, and as a member or leader in diverse and multidisciplinary teams.
PO 10	Communication Communicate effectively on complex engineering activities with the engineering community and society at large through reports, documentation, presentations, and clear instructions.
PO 11	Project Management and Finance Demonstrate knowledge and understanding of engineering and management principles and apply them to manage projects effectively in multidisciplinary environments as an individual or team leader.

PSO No	PROGRAMME SPECIFIC OUTCOMES (PSO) CHEMICAL ENGINEERING
PSO 1	Apply advanced analytical techniques, latest technologies, and management skills in solving real-world challenges that involve technical aspects as well as human management.
PSO 2	Design solutions for complex Chemical engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health & safety, cultural, societal, and environmental considerations with modern engineering tools.
PSO 3	Design innovative, sustainable, and cost-effective Chemical Engineering projects by giving importance to the required safety measures and ethical practices.

Credit Guidelines (General)			
Component	**Hour/Week**	**Credit**	**Total Hours/Semester**
Theory	1	1	15
Practical	2	1	30
Tutorial	1	1	15
Note: In specific cases; extra credits can be granted for specific/important subjects.			

CO-PO Mapping Guidelines		
Mapping Level	**% age Mapping**	**Indicator**
0 / -	0	No Mapping
1	0-33	Low Level (Slightly Mapped)
2	33-66	Medium Level (Moderately Mapped)
3	>66	High Level (Strongly Mapped)

Syllabus Book

Institute of Diploma studies

P P Savani University

School of Engineering

Effective From: 2025-26

Authored by: P P Savani University

CONTENT

FIRST YEAR
INSTITUTE OF DIPLOMA STUDIES

P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
INSTITUTE OF DIPLOMA STUDIES															
TEACHING & EXAMINATION SCHEME FOR DIPLOMA CHEMICAL ENGINEERING PROGRAMME AY:2025-26(BATCH:2025)															
Sem.	**Course Code**	**Course Title**	**Offered By**	**Teaching Scheme**					**Examination Scheme**						
				Contact Hours				**Credit**	**Theory**		**Practical**		**Tutorial**		**Total**
				Theory	**Practical**	**Tutorial**	**Total**		**CE**	**ESE**	**CE**	**ESE**	**CE**	**ESE**	
1	IDSH1110	Mathematics-I	SH	3	0	2	5	5	40	60	0	0	100	0	200
	IDSH1130	Physics	SH	3	2	0	5	4	40	60	40	60	0	0	200
	IDCV1110	Basics of Civil Engineering	CV	3	0	2	5	5	40	60	0	0	100	0	200
	IDCE1110	Computer Fundamentals	CE	3	4	0	7	5	40	60	40	60	0	0	200
	CFLS2110	Elementary Communicative English-I	CLFS	3	0	0	3	3	100	0	0	0	0	0	100
						Total	**25**	**22**							**900**
2	IDSH1120	Mathematics-II	SH	3	0	2	5	5	40	60	0	0	100	0	200
	IDSH1140	Chemistry	CH	3	2	0	5	4	40	60	40	60	0	0	200
	IDME1110	Basics of Mechanical Engineering	ME	3	0	2	5	5	40	60	0	0	100	0	200
	IDIT1110	Python Programming	IT	3	2	0	5	4	40	60	40	60	0	0	200
	IDME1120	Workshop Fundamentals	ME	0	2	0	2	2	0	0	100	0	0	0	100
	CFLS2120	Elementary Communicative English-II	CLFS	2	0	0	2	2	100	0	0	0	0	0	100
						Total	**24**	**22**							**1000**

P P Savani University
Institute of Diploma Studies

Department of Applied Science & Humanities

Course Code: IDSH1110
Course Name: Mathematics-1
Prerequisite Course(s): Algebra, Geometry, Trigonometry till 9th Standard level

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	100	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:
To help learners to

- outline logarithm properties.
- implement concepts of Determinants and Matrices for solving science and engineering problems.
- present usefulness of trigonometry.
- acquire knowledge of co-ordinate geometry and ability to work with applications to Engineering Mathematics.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Logarithm** Basic concept of logarithm, Rules and related examples, Applications of logarithm.	5	11
2.	**Trigonometry** Basic concept of trigonometry, Units of angles (degree and radian), Allied & compound angles, Multiple–submultiples angles, Graph of sine and cosine, Periodic function, Sum and factor formula.	10	21
3.	**Co-ordinate geometry** Introduction, Point, Distance formula, Mid-point, Locus of a point, Straight lines, Slope of a line, Equation of a straight line, The general equation, Angle between two lines, Circle.	8	18
4.	**Statistics** Introduction, Central tendency, Mean, Mean of grouped data, Median, Median for grouped data, Mode for grouped data, Mode, Standard	10	23

	deviation, Standard deviation for grouped data.		
5.	**Determinants and Matrices** Basic concept of determinants and matrices, Addition and subtraction, Product, Inverse up to 3X3 matrix, Solution of simultaneous equations up to three variables, Applications of determinants and matrices.	12	27
	TOTAL	**45**	**100**

List of Tutorials:

Sr. No.	List of Tutorial	Hours
1.	Logarithm-1	4
2.	Logarithm-2	2
3.	Trigonometry-1	2
4.	Trigonometry-2	2
5.	Trigonometry-3	2
6.	Co-ordinate geometry-1	4
7.	Co-ordinate geometry-2	2
8.	Statistics-1	2
9.	Statistics-1	2
10.	Statistics-2	2
11.	Determinants and Matrices-1	2
12.	Determinants and Matrices-2	2
13.	Determinants and Matrices-3	2
	TOTAL	**30**

Text Book:

Title	Author(s)	Publication
Diploma Engineering Mathematics	H. K. Dass	H. K. Dass
Engineering Mathematics - 3rd Edition	Anthony croft & others	Pearson Education Publication

Reference Book:

Title	Author(s)	Publication
Basic Mathematics	G.C. Patel and Ami C. Shah	Atul Prakashan
Advanced Mathematics for Polytechnic	Dr. N. R. Pandya	Macmillan Publication
Applied Mathematics	W. R.Neelkanth	Sapna Publication

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous evaluation consists of performance of tutorial which will be evaluated out of 10 Marks for each tutorial and average of the same will be converted to 75 marks.
- Viva of 25 marks.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

IDSH1110	**MATHEMATICS-1**
CO 1	Apply algebraic concepts to solve engineering-related mathematical problems.
CO 2	Use trigonometric concepts and identities to solve engineering and real-world problems.
CO 3	Apply coordinate geometry concepts to analyze spatial relationships in engineering contexts.
CO 4	Analyze and interpret data sets using statistical methods to support decision-making in engineering applications.
CO 5	Solve engineering-related problems using determinants and matrices, including systems of linear equations.

Mapping of CO with PO

IDSH1110	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	2			1						
CO 2	3	2	1		1						
CO 3	3	3	1	2	1						
CO 4	2	3		3	2					1	
CO 5	3	3	2	2	2						1

Mapping of CO with PSO

IDSH1110	PSO1	PSO2	PSO3
CO 1	1	1	3
CO 2	1	1	3
CO 3	2	2	3
CO 4	2	2	3
CO 5			

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Logarithm	1,2,3,5
2	Trigonometry	2,3,4,5,6
3	Coordinate geometry	2,3,4,5
4	Statistics	1,2,3,4,5
5	Determinants and Matrices	2,3,4,5

P P Savani University
Institute of Diploma Studies

Department of Applied Science & Humanities

Course Code: IDSH1130

Course Name: Physics

Prerequisite Course(s): Concept of Science up to 9th Standard

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- understand the basic principles of physics and apply for the advancement of engineering and technology.
- experimenting the laboratory concepts to apply in their career of engineering.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introductory concepts:** Need of measurement and unit in engineering and science, definition of unit, requirements of standard unit, systems of units-CGS, MKS and SI, fundamental and derived quantities and their units Definition of accuracy, precision and error, estimation of errors -absolute error, relative error and percentage error, rules and identification of significant figures. (Numerical on above topics)	08	18
2.	**Mechanics:** The concept of Force, Newton's 1st law of motion, Newton's 2nd law of motion, Newton's 3rd law of motion, Conservation of momentum, Applications of Conservation of linear momentum, Impulse. (Numerical on above topics)	07	15
3.	**Work, Energy and Power:** Work done by a constant force and a variable force, Kinetic energy, Work-energy theorem, Power, Notion of potential energy, Potential energy of a spring, Conservative forces, Conservation of mechanical energy (kinetic and potential energies), Non-conservative forces. (Numerical on above topics)	07	15

4.	**Mechanical properties of solids:** Deforming force, Restoring force, Elastic and plastic body, Stress and Strain with their types, Elastic limit, Hooke's law, Young's modulus, Bulk modulus, Modulus of rigidity and Relation between them (no derivation), Stress- Strain diagram, Yield point, Ultimate stress, Breaking stress, Factor of safety. (Numerical on above topics)	08	18
5.	**Properties of fluids:** Pascal's law and its applications (hydraulic lift and hydraulic brakes), Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's theorem and its applications, Surface energy and surface tension, angle of contact. (Numerical on above topics)	08	18
6.	**Heat transfer:** Introduction to thermodynamics, Temperature and Heat, Transmission of heat - Conduction, Convection and Radiation, Law of thermal conductivity, Coefficient of thermal conductivity and its S.I. unit, Heat capacity and Specific heat of materials, Celsius, Fahrenheit and Kelvin temperature scales and their conversion formula. (Numerical on above topics)	07	16
	TOTAL	**45**	**100**

List of Practical:

Sr. No.	Name of Practical	Hours
1.	To study about basic unit conversion and dimension analysis.	04
2.	To measure diameter and the dimension of regular body of known mass using Vernier Calipers.	04
3.	To measure the thickness of a sheet and diameter of a wire with the help of Micrometer Screw Gauge.	04
4.	To determine the radius of curvature of a given spherical surface by a spherometer.	04
5.	To verify ohm's law by using ammeter and voltmeter.	02
6.	To determine the coefficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.	04
7.	To determine the value of 'g' using simple pendulum.	04
8.	To study the relationship between the temperature of a hot body and time by plotting a cooling curve.	04
	TOTAL	**30**

Text Book(s):

Title	Author/s	Publication
Physics Part-I and II	Resnick and Haliday	Wiley Eastern Publication
Concept of the Modern Physics	A. Beiser	Tata McGraw-Hill Education
Concept of Physics	H.C. Verma	Bharati Bhawan
Fundamentals of Physics	Gomber and Gogia	Pradeep publications
NCERT Physics part 1 & 2		NCERT

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

Practical:

- Continuous Evaluation consists of Performance of Practical which will be evaluated out of 20 marks for each practical and average of the same will be converted to 10 Marks.
- Internal viva and practical performance consist of 20 Marks.
- Practical performance/quiz/drawing/test of 30 marks during End Semester Exam.
- Viva/Oral performance of 30 marks during End Semester Exam.

Course Outcome(s):

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

IDSH1130	**PHYSICS**
CO 1	Identify physical quantities, different systems of units and make measurements with accuracy by minimizing different types of errors to solve real life relevant problems.
CO 2	Analyze type of motions and apply the knowledge to solve equation of motion and conservation of momentum principle to describe motion of rocket, recoil of gun etc.
CO 3	Define scientific work, energy and power and their units. Derive relationships for work, energy and power and solve related problems.
CO 4	Learn about the concept of elasticity, it's types and applications from engineering perspectives.
CO 5	Describe the properties of fluids, understand the concepts of viscosity and surface tension and their respective applications.

Mapping of CO with PO

IDSH1130	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	2	2	1	1	1	1	1	1	2
CO 2	3	3	2	2	2	1	1	1	1	1	1	2
CO 3	3	3	2	2	1	1	1	1	1	1	1	2
CO 4	3	3	2	2	2	1	2	1	1	1	1	2
CO 5	3	3	2	2	2	1	2	1	1	1	1	2

Mapping of CO with PSO

IDSH1130	PSO1	PSO2	PSO3
CO 1	1	1	3
CO 2	1	1	3
CO 3	1	1	3
CO 4	1	1	3
CO 5	1	1	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
01	Introductory Concepts	3,5
02	Mechanics	1,4
03	Work, Energy and Power	1,3
04	Mechanical properties of solids	2,6
05	Properties of fluids	1,5
06	Heat transfer	3,4

P P Savani University
Institute of Diploma Studies

Department of Civil Engineering

Course Code: IDCV1110
Course Name: Basics of Civil Engineering
Prerequisite Course(s):

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:
To help learners to

- Scope and significance of civil engineering in infrastructural development.
- Surveying and levelling techniques and their importance in construction and land measurements.
- construction materials, their properties, and their selection based on strength, durability, economy, and environmental considerations.
- Highlight advancements in civil engineering, focusing on sustainable practices, smart city planning, and innovative systems for urban development.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction:** Branches of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on the economy of a country.	4	8
2.	**Surveying and Levelling:** Definition of Surveying, Aims and applications, Fundamental principles of surveying, Classification of surveying, Plans and maps, Scales, and Units of measurement, Introduction to liner and angular measurements, Types of compass. Introduction to levelling, Aims and application of levelling, Methods of levelling.	10	22
3.	**Overview of Construction Material:** Scope of construction materials in Building Construction, Selection of materials for different civil engineering structures based on strength, durability, Eco friendly and economy.	9	20

4.	**Building Construction:** Introduction, Classification of buildings (types of buildings), Types of loads acting on buildings, Building Components and their functions and nominal dimensions, Bonds in brickwork.	6	13
5.	**Building Services:** Introduction, Water supply system in a building, drainage, House drainage system, Electrification, Building finishes.	8	19
6.	**Advancements in Civil Engineering:** Smart city and its features, Solid waste management systems, Mass transport systems, Bus Rapid Transit System (BRTS), Metro, Green Building, Features of earthquake resistance structures.	8	18
	TOTAL	**45**	**100**

List of Tutorials:

Sr. No.	List of Tutorial	Hours
1.	Units of Conversion exercise	4
2.	Preparation of sketches on Conventional signs, symbols and abbreviations	2
3.	Assignment of Surveying and levelling	2
4.	Chart preparation of various materials. Collection of rate and sample.	4
5.	Preparation of sketchbook showing various bonds.	4
6.	Preparation sketch of various building components.	4
7.	Assignment based upon house drainage system.	2
8.	Assignment based on green building.	2
9.	Case studies on smart cities.	2
10.	Case study on BRTS and metro.	4
	TOTAL	**30**

Text Book:

Title	Author(s)	Publication
Elements of Civil Engineering	Anurag Kandya	Charotar Publication
Building Construction	Dr.B.C.Punmia	Laxmi Publication

Reference Book:

Title	Author(s)	Publication
Surveying and leveling	N. N. Basak	Tata McGraw Hill Education
Engineering Material	S.C. Rangwala	Charotar Publication
Basic Civil Engineering	M.S.Palanichamy	McGraw Hill

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and the average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous evaluation consists of the performance of the tutorial which will be evaluated out of

10 Marks for each tutorial and the average of the same will be converted to 20 marks.

- Internal viva consists of 20 marks.
- MCQ/ Quiz/ Drawing/ Test consists of 30 marks during End Semester Exam.
- Viva/ Oral Performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

IDCV1110	BASICS OF CIVIL ENGINEERING
CO 1	Understand the scope and applications of Civil Engineering.
CO 2	Describe the methods of levelling and demonstrate its applications in real-world scenarios.
CO 3	Evaluate materials based on strength, durability, eco-friendliness, and economic considerations for different civil engineering structures.
CO 4	Identify the various building components, methods of construction, and services.
CO 5	Describe the Concept of Smart Cities and promote sustainable civil engineering practices.

Mapping of CO with PO

IDCV1110	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2	1			2	2					1
CO 2	3	3	2	1		1	2					
CO 3	3	2	3			3	3		1		1	
CO 4	3	2	1		3	2	3					3
CO 5	3	2	2	3				2		1		

Mapping of CO with PSO

IDCV1110	PSO1	PSO2	PSO3
CO 1	2	2	2
CO 2	2	2	2
CO 3	3	2	2
CO 4	3	2	2
CO 5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction	1,2,3,4
2	Surveying and Levelling	2,3,4,5
3	Overview of Construction Material	2,3,4,5,6
4	Building Construction	1,2,3,5
5	Building Services	2,3,5
6	Advancements in Civil Engineering	1,2,3,5

P P Savani University
Institute of Diploma Studies

Department of Computer Engineering

Course Code: IDCE1110
Course Name: Computer Fundamentals
Prerequisite Course(s): NA

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	04	-	05	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:
To help learners to

- develop understanding of basic concepts that can be used in programming language.
- develop the algorithm as well as flowchart for particular problem.
- enforce logical thinking.
- understand the fundamentals of programming concepts and methodology.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Computers** Evolution of Computers: Generations of Computers, Functional Components of a Computer, Types of Software: System Software, Application Software, Utility Programs, Number Systems: Binary, Octal, Decimal, and Hexadecimal, Introduction to Computer Networks and the Internet	7	15
2.	**Basics of C Programming:** Introduction to Computer Programming, Importance of Programming in Problem Solving, Programming Methodologies (Structured, Object-Oriented, etc.), Steps in Program Development, Overview of Programming Languages, Features of C and Its Importance, Writing, Compiling, and Executing C Programs, Understanding Errors: Syntax Errors, Logical Errors, and Runtime Errors	6	18
3.	**Data Types, Operators, and Tokens:** Data Types and Variables, Primitive Data Types in C, Variables and Constants, Scope and Lifetime of Variables, Operators, Types of Operators in C, Expressions and Operator Precedence, Tokens, Overview of Tokens: Keywords, Identifiers, Constants, Strings, and Operator	10	22
4.	**Control Structures in C:** Decision-Making, Simple If and If-Else Statements, Switch Case and Nested If-Else, Loops, For, While, and Do-While Loops, Using Break and Continue, Nested Loops	8	25

5.	**Arrays and Strings:** Arrays, Introduction to Arrays, Accessing Elements and Array Operations, Applications of Arrays, Strings, Declaring and Initializing Strings, String Functions: strlen(), strcat(), strcpy(), strcmp(), Input and Output with Strings	14	20
	TOTAL	**45**	**100**

List of practical:

Sr. No.	List of Practical	Hours
1.	Identify CPU, RAM, Hard Disk, and other internal components.	2
2.	Compare various types of operating systems.	2
3.	Write and execute a "Hello, World!" program. Write a program to perform addition, subtraction, multiplication, and division of two numbers.	2
4.	Develop a program to calculate the area and perimeter of a rectangle.	4
5.	Declare and initialize variables of different data types.	4
6.	Write a program to evaluate a complex mathematical expression using arithmetic operators.	4
7.	Demonstrate the use of relational and logical operators in a program.	4
8.	Write a program to determine whether a number is positive, negative, or zero.	6
9.	Develop a program to calculate grade based on marks using `if-else` or `switch` statements.	6
10.	Write a program to display the multiplication table of a given number using a loop.	6
11.	Calculate the factorial of a number using a `for` loop.	4
12.	Write a program to generate pyramid patterns using nested loops.	4
13.	Develop a program to check whether a number is prime using nested control structures.	4
14.	Write a program to input and display elements of an array.	2
15.	Implement a program to search for a specific element in an array.	2
16.	Write a program to reverse a given string without using inbuilt function.	2
17.	Develop a program to count the number of vowels, consonants, and digits in a string.	2
	TOTAL	**60**

Text Book:

Title	Author(s)	Publication
Programming in ANSI C	E. Balagurusamy	McGraw Hill Education
Fundamentals of Computers	V. Rajaraman	PHI Learning Pvt. Ltd.

Reference Book:

Title	Author(s)	Publication
Computer Fundamentals	N.M. Desai	University Granth Nirman Board
Microsoft Office Guide	Hiren Desai	Parshwa Publication

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/ Oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

IDCE1110	**COMPUTER FUNDAMENTALS**
CO 1	Understand computer architecture, software types, number systems, and basics of networks.
CO 2	Use MS Office tools for document creation, data management, and multimedia presentations.
CO 3	Develop and debug basic C programs using programming methodologies.
CO 4	Implement solutions using data types, operators, and control structures in C programming.
CO 5	Solve problems with arrays and strings, including data manipulation and algorithm implementation.

Mapping of CO with PO

IDCE1110	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	1	1							2
CO 2	2	2	3	1	3				1	2	1	2
CO 3	3	3	3	2	3				1	1	1	3
CO 4	3	3	3	2	3				1	1	1	3
CO 5	3	3	3	2	3				1	1	1	3

Mapping of CO with PSO

IDCE1110	PSO1	PSO2	PSO3
CO 1	2	1	3
CO 2	2	2	3
CO 3	3	3	3
CO 4	3	3	3
CO 5	3	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to Computers	1,2,3,5
2	Essentials of MS Office	2,3,4,5
3	Basics of C Programming	2,3,4,5,6
4	Data Types, Operators, and Tokens:	2,3,5
5	Control Statements in C	2,3,5
6	Arrays and Strings	1,2,3,5

P P Savani University
Institute of Diploma Studies

Centre for Language Studies

Course Code: CFLS2110
Course Name: Elementary communicative English-I
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	-	03	100	00	-	-	-	-	100

Objective(s) of the Course:
To help learners to

- Recall basic listening skills and demonstrate understanding of simple spoken English in various contexts. Recognize and comprehend basic reading materials by identifying main ideas, key details, and vocabulary.
- Interpret and explain the meaning of simple spoken English in everyday situations. Comprehend and summarize information from simple texts, demonstrating understanding of vocabulary and basic grammar structures.
- Utilize acquired vocabulary and expressions to communicate effectively in basic conversations and written interactions. Apply basic grammar structures and vocabulary to produce short written texts with correct grammar and sentence structure.
- Analyze and evaluate spoken and written texts to identify main ideas, supporting details, and specific information. Analyze and identify grammatical structures and vocabulary usage in written and spoken English.
- Evaluate one's own speaking skills by assessing fluency, accuracy, and coherence in basic conversations. Assess and critique written texts for clarity, grammar usage, and coherence.
- Generate short written texts, such as emails, postcards, and descriptions, using correct grammar, vocabulary, and sentence structure.
- Create and engage in basic conversations using appropriate grammar structures and vocabulary to express ideas accurately.

Course Content:

S.No.	**Content**	Hours	Weightage in %
	Section 1		
1.	**Listening**	11	25

	1.1	Listening to short dialogues and conversations to understand greetings, introductions, and basic information. Simple instructions and following them. Listening to short descriptions and narratives to grasp main ideas and key details. Recorded conversations to understand everyday situations and respond appropriately.		
Section 2				
2.	**Reading and Language**		12	25
	2.1	Reading short articles, dialogues, and narratives to understand the main ideas, supporting details, and vocabulary. Identifying and understanding basic grammatical structures and sentence patterns. Using context clues to comprehend unfamiliar words and phrases. Reading and understanding simple instructions, signs, and labels		
Section 3				
3.	**Speaking Skills, Non-Verbal Aspects and Corporate Grooming and Etiquettes**		11	25
	3.1	Engaging in basic conversations on topics like personal information, daily routines, and hobbies. Role-playing various situations, such as ordering food in a restaurant or asking for directions. Describing people, places, and objects using basic vocabulary and sentence structures. Participating in pair or group discussions on familiar topics		
Section 4				
4.	**Writing**		11	25
	4.1	Writing short paragraphs and sentences to describe people, places, and daily routines. Composing simple emails, postcards, and messages using appropriate language and structure. Practicing basic sentence formation, grammar usage, and punctuation. Developing writing fluency by expressing personal opinions and ideas on various topics.		

Text Books:

	Title	**Author/s**	**Publication**
1	New Cutting Edge Elementary/ Intermediate Students' Book	Sarah Cunningham Longman and Peter Moor	Pearson Longman

Online References:

=>https://www.academia.edu/34869668/New_Cutting_Edge_Elementary_Workbook_ With_Key

Course Evaluation:

Theory:

- Continuous Evaluation consists of four tests (LSRW), each of 25 marks and 1hour of duration.

Course Outcome(s):

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

CFLS2110	Elementary Communicative English I
CO1	Demonstrate basic listening and reading comprehension skills by accurately recalling, summarizing, and understanding key ideas, details, and vocabulary from spoken and written English.
CO2	Apply acquired vocabulary and grammatical structures to effectively engage in basic spoken conversations and produce written texts using correct sentence formation and coherence.
CO3	Analyze and critique spoken and written texts to identify main ideas, supporting details, and specific information accurately, and evaluate grammar and vocabulary usage.
CO4	Create coherent and grammatically correct written texts and spoken conversations in response to familiar topics, demonstrating creativity, accuracy, and fluency.

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1. Remember	2. Understand	3. Apply
4. Analyze	5. Evaluate	6. Create

Module No	Content	RBT Level
1	Listening	1, 2, 3, 4, 5, 6
2	Reading and Language	1, 2, 3, 4, 5, 6
3	Speaking Skills, Non-Verbal Aspects	1, 2, 3, 4, 5, 6
4	Writing	1, 2, 3, 4, 5, 6

P P Savani University
Institute of Diploma Studies

Department of Applied Science & Humanities

Course Code: IDSH1120
Course Name: Mathematics-II
Prerequisite Course(s): Algebra, Geometry, Trigonometry till 9th Standard level

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	100	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:
To help learners to
- This course is designed to give a comprehensive coverage at an introductory level to the subject of Functions and Limits, Differentiation, Integration and First Order Differential Equations.
- Recognize importance of differentiation and integration for solving engineering problems.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Complex Number** Introduction, Mathematical Operations, Polar form, De Movire's Theorem.	6	13
2.	**Functions and Limits** Introduction of Function, Types of function, Classification of function, Limit of a function, Properties of limit, Standard limits, limit of trigonometric functions.	8	18
3.	**Differentiation** Introduction of Differentiation, Derivative of standard functions, Working rules, Differentiation of composite function, Differentiation of parametric functions, Differentiation of implicit function, Derivative using logarithms, Successive differentiation, Application of Derivative (Maxima, Minima, Velocity & Acceleration).	12	27
4.	**Integration** Introduction of Integration, Integration of standard functions, Integration by substitution, Integration by parts, Integration	10	22

	using partial fraction.		
5.	**Mensuration** Basic concept of Mensuration, Area of Triangle, Square, Rectangle, Trapezium, Parallelogram, Rhombus and Circle surface, Volume of Cuboids, Cone, Cylinder and Sphere.	9	20
	TOTAL	**45**	**100**

List of Tutorials:

Sr. No.	List of Tutorial	Hours
1.	Complex Number-1	2
2.	Complex Number-2	2
3.	Complex Number-3	2
4.	Functions and Limits-1	4
5.	Functions and Limits-2	2
6.	Differentiation-1	2
7.	Differentiation-2	2
8.	Differentiation-3	2
9.	Integration-1	2
10.	Integration-2	2
11.	Integration-3	2
12.	Mensuration-1	4
13.	Mensuration-2	2
	TOTAL	**30**

Text Book:

Title	Author(s)	Publication
Advanced Mathematics for Polytechnic	Dr. N.R. Pandya	Macmillan Publication
Engineering Mathematics - 3rd Edition	Anthony croft and others	Pearson Education Publication

Reference Book:

Title	Author(s)	Publication
Applied Mathematics for Polytechnics - 10th Edition	H. K. Dass	H. K. Dass
Applied Mathematics	W. R.Neelkanth	Sapna Publication
Polytechnic Mathematics	Deshpande S P	Pune Vidyarthi Gruh Prakashan,1984
Polytechnic Mathematics	Prakash D S	S Chand,1985

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.

- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous evaluation consists of performance of tutorial which will be evaluated out of 10 Marksfor each tutorial and average of the same will be converted to 75 marks.
- Viva of 25 marks.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

IDSH1120	**MATHEMATICS-II**
CO 1	Apply the properties and algebraic operations of complex numbers, including polar form and De Moivre's Theorem, to solve engineering problems.
CO 2	Analyze functions and evaluate limits, including standard and trigonometric limits, to model engineering problems.
CO 3	Apply differentiation techniques to determine rates of change and solve engineering problems involving maxima, minima, velocity, and acceleration.
CO 4	Use integration techniques to compute areas, volumes, and solve engineering problems involving physical quantities.
CO 5	Compute areas, perimeters, surface areas, and volumes of standard geometrical shapes to solve real-world engineering problems in mensuration.

Mapping of CO with PO

IDSH1120	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	2		1	1						
CO 2	3	3		2	1						
CO 3	3	3	2	2	1						
CO 4	3	3	2	2	1						
CO 5	3	2	2	1	1		1				

Mapping of CO with PSO

IDSH1120	PSO1	PSO2	PSO3
CO 1	1	1	3
CO 2	1	1	3
CO 3	2	2	3
CO 4	2	2	3
CO 5			

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Complex Number	1,2,3,4,6
2	Function and Limits	1,2,3,4
3	Differentiation	2,3,5
4	Integration	2,3,5
5	Mensuration	1,2,3,5

P P Savani University
Institute of Diploma Studies

Department of Applied Science & Humanities

Course Code: IDSH1140
Course Name: Chemistry
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- The student will understand the interdisciplinary nature of chemistry and to integrate knowledge of mathematics, physics and other disciplines to a wide variety of chemical problems.
- The student will understand the importance of the Periodic Table of the Elements, how it came to be, and its role in organizing chemical information.
- The student will acquire a foundation of chemistry of sufficient breadth and depth.

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Atomic Mass and Molecular Structure** Atom, Fundamental particles of Atom their Mass, Charge and Location. Atomic number and Mass number, Octet Rule, Isotopes and Isobars with suitable examples, Formation of Cation and Anion by electronic concept of oxidation and reduction, Molecule, Molecular Formula, Molecular Mass, Mole, Avogadro Number, Avogadro's Hypothesis – Relationship between Molecular Mass and Vapour Density, Simple calculations.	10	20
2.	**Chemical Bonding** Chemical Bond, Valence, Valence Electrons, Bonding and Non Bonding Electrons, Lewis Symbols. Condition for Formation of Ionic Bond, Factors Governing Formation of Ionic Bond, Metallic Bond, Covalent Bond and Co-ordinate Covalent Bond: Hydrogen Bonding.	06	20
3.	**Acids and Bases** Theories of Acids and Bases, Arrhenius Theory, Lowry – Bronsted Theory, Lewis Theory, pH and pOH, Indicator, Buffer solution, Types of buffer solution with examples, Application of pH in Industries, Numericals	06	10

1.	**Solutions and Colloids** Methods of expressing concentration of a solution Molarity, Molality, Normality, Mole fraction and Percentage Mass – Simple problems. True solution and Colloidal solution, Definition, Differences, Types of colloids – Lyophilic and Lyophobic colloids. Industrial applications of colloids.	08	20
2.	**Electrochemistry** Electrolyte, Strong and Weak electrolytes, Electrolysis, Industrial application of Electrolysis, Electroplating, Preparation of surface, Process Factors affecting the stability of the coating, Applications of Electro plating.	08	15
3.	**Electrochemical-Cell** Electrochemical Cell definition, Representation of a Cell, Single Electrode Potential definition, Galvanic Cell, Formation of Daniel Cell, Electrochemical Series, Definition and Significance, Electrolytic Concentration Cell definition and Formation.	07	15
	TOTAL	**45**	**30**

List of Practical

Sr No	Name of Practical/Tutorial	Hours
1.	Using a chemical balance.	04
2.	Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Quantitative analysis etc.	04
3.	Demonstration: Preparation of solutions of different concentrations	04
4.	Preparation of standard solution of Oxalic acid and Sodium Carbonate.	04
5.	Determination of strength of a given solution of Sodium Hydroxide by titrating it against standard solution of Oxalic acid.	04
6.	Determination of strength of a given solution of Hydrochloric acid by titrating it against standard Sodium Carbonate solution.	04
7.	Determination of temporary and permanent hardness in water sample using EDTA as standard solution.	04
8.	Determination of pH	02
	TOTAL	**30**

Text Book(s):

Title	Author/s	Publication
Text Book of Engineering Chemistry	Chawla S.	Dhanpat Rai & Co. Pvt. Ltd., Delhi, 2003.
Engineering Chemistry	Sharma B. K.	Krishna Prakashan Media (P) Ltd, Meerut.,2001

Reference Book(s):

Title	Author/s	Publication
Concise Inorganic Chemistry	J.D. Lee	Wiley India
Textbook of Engineering Chemistry (4th Edition)	R. Gopalan, D. Venkappaya, S. Nagarajan	Vikas Publishing house Ltd.

Web Material Link(s):

https://onlinecourses.nptel.ac.in/noc21_cy45/preview

https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-cy03/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/ Oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

IDSH1140	Chemistry
CO1	Explain basic atomic structure, chemical bonding, and periodic trends.
CO2	Apply principles of acids, bases, solutions, and electrochemistry to solve problems.
CO3	Perform chemistry laboratory experiments safely using standard techniques.
CO4	Analyze electrochemical processes and industrial applications of chemistry.
CO 5	Practice professional ethics, teamwork, and safety in laboratory and industrial work.

Mapping of CO with PO

IDSH1140	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1									1
CO 2	2	2	1		1						1
CO 3	1	1		2	2	1	2	2	1		1
CO 4	2	2	2	2	1	2	1		1		1
CO 5							2	2	2	1	1

Mapping of CO with PSO

IDSH1140	PSO1	PSO2	PSO3
CO 1	2	1	

CO 2	2	2	1
CO 3	3	2	1
CO 4	3	2	1
CO 5	3	3	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Atomic Mass and Molecular Structure	1, 2, 5
2	Chemical Bonding	1, 2, 3
3	Acids and Bases	2, 3, 4
4	Solutions and Colloids	2, 3, 4,5
5	Electrochemistry	1, 2, 5
6	Electrochemical-Cell	1, 2, 5

P P Savani University
Institute of Diploma Studies

Department of Mechanical Engineering

Course Code: IDME1110
Course Name: Basics of Mechanical Engineering
Prerequisite Course(s): Zeal to learn the course

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:

To help learners to

- Use relevant mechanical power and hand tools in real life applications.
- Recognize the various properties of gases, steams and their applications in an engineering industry.
- Explore the working principles of different prime movers like IC Engine, Boilers
- Select relevant power transmission mode in simple engineering situations.
- Identify and comprehend various hydro-pneumatic devices/equipment, brakes, clutch and couplings.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction and Basic Mechanical Applications** Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Prime movers and its types. Basic Mechanical Components and its applications like bolts, nuts, washers, bearings, valves, bushes, springs, levers, rivets, keys, shafts, axles.	6	15
2.	**Properties of Gases** Difference between vapour and gas, perfect gas, gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant and universal gas constant, N.T.P, S.T.P	6	15
3.	**Steam Generators** Introduction, I.B.R, Classification of boilers, Cohran and Babcock and Wilcox boiler, only Functioning of different mountings (Only Purposes) and accessories.	6	10
4.	**Pumps** Types, Construction and working of Reciprocating, Centrifugal pumps and Rotary pumps	4	10

5.	**Internal Combustion Engines** Introduction, Difference between I.C. Engine and E.C. Engine, Classification of I.C. Engine, Main Components of Engine and their functions, working four- stroke cycle Petrol/Diesel engines, Comparison between Petrol cycle and diesel cycle. Basic concept of CNG and EV. (No Numericals)	8	15
6.	**Transmission of Motion and Power** Shaft and axle, Various types of Belt drive, Chain drive, Friction drive, Gear drive.	8	15
7.	**Couplings, Clutches and Brakes** Concept and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band, and Disc).	7	20
	TOTAL	**45**	**100**

List of Tutorials:

Sr. No.	List of Tutorial	Hours
1.	Demonstration of various types of boilers.	4
2.	Demonstration of different boiler mountings and accessories.	4
3.	Demonstration of four stoke petrol/diesel engines.	2
4.	Demonstration of centrifugal, reciprocating, and rotary pump.	4
5.	Demonstration of various belt drives and chain drive.	4
6.	Demonstration of various gear drives.	2
7.	Demonstration of various couplings.	2
8.	Demonstration of various brakes.	2
9.	Demonstration of various clutches.	2
	TOTAL	**30**

Text Book:

Title	Author(s)	Publication
Elements of Mechanical Engineering	N M Bhatt and J R Mehta	Mahajan Publishing House
Elements of Mechanical Engineering	Sadhu Singh	S. Chand Publication

Reference Book:

Title	Author(s)	Publication
Elements of Mechanical Engineering	P. S. Desai and S. B. Soni	Atul Prakashan
Basic Mechanical Engineering	Pravin Kumar	Pearson Education

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/ Oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

IDME1110	**BASICS OF MECHANICAL ENGINEERING**
CO 1	Use relevant mechanical power and hand tools in real life applications.
CO 2	Recognize the various properties of gases, steams and their applications in an engineering industry.
CO 3	Explore the working principles of different prime movers like IC Engine, Boilers
CO 4	Select relevant power transmission mode in simple engineering situation.
CO 5	Identify and comprehend various hydro-pneumatic devices/equipment, brakes, clutch and couplings.

Mapping of CO with PO

IDME1110	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	1	1	1					1	1	2
CO 2	1	2	1	2	1				1	1	1	2
CO 3	1	2	1	2	1					1	1	1
CO 4	1	1	1	2	3				1	1	1	1
CO 5	1	2	1	3	3					1	1	2

Mapping of CO with PSO

IDME1110	PSO1	PSO2	PSO3
CO 1	1	2	3
CO 2	1	2	3
CO 3	1	1	2
CO 4	1	3	1
CO 5	2	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction and Basic Mechanical Applications	1,2,3
2	Properties of Gases	1,2,3,4
3	Steam Generators	1,2,3
4	Pumps	1,2,3
5	Internal Combustion Engines	1,2,3,4
6	Transmission of Motion and Power	1,2,3,4
7	Couplings, Clutches and Brakes	1,2,3,4

P P Savani University
Institute of Diploma Studies

Department of Information Technology

Course Code: IDIT1110
Course Name: Python Programming
Prerequisite Course(s):

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:

To help learners to

- To understand basic of python programming.
- To implement various control structures on different data types and analyze the use of different data structures in Python.
- Develop logic building and problem-solving skills.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Python** History, Features and application of python, installing Python, Basic structure of python program, Input and Output Functions in Python, Variable, Identifiers, Basic Operators, Expressions and Types of Data Int, Float, Complex, String, List, Tuple, Set, Dictionary and its Methods, Type Conversions, Comments, Input Processing and output.	06	14
2.	**Control Flow Structures in Python** Conditional Blocks Using if, if_Else and Else If, Simple for Loops in Python, For Loop Using Ranges, String, List and Dictionaries Use of While Loops in Python, Loop Manipulation Using Pass, Continue, Break and Else	07	18
3.	**Array and Strings** Array, Advantages of array, Creating an array, Importing the array module, Indexing and slicing on arrays, Processing the arrays, Types of arrays. Introduction to String, Access String elements using index	08	18

	operator, String functions: Basic functions: len, max, min, Testing functions: isalnum, isalpha, isdigit, isidentifier, islower, isupper, Searching functions: endswith, startswith, find, rfind, count, Manipulation functions: capitalize, lower, upper, title, swapcase, replace, lstrip, rstrip, strip		
4.	**Lists, Tuples, Sets, and Dictionaries** Dictionaries, Accessing Values in Dictionaries, Working with Dictionaries, Properties, Functions and Methods. Sets, Accessing Values in Set, Working with Set Properties, Functions and Methods, Tuple, Accessing Tuples, Operations, Working, Functions and Methods. List, Accessing List, Operations, Working With Lists, Function and methods, two-dimensional lists.	08	15
5.	**Functions, Modules and Packages** Introduction to Functions, defining a Function, Calling a Function, Types of Functions, Function Arguments, Anonymous Functions, Global and Local Variables, Importing Module, Math Module, Random Module, Introduction to Packages: Numpy, Pandas, Matplotlib.	08	15
6.	**File Handling** Introduction to Text files, File Handling functions: Basic functions: open, close, Reading file: read, readline, readlines, Writing file: write, append, writelines	08	20
	TOTAL	**45**	**100**

List of Practical:

Sr. No.	List of Practical	Hours
1.	Introduction to Python (Introduction to IDLE, different data types, Input Output in Python, Operators, Operator precedence).	04
2.	Implementation of Dictionaries, Sets, Tuples and Lists and its various methods in Python.	06
3.	Working with decision structures in Python	04
4.	Working with array in Python	04
5.	Manipulation of Strings.	02
6.	Working with functions in Python.	04
7.	Working with modules and packages in Python.	04
8.	Implementation of file handling in Python.	02
	TOTAL	**30**

Text Book:

Title	Author(s)	Publication
Python approach Programming: A modular	Sheetal Taneja, Naveen Kumar	Pearson

Reference Book:

Title	Author(s)	Publication
Think Python: How to Think Like a Computer Scientist	Allen Downey	Green Tea Press
Python Cookbook	David Ascher, Alex Martelli Oreilly	O Reilly Media

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/ Oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

IDIT1110	PYTHON PROGRAMMING
CO 1	Interpret the fundamental Python syntax and semantics and control flow statements.
CO 2	Determine the methods for creating and manipulating Python programs by utilizing data structures like lists, dictionaries, tuples, and sets.
CO 3	Apply a modular programming approach to solve the given problems using user-defined functions.
CO 4	Perform string manipulation and file handling operations.
CO 5	Utilize Python modules, packages, and libraries (Math, Random, NumPy, Pandas, and Matplotlib to develop efficient, reusable, and data-oriented Python applications.

Mapping of CO with PO

IDIT1110	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	2	1		2				1	1	
CO 2	3	3	2	1	3				1	1	
CO 3	3	3	2	2	3				1	1	1
CO 4	3	3	2	2	3				1	2	
CO 5	3	3	2	2	3				1	2	1

Mapping of CO with PSO

IDIT1110	PSO1	PSO2	PSO3
CO 1	3	2	1
CO 2	3	3	1
CO 3	3	3	2
CO 4	3	3	2
CO 5	3	3	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Python	1,2,4
2	Control Flow Structures in Python	1,2,3
3	Array and Strings	1,2,3
4	Lists, Tuples, Sets, and Dictionaries	2,3,4
5	Functions, Modules, and Packages	2,3,4
6	File Handling	3,4,5

P P Savani University
Institute of Diploma Studies

Department of Mechanical Engineering

Course Code: IDME1120
Course Name: Workshop Fundamentals
Prerequisite Course(s):--

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
00	02	-	02	00	00	100	00	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:

To help learners to

- Introduce essential tools and machines used in workshops, emphasizing their functions, handling, and maintenance.
- Provide practical training in machining, fitting, carpentry, and other foundational manufacturing techniques.
- Instill the importance of workshop safety protocols to prevent accidents and ensure a secure working environment.
- Bridge the gap between classroom learning and real-world applications by implementing engineering principles in practical tasks.

Course Content:

Module No.	Content	Weightage in %
1.	**Introduction to Workshop Practice** Workshop Layout, Overview of workshop safety rules and regulations, Importance of various sections/shops in workshop, Understanding tools, materials, and machinery.	7
2.	**Carpentry, Fitting and Bench work** Basic wood types and their properties, Tools: saws, chisels, planes, hammer, and clamps, Preparation of Job as per Drawing including Marking and other Performing Operations Tools: files, hammers, punches, and measuring instruments, Techniques: filing, drilling, tapping, and sawing.	33
3.	**Introduction to Machine Tools and Sheet Metal Work** Introduction and Demonstration of various Machine Tools like Lathe, Drilling, Grinding, Hack Saw Cutting etc. Introduction to sheet metal materials and their uses, Tools: snips, mallets, and stakes, Techniques: bending, cutting, joining, and soldering	26
4.	**Welding and Plumbing** Types of welding: gas, arc, and MIG/TIG welding, Tools and safety equipment for welding, Welding techniques and applications. Introduction and Demonstration of Plumbing Shop.	7

5.	**Forging and Smithy** Tools: hammers, anvils, and tongs, Techniques: heating, bending, and shaping metals Applications of forging in engineering.	13
6.	**Measurement and Metrology** Introduction to measuring tools: Vernier calipers, micrometers, and gauges, Precision and accuracy in measurements.	7
7.	**Electrical and Electronic Skill** Use of Multimeter, Soldering of electrical circuits having discrete components (R, L, C & diode) and ICs on PCB, connections on Breadboard	7
	TOTAL	**100**

List of Practical:

Sr. No.	List of Practical	Hours
1.	Introduction and Demonstration of Safety Norms and various shops.	02
2.	To Perform a Job of Fitting Shop.	08
3.	To Perform a Job of Carpentry Shop.	04
4.	To Perform a Job of Black Smithy shop.	04
5.	To Perform a Job of Sheet metal Shop.	08
6.	To Perform a Job of Plumbing Shop	02
7.	Introduction to Machine Tool	02
	TOTAL	**30**

Text Book:

Title	Author(s)	Publication
Elements of Workshop Technology	S K Hajra Choudhury	Media Promoters & Publishers
A text book in Electrical Technology	B L Theraja	S Chand and Co

Reference Book:

Title	Author(s)	Publication
A Textbook of Workshop Technology	Deepak Dhounchak and Lalit Kumar Biban	White Falcon Publishing; 1st edition
Elements Of Workshop Technology Vol 2 Machine	S. K. Hajra Choudhury and Nirjhar Roy	Media Promoter and Publishers Pvt. Ltd.
Basic Electronics: A text lab manual	P.B. Zbar, A.P. Malvino, M.A. Miller	Mc-Graw Hill.

Course Evaluation:

Practical:

- Continuous Evaluation consists of Performance of Practical/Tutorial which will be evaluated outof 10 for each practical/Tutorial and average of the same will be converted to 30 Marks.

- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator
- Internal Viva consists of 30 Marks.
- Practical performance/quiz/drawing/test will consist of 30 Marks.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

IDME1120	**WORKSHOP FUNDAMENTALS**
CO 1	Demonstrate proficiency in basic workshop operations such as carpentry, fitting, welding, and machining.
CO 2	Understand the proper use and maintenance of hand tools, power tools, and workshop machinery, and sheet metal work
CO 3	Adopt essential safety protocols to ensure a hazard-free workshop environment.
CO 4	Identify and utilize various materials effectively, understanding their properties and applications in engineering projects.
CO 5	Use precision measuring instruments and electrical/electronic tools such as Vernier calipers, micrometers, multimeters, soldering equipment, and breadboards to carry out accurate measurements and basic circuit assembly.

Mapping of CO with PO

IDME1120	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2			1	2				2		1
CO 2	2				3			3	3		1
CO 3	2			1	2				1		1
CO 4	2								3		2
CO 5	2		1	1	2				1		1

Mapping of CO with PSO

IDME1120	PSO1	PSO2	PSO3
CO 1	2	3	2
CO 2		1	
CO 3	2	3	2
CO 4	3	3	3
CO 5	3	2	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to Workshop Practice	1,2
2	Carpentry, Fitting, and Benchwork	1,2,3
3	Introduction to Machine Tools and Sheet Metal Work	1,2,3,4
4	Welding and Plumbing	1,2,3,4
5	Forging and Smithy	1,2,4

6	Measurement and Metrology	1,2,3,4,5
7	Electrical and Electronic Skill	1,2,3

P P Savani University
Centre for Language Studies

Course Code: CFLS2120
Course Name: Elementary Communicative English-II
Prerequisite Course(s): -- CFL2110 : Elementary communicative English-I

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	-	-	02	100	00	-	-	-	-	100

Objective(s) of the Course:
To help learners to:

- Recall basic listening skills and demonstrate understanding of simple spoken English in various contexts. Recognize and comprehend basic reading materials by identifying main ideas, key details, and vocabulary.
- Interpret and explain the meaning of simple spoken English in everyday situations. Comprehend and summarize information from simple texts, demonstrating understanding of vocabulary and basic grammar structures.
- Utilize acquired vocabulary and expressions to communicate effectively in basic conversations and written interactions. Apply basic grammar structures and vocabulary to produce short written texts with correct grammar and sentence structure.
- Analyze and evaluate spoken and written texts to identify main ideas, supporting details, and specific information. Analyze and identify grammatical structures and vocabulary usage in written and spoken English.
- Evaluate one's own speaking skills by assessing fluency, accuracy, and coherence in basic conversations. Assess and critique written texts for clarity, grammar usage, and coherence.
- Generate short written texts, such as emails, postcards, and descriptions, using correct grammar, vocabulary, and sentence structure.
- Create and engage in basic conversations using appropriate grammar structures and vocabulary to express ideas accurately.

Course Content:

S.No.	**Content**	Hours	Weightage in %
	Section 1		
1.	**Listening**	8	25

	1.1	Listening to short dialogues and conversations to understand greetings, introductions, and basic information. Simple instructions and following them. Listening to short descriptions and narratives to grasp main ideas and key details. Recorded conversations to understand everyday situations and respond appropriately.		
Section 2				
2.	**Reading and Language**		8	25
	2.1	Reading short articles, dialogues, and narratives to understand the main ideas, supporting details, and vocabulary. Identifying and understanding basic grammatical structures and sentence patterns. Using context clues to comprehend unfamiliar words and phrases. Reading and understanding simple instructions, signs, and labels		
Section 3				
3.	**Speaking Skills, Non-Verbal Aspects and Corporate Grooming and Etiquettes**		7	25
	3.1	Engaging in basic conversations on topics like personal information, daily routines, and hobbies. Role-playing various situations, such as ordering food in a restaurant or asking for directions. Describing people, places, and objects using basic vocabulary and sentence structures. Participating in pair or group discussions on familiar topics		
Section 4				
4.	**Writing**		7	25
	4.1	Writing short paragraphs and sentences to describe people, places, and daily routines. Composing simple emails, postcards, and messages using appropriate language and structure. Practicing basic sentence formation, grammar usage, and punctuation. Developing writing fluency by expressing personal opinions and ideas on various topics.		

Text Book (s):

	Title	**Author/s**	**Publication**
1	New Cutting Edge Intermediate Students' Book	Sarah Cunningham Longman	Pearson Longman
2	New Cutting Edge Upper Intermediate Students' Book	and Peter Moor	Pearson Longman

Reference Book (s):

Online References:

=>https://www.academia.edu/34869668/New_Cutting_Edge_ Intermediate _Workbook_

=>https://www.academia.edu/34869668/New_Cutting_Edge_Upper Intermediate _Workbook_With_Key

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 25 marks. Test one can be based on Reading and Writing Skills whereas Test Two can be based on Listening and Reading Skills.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

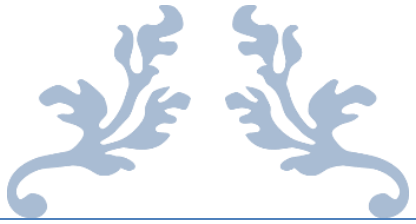
After completion of the course, the student will be able to

CFLS2120	**Elementary Communicative English II**
CO1	Demonstrate basic listening and reading comprehension skills by accurately recalling, summarizing, and understanding key ideas, details, and vocabulary from spoken and written English.
CO2	Apply acquired vocabulary, expressions, and grammatical structures to effectively engage in basic conversations and produce short written texts with correct sentence structure.
CO3	Analyze and evaluate spoken and written texts to identify main ideas, supporting details, and specific information, and critique grammar, vocabulary, and sentence formation.
CO4	Create grammatically correct, coherent, and fluent written texts and spoken conversations using appropriate vocabulary and sentence structures to express ideas accurately and creatively.

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1. Remember	2. Understand	3. Apply
4. Analyze	5. Evaluate	6. Create

Module No	**Content**	**RBT Level**
1	Listening	1, 2, 3, 4, 5, 6
2	Reading and Language	1, 2, 3, 4, 5, 6
3	Speaking Skills, Non-Verbal Aspects	1, 2, 3, 4, 5,6
4	Writing	1, 2, 3, 4, 5, 6



SECOND YEAR

INSTITUTE OF DIPLOMA STUDIES

P P SAVANI UNIVERSITY

INSTITUTE OF DIPLOMA STUDIES

TEACHING & EXAMINATION SCHEME FOR DIPLOMA CHEMICAL ENGINEERING PROGRAMME AY:2025-26

Sem	Course Code	Course Title	Offered By	Teaching Scheme					Examination Scheme						
				Contact Hours				Credit	Theory		Practical		Tutorial		Total
				Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
3	IDCH2210	Fluid Flow Operation	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2220	Industrial Stoichiometry	CH	2	0	2	4	4	40	60	00	00	40	60	200
	IDCH2230	Chemical Process Technology	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2240	Industrial Safety & Environmental Engineering	CH	2	0	0	2	2	40	60	00	00	00	00	100
	IDCH2250	Basic of Chemical Thermodynamics	CH	3	0	2	5	5	40	60	00	00	40	60	200
	IDME2010	Basic Engineering Drawing	ME	3	4	0	7	4	40	60	40	100	00	00	200
						Total	**31**	**24**							**1100**
4	IDCH2260	Fundamental of Mass Transfer	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2270	Instrumentation	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2280	Plant Utilities & Energy Engineering	CH	2	0	0	2	2	40	60	00	00	00	00	100
	IDCH2290	Mechanical Operation	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2300	Process Heat Transfer	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2310	Fertilizer Technology	CH	2	0	2	4	4	40	60	00	00	40	60	200
						Total	**30**	**22**							**1100**

P P Savani University
Institute of Diploma Studies
Department of Chemical Engineering

Course Code: IDCH2210
Course Name: Fluid Flow Operation
Prerequisite Course(s): --

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	4	0	4	40	60	40	60	0	0	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- The student will understand the type of fluids
- The student will understand the flow of fluids

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Introduction to fluids** Properties of fluids- Density and viscosity (absolute and kinematic), Vapour pressure and surface tension, cohesion and adhesion, Principle of Hydrostatic Equilibrium Manometers- Types of Manometers (U, Inclined, Differential), Equations, Uses Types of Fluids- Ideal and Actual fluids, Compressible and Incompressible Fluids, Newtonian and Non-Newtonian fluids including time dependent and time independent fluids.	05	15
2.	**Flow of Fluids (Incompressible)** Fluid flow, stream line flow, steady and unsteady state flow, uniform and non uniform flow, rotational and irrotational flow. Equation of continuity, Calculation of mass flow rate, volumetric flow rate, average velocity and mass velocity. Bernoulli's Theorem by Euler's equation and its application, Bernoulli's equation for ideal fluid, actual fluid and with pump work done. Correction in Bernoulli's equation.	05	20

3.	**Measurement of flow** Measurement of fluid flow with the help of flow meters-Venturimeter: Construction Principle, Working, Coefficient of discharge, Calibration, Derivation, Orifice meter: Construction, principle, Working, Coefficient of discharge, Calibration, Derivation for calculating the flow rates, Rota meter: construction, principle working and Calibration, Pitot tube: Construction, Principle and Working. Nozzle meter: construction, principal working, derivation for calculating flowrates.	05	15
4.	**Pipe, fitting and valves** Standard sizes of pipes, wall thickness, Schedule number, BWG Number Joints and fittings, Gate valve, Globe valve, Ball valve, Needle valve, Non return value, Butterfly valve, Diaphragm valve	05	10
5.	**Transportation of Fluids** Pumps-Centrifugal Pump: Parts of centrifugal pump, working of Centrifugal pump, Performance of centrifugal pump (Characteristics of centrifugal pump), Characteristics curves, priming, Developed Head, Cavitation, Net Positive	05	25
6.	**Pump types** Suction Head (NPSH) Priming. Positive displacement reciprocating pumps based on pressure component and based on action of piston/plunger, their construction & working, Gear pump, its construction and working, Diaphragm pump, its utility, construction and working, Screw pump, characteristic curve of pump.	05	15
	Total	**30**	**100**

List of Practical

Sr No	Name of Practical/Tutorial	Hours
1	Determination of coefficient of discharge of venture meter and plot a calibration curve	02
2	Determination of coefficient of discharge of orifice meter & plot a calibration curve	08
3	To calibrate a rotameter for different liquids and plot the calibration curve.	08
4	To perform experiment on Bernoulli's Theorem and prove that the summation of pressure head, kinetic head and potential head is constant.	08
5	Determination of equivalent length of pipe fittings	08
6	To plot characteristics curves of centrifugal pump	08
7	To measure the viscosity of different liquids (Ostwald's Viscometer or Redwood Viscometer)	08
8	To measure the flow rate of gases using flow meter.	08
9	To measure the major and minor loses in pipes.	02

Text Book(s):

Title	Author/s	Publication
Unit Operations of Chemical Engineering	McCabe, Smith.	McGraw Hill
Chemical Engineering Volume-1	Richardson & Coulson	Pergamon Press

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of Practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

IDCH2210	FLUID FLOW OPERATION
CO1	Identify fluid properties and memorize the concepts of pressure
CO2	Classify different types of fluid and generalize the concepts of boundary layer and its estimation in different flows
CO3	Apply and demonstrate the basic equations of fluid flow.
CO4	Evaluate and compare the performance of various fluid flowing machinery i.e pumps and compressor and metering devices i.e. flow meters.
CO5	Design and analyze simple fluid flow systems in industrial applications.

Mapping of CO with PO

IDCH2210	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1									1
CO 2	2	2		1							1
CO 3	2	2	1	2	2						1
CO 4	2	2	2	1	2	1					1
CO 5	2	2	2	2	2	1		1	1	1	2

Mapping of CO with PSO

IDCH2210	PSO1	PSO2	PSO3
CO 1	2	1	
CO 2	2	2	
CO 3	2	2	1

CO 4	2	2	1
CO 5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to fluids	1,2
2	Flow of Fluids (Incompressible)	2,3
3	Measurement of flow	2,3,4,
4	Pipe, fitting and valves	2,3,5
5	Transportation of Fluids	3,4,5
6	Pump types	4,5

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2220
Course Name: Industrial Stoichiometry
Prerequisite Course(s): -Fundamentals of Chemistry (IDSH1050)

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	0	2	4	40	60	00	00	40	60	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- It is expected that this course will lay the foundation of basic knowledge and calculation skills that is frequently used in subsequent chemical engineering courses as well as professional life

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Unit Systems:** Introduction to process calculation, dimensions and systems of units, fundamental quantities of units, derived quantities, definition and units of force, volume, pressure, work, energy, power, heat, unit conversions in FPS, MKS and SI systems	03	10
2.	**Basic Chemical Calculations:** Definition and calculations of mole, atomic weight, molecular weight, equivalent weight, specific gravity and API gravity. Composition of solid, liquid by weight % and mole %, morality, normality, morality, gm/lit.	04	15
3.	**Ideal gas law:** Concept of ideal gas, derivation of ideal gas law, definition of STP and NTP, Dalton's law and Amagat's law, derive relation between mole%, volume% and pressure% of ideal gases, calculation of average molecular weight, density, mole%, weight % in gas mixture in SI/MKS systems.	03	15
4.	**Material Balance in Processes with and Without Chemical Reactions:** Law of conversation of mass, brief description and simple material balance calculation of drying, distillation, absorption, mixing, crystallization, evaporation, single stage material balance calculation of leaching and	11	30

	extraction, brief idea regarding recycling and by-passing operation. Definition: Limiting reactant, excess reactant, conversion, yield and selectivity, simple numerical for finding yield, conversion and composition, simple calculation of material balance based on reaction.		
5.	**Energy Balance:** Heat capacity and specific heat, mean heat capacity of gases, heat capacity of gas mixture and liquid mixture, calculations of heat capacity by integral equation up to three terms, brief explanation of sensible heat and latent heat of fusion, sublimation, vaporization, calculations of standard heat of formation from heat of combustion data, calculations for heat of reaction from heat of formation and heat of combustion data	05	20
6.	**Combustion:** Introduction of combustion, types of fuels, calorific values of fuels, proximate and ultimate analysis of solid fuel, numerical related to calorific values of fuel from composition, numerical related to air, requirement and composition of flue gases.	04	10
	Total	**30**	**100**

Text Book(s):

Title	Author/s	Publication
Stoichiometry	Bhatt B.I. and Vora S.M.	Tata McGraw-Hill, 1976
Basic Principles and Calculations in Chemical Engineering	Himmelblau David M. Riggs B. James	8th Ed., PHI, Eastern Economy Edition

Reference Book(s):

Title	Author/s	Publication
Introduction to Process Calculations Stoichiometry	Gavhane K. A.	Nirali Prakashan, Pune,Year-2012

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests of 30 marks each and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty Evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

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

IDCH2220	INDUSTRIAL STOICHIOMETRY
CO1	Discriminate the material balance of various process streams.
CO2	Estimate the heat balance of various process steams.
CO3	Assess the heat balance of various process steams.

CO4	Appraise the various properties like temperature, pressure, heat, mass, calorific value.
CO5	Solve integrated material and energy balance problems for industrial processes.

Mapping of CO with PO

IDCH2220	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	2			1						1
CO 2	2	2		1	1						1
CO 3	2	2	1	1	1						1
CO 4	2	1		1	1						1
CO 5	2	2	2	1	1	1				1	1

Mapping of CO with PSO

IDCH2220	PSO1	PSO2	PSO3
CO 1	2	1	1
CO 2	2	1	1
CO 3	2	2	1
CO 4	1	2	1
CO 5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Unit Systems	1
2	Basic Chemical Calculations	2,3
3	Ideal gas law	1,2,3
4	Material Balance in Processes Without Chemical Reactions	2,3,5
5	Material Balance in Processes Involving Chemical Reactions	2,3,5
6	Energy Balance	4,5
7	Combustion	5,6

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2030
Course Name: Chemical Process Technology
Prerequisite Course(s): --

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	4	0	4	40	60	40	60	0	0	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- The student will understand the type of chemical processes
- The student will understand the basics of chemical process industries

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Introduction** Introduction of Chemical process industries with reference to Indian resources, trade and export potential. Process symbols used for various equipment, Uses of different process equipment	05	15
2.	**Sugar Industry** Manufacturer of cane sugar, Various engineering problems encountered in sugar industry, Pollution abatement in sugar industry	05	20
3.	**Fermentation Industry** Introduction of fermentation industry, Types of fermentation processes, Production of ethyl alcohol by fermentation, Industrial alcohol, manufacture of industrial alcohol-beers, wines and liquors	05	15
4.	**Soaps and Detergent Industry** Manufacturing of soap, glycerin as by products from soap Manufacturing of detergents (including raw material and manufacturing process), Manufacturing of House disinfectants Various engineering problems encountered in soaps and detergent industry	05	10
5.	**Pulp and Paper Industry** Different pulping process, Manufacturing of paper, Role of additives, Various engineering problems encountered in paper industry. Pollution abatement in pulp and paper	05	25

	industry.		
6.	**Polymer Industry** Types of polymer, polymerization process, manufacture of polyethylene, styrene nylon6, nylon 66, rayon. Manufacture of rubber	05	15
	Total	**30**	**100**

List of Practical

Sr No	Name of Practical/Tutorial	Hours
1	Preparation of Phenyl (domestic disinfectant)	06
2	Preparation of Soap by Coconut Oil	08
3	Preparation of Soap by mustard oil	08
4	Preparation of Detergent/liquid detergent	08
5	Atmospheric distillation of petroleum fraction analysis to petroleum	08
6	Preparation of polymer by Bulk Polymerization.	08
7	Preparation of Thermo Plastics PMMA	08
8	Preparation of phenyl formaldehyde Resin	06

Text Book(s):

Title	Author/s	Publication
Chemical Technology	M. Gopala Rao	East west publication

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of Practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

IDCH2230	CHEMICAL PROCESS TECHNOLOGY
CO1	Identify and describe basic equipment used in process industries.
CO2	Explain the basic process industry drawings.
CO3	Demonstrate the ability to apply basic concepts of chemistry and physics within process industries.
CO4	Correlate the importance of quality, safety, health and environment to the process industry.

CO5	Evaluate industrial processes with respect to efficiency, safety, and sustainability.

Mapping of CO with PO

IDCH2230	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1			1				1		1
CO 2	2	1	1		2				1		1
CO 3	2	2	1	1	1				-		1
CO 4	1	1	1			2	2	1	1		1
CO 5	2	2	2	1	1	2	1	1	1	1	1

Mapping of CO with PSO

IDCH2230	PSO1	PSO2	PSO3
CO 1	2	1	1
CO 2	2	1	1
CO 3	2	2	1
CO4	1	2	1
CO5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction	1
2	Sugar Industry	2,3
3	Fermentation Industry	2,3,4,
4	Soaps and Detergent Industry	3,5,6
5	Pulp and Paper Industry	3,5,6
6	Polymer Industry	3,5,6

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2240
Course Name: Industrial Safety & Environmental Engineering
Prerequisite Course(s): --

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	0	0	2	40	60	20	30	0	0	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- knowledge of different types of pollution caused due to industrialization.
- Know various types of accidents which occur in chemical plants and how to safeguard them to avoid injury to men and material.

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Introduction to Safety & Environmental Concepts:** Industrial safety: need, scope, objectives; role of safety in chemical industries; safety culture, policies, and organization structure; types of industrial accidents and case studies; concepts of hazard, risk, incident, accident, near-miss; introduction to environmental pollution; types of pollution (air, water, soil, noise); sources of pollutants; effects on human health, ecosystem, vegetation, and climate; sustainable development principles.	03	15
2.	**Chemical & Fire Hazards and Their Control:** Classification of chemical hazards (toxic, flammable, corrosive, reactive); fire triangle and tetrahedron; types of fire (Class A, B, C, D, K); causes of industrial fires and explosions; hazard identification (HAZID basics); hazard control methods (elimination, substitution, engineering, administrative); fire prevention strategies; fire detection systems; fire extinguishing agents (water, foam, dry powder, CO_2) and their working; basics of explosion prevention.	05	20
3.	**Personal Protective Equipment (PPE):** Importance and hierarchy of protection; PPE selection criteria; head protection (helmets); eye and face protection (goggles, face shields); hearing protection (earplugs, earmuffs); respiratory protection (masks, respirators, SCBA); hand and foot protection (gloves, safety shoes); PPE maintenance, storage,	02	10

	limitations; basic standards overview.		
4.	**Air Pollution & Control Techniques:** Definition and classification of pollutants (primary, secondary); sources (industrial, vehicular, natural); properties of pollutants; effects on health and environment; air quality standards; air sampling basics; control devices—gravitational settling chambers, cyclone separators, bag filters, electrostatic precipitators, wet scrubbers; mechanisms (diffusion, interception, impaction); equipment selection criteria.	06	20
5.	**Water Pollution & Characterization:** Sources (domestic, industrial, agricultural); types of pollutants; water quality parameters (BOD, COD, TS, TDS, TSS, VM, SM); measurement and significance; effects on aquatic life and humans; wastewater treatment—primary (sedimentation), secondary (biological), tertiary (advanced methods).	04	15
6.	**Solid Waste Management:** Definition and classification (municipal, industrial, hazardous); sources and characteristics; 3R concept (Reduce, Reuse, Recycle); collection and segregation; disposal methods—open dumping, sanitary landfilling (design basics), incineration, composting; hazardous waste basics; environmental impacts; waste-to-energy concepts.	10	20
		30	**100**

Text Book(s):

Title	Author/s	Publication
Environmental Pollution control engineering	C. S. Rao	New Age International Publications.

Reference Book(s):

Title	Author/s	Publication
Fundamentals of air & water pollution	P. C. Mishra	APH Publishing 2008
Pollution Control in process Industries	S. P. Mahajan	TMH Publication
Safety management	John V. Grimaldi	Richard D. Irwin; 4th Edition

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

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

IDCH2240	INDUSTRIAL SAFETY & ENVIRONMENTAL ENGINEERING
CO1	Identify instrument for the p, t ,v measurement of given parameter.
CO2	Identify the causes of accident and explain various controlling methods.
CO3	Acquainted with the principles of environment & ergonomics.
CO4	Familiarise with process safety management (psm) as per osha
CO5	Apply safety standards and environmental regulations in process industries.

Mapping of CO with PO

IDCH2240	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1	-	-	2	-	-	-	-	-	-
CO 2	2	2	1	1	1	2	2	-	-	-	-
CO 3	1	1	-	1	-	2	2	-	-	-	1
CO 4	2	2	1	1	1	1	2	-	-	1	1
CO 5	2	2	2	1	1	2	2	1	1	1	1

Mapping of CO with PSO

IDCH2240	PSO1	PSO2	PSO3
CO 1	2	1	-
CO 2	2	2	1
CO 3	1	2	1
CO4	2	2	1
CO5	2	2	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	General Introduction & Concept of Safety:	1,2
2	Chemical & Fire Hazards & their Control:	2,3
3	Personal Protective Devices:	2,3,4
4	Introduction to pollution:	1,2
5	Air Pollution:	2,3,5
6	Water pollution:	2,3,5
7	Solid waste of disposal methods:	1,2,3,5

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2250
Course Name: Chemical Engineering Thermodynamics
Prerequisite Course(s): --

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	0	4	6	40	60	00	00	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
It is a core subject of Chemical Engineering and is essential for understanding basic concepts, thermodynamic properties of fluid and performance of thermal systems used in industry.

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Introduction and Basic Concepts** Systems, processes and surroundings, homogenous and heterogeneous systems, closed, open and isolated, intensive and extensive properties, state and path functions. Concept of internal energy, enthalpy, entropy, free energy and equilibrium equation of state, ideal gas law, Vander Waals equation. Amagat's law, Dalton's law, Henry's law, Zeroth law of thermodynamics.	08	25
2.	**First Law of Thermodynamics for Open and Closed System** Statement of first law of thermodynamics, use of steam tables, calculation of internal energy, enthalpy, heat and work for ideal gas undergoing reversible, isothermal, Isobaric, adiabatic and polytrophic process. T-V, P-V and P-T diagrams.	08	10
3.	**Second Law of Thermodynamics** Statement of second law of thermodynamics: Kelvin Plank statement and Classius statement, Carnot cycle and its efficiency, concept of entropy and entropy change for closed and open system. Heat pump and heat engine (coefficient of performance and efficiency). Reversible and irreversible process. Thermodynamic temperature scale. Thermal thermodynamic equation, Maxwell relation. Third Law of Thermodynamics	08	15

4.	**Entropy** Inequality of Classius, entropy-a property of a system entropy change in reversible process, entropy change for an open system, principle of increase of entropy, efficiency, irreversibility.	06	15
5.	**Applications of Second law of Thermodynamics** Refrigeration, vapor compression and absorption refrigeration cycle, air refrigeration cycle, types of compressors, reciprocating air compressor, single stage compressor, and isentropic efficiency of compressor, coefficient of performance(COP), liquefaction process, latest refrigerants- their qualities and applications.	07	15
6.	**Chemical Reaction Equilibrium and Vapor Liquid Equilibrium** Concept of chemical potential, Gibb's Duhen Equation, Raoul's law, Gibb's phase rule, vapor liquid equilibrium, dew point and bubble point, calculations for two component systems, fugacity, fugacity, fugacity coefficient, activity and activity coefficient.	08	20
	Total	**30**	**100**

Text Book(s):

Title	Author/s	Publication
Chemical Engineering Thermodynamics	K.A. Gavhane	Nirali Publication
Chemical Engineering Thermodynamics	Dodge	McGraw Hill

Reference Book(s):

Title	Author/s	Publication
Chemical Engineering Thermodynamics	K.V. Narayanan	Prentice Hall India
Engineering Thermodynamics	PK Nag	McGraw Hill

Web Material Link(s):
http://nptel.ac.in/courses/103106070/

Course Evaluation:
Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Tutorials:

- Continuous Evaluation consists of performance of Tutorial which should be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Tutorials performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

IDCH2250	BASICS OF CHEMICAL THERMODYNAMICS
CO1	Illustrate the application of first law and second law to the problem of phase
CO2	Estimate the efficiency of heat equipments for a given duty.
CO3	Distinguish systems, functions, properties and processes.
CO4	Implement the various law of thermodynamics for non flow & flow process and access the pvt behavior of the fluids.
CO5	Analyze thermodynamic systems for real-life chemical engineering applications.

Mapping of CO with PO

IDCH2250	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	2	1	1	1	-	-	-	-	-	1
CO 2	2	2	2	1	1	1	-	-	-	1	1
CO 3	2	1	-	-	-	-	-	-	-	-	1
CO 4	2	2	1	1	2	-	-	-	-	-	1
CO 5	2	2	2	2	1	1	1	-	1	1	1

Mapping of CO with PSO

IDCH2250	PSO1	PSO2	PSO3
CO 1	2	1	1
CO 2	2	2	1
CO 3	1	1	1
CO4	2	2	1
CO5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction and Basic Concepts	1,2
2	First Law of Thermodynamics for Open and Closed System	1,2,3
3	Second Law of Thermodynamics	2,3,4,
4	Entropy	2,4,5
5	Applications of Second law of Thermodynamics	2,5,6

6	Chemical Reaction Equilibrium and Vapor Liquid Equilibrium	2,3,5,6

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDME2010
Course Name: Basics of Engineering Drawing
Prerequisite Course(s):--

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
				Theory		Practical		Tutorial		
Theory	Practical	Tutorial	Credit	CE	ESE	CE	ESE	CE	ESE	Total
03	04	00	04	40	60	100	00	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Understand the language and familiarize with Indian Standards related to engineering drawings
- Develop drafting and sketching skills, application of drawing equipment's.
- Read various engineering curves, projections and dimensioning styles.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction** BIS SP-46, Drawing Instruments and their uses, Letters and numbers– Standard Sizes and Layout of drawing sheets-Types of lines and their applications- Different types of Dimensioning techniques, Scale (reduced, enlarged & full size), plain scale and diagonal scale, Geometrical constructions.	04	14
2.	**Orthographic projections of points and lines:** Introduction to orthographic projection, First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. Projections of points Projections of lines in different quadrants, inclinations, True lengths of the lines projections on auxiliary planes	10	34
3.	**Projections of plane figures:** Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes).	05	15
4.	**Projection of solids:** Types of Solid. Projection of Cone, Cylinder, Prism &pyramids. Simple cases when solid are placed in different positions Axis faces and tines lying in the faces of the solid making given angles.	06	22

5.	**Isometric projection:** Introduction to isometric projections. Isometric scale and Natural scale. Isometric view and isometric projection. Illustrative problems related to objects containing lines, circles and arcs shape only	05	15
		45	**100**

List of Practical:

Sr No	Name of Practical	Hours
1.	Letters and numbers, Dimensioning techniques, Scale (reduced, enlarged & full size), plain scale and diagonal scale, Geometrical constructions.	02
2.	Orthographic projections of points and lines:	15
3.	Projections of plane figures	15
4.	Projection of solids	12
5.	Isometric projection	16

Text Book(s):

Title	Author/s	Publication
A Text Book of Engineering Graphics	P J Shah	S. Chand & Company Ltd., New Delhi
Engineering Drawing	N D Bhatt	Charotar Publishing House, Anand

Reference Book(s):

Title	Author/s	Publication
Engineering Drawing	P.S.Gill	S. K. Kataria& sons, Delhi
Engineering Drawing	B. Agrawal & C M Agrawal	Tata McGraw Hill, New Delhi
Engineering Drawing made Easy	K. Venugopal	Wiley Eastern Ltd

Web Material Link(s):

- http://nptel.ac.in/courses/105104148/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 20 marks as per the guidelines provided by the course coordinator.

Practical:

- Continuous Evaluation consists of Performance of Practical/Tutorial which will be evaluated out of 10 for each practical/Tutorial and average of the same will be converted to 20 Marks.
- Internal Viva consists of 30 Marks.
- Practical performance/quiz/drawing/test of 50 marks during End Semester Exam.

Course Outcome(s):

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

IDME2010	BASICS OF ENGINEERING DRAWING
CO1	Interpret engineering drawing as a technical communication language.
CO2	Understand different dimensioning methods and its use in drawings.
CO3	Relate the use of engineer's scale to different engineering fields.
CO4	Identify the use of orthographic & isometric projection in real time applications.
CO5	Develop engineering drawings for practical components and systems.

Mapping of CO with PO

IDME2010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1	-	-	1	-	-	-	2	-	1
CO 2	2	1	1	-	1	-	-	-	1	-	1
CO 3	2	1	-	-	1	-	-	-	1	-	1
CO 4	2	2	1	1	2	-	-	-	1	-	1
CO 5	2	2	2	1	2	-	-	1	1	1	1

Mapping of CO with PSO

IDME2010	PSO1	PSO2	PSO3
CO 1	1	1	1
CO 2	1	1	1
CO 3	1	1	1
CO4	2	1	1
CO5	2	2	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction	1,2
2	Orthographic projections of points and lines	1,5,6
3	Projections of plane figures	2,4,6
4	Projection of solids	2,4,6
5	Isometric projection	2,5,6

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2260
Course Name: Fundamental of Mass Transfer
Prerequisite Course(s): --

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	4	0	4	40	60	40	60	0	0	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- gain knowledge of basic fundamentals of mass transfer operations such as diffusion, leaching, absorption etc.
- gain knowledge of fundamental principles, design aspects, equations, associated problems, industrial applications of all-important unit operations.
- equip them with the essential knowledge and skills required to appear in campus interview or work as an engineer in the chemical industries with confidence.

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Introduction to Mass Transfer Operations:** Importance in chemical industries; role in separation processes; classification of mass transfer operations (gas-liquid, liquid-liquid, solid-liquid, membrane separations); rate processes and driving force concepts; methods of operation (stage-wise and continuous contact); fundamentals of equilibrium vs non-equilibrium processes; basic design principles and industrial relevance.	03	10
2.	**Molecular Diffusion in Fluids:** Concept of molecular vs eddy diffusion; Fick's First and Second Laws; steady-state and unsteady-state diffusion; diffusion in gases and liquids; diffusion through stagnant and moving media; equimolar counter diffusion; diffusion with bulk flow; thermal diffusion; estimation of diffusion coefficients; applications in chemical processes; numerical problems.	05	15
3.	**Interphase Mass Transfer:** Phase equilibrium concepts; interfacial mass transfer; individual and overall mass transfer coefficients; film theory, penetration theory, surface renewal theory; resistance in series; analogy between heat, mass, and momentum transfer (Reynolds, Chilton-Colburn	05	20

	analogy); concept of stages; stage efficiency; cascade operations; HTU and NTU concepts; industrial examples.		
4.	**Gas Absorption:** Principles and industrial applications; gas-liquid equilibrium (Henry's law, Raoult's law); solubility of gases in liquids and effect of temperature & pressure; ideal and non-ideal systems; solvent selection criteria; single-stage and multistage absorption; material balance for countercurrent and co-current operations; concept of HETP, HTU, NTU; absorption tower design basics; simple numerical problems.	06	20
5.	**Liquid-Liquid Extraction & Leaching: Liquid-Liquid Extraction:** Definition, applications; ternary equilibrium systems; triangular diagrams; tie lines and plait point; solvent selection; single-stage and multistage extraction; distribution coefficient; numerical problems. **Leaching:** Definition and industrial applications; preparation of solids; leaching mechanisms; equipment (heap leaching, in-situ leaching, agitated tanks); Shanks system, Rotocel extractor, Kennedy extractor, Bollman extractor; factors affecting leaching efficiency.	07	20
6.	**Gas-Liquid Contacting Equipment:** Classification of contacting devices; gas dispersed systems (bubble column, sparged vessel, agitated vessel, tray towers); liquid dispersed systems (spray towers, packed towers, wetted wall column, venturi scrubbers); construction and working principles; hydrodynamics; flooding, loading, weeping; pressure drop considerations; comparison between tray and packed columns; selection criteria for industrial applications.	04	15
	Total	**30**	**100**

List of Practical

Sr No	Name of Practical/Tutorial	Hours
1.	Solid In Air Diffusion (Vaporization Of Naphthalene Balls)	08
2.	Vapour In Air Diffusion - To determine the diffusion coefficient of an organic vapor (i.e. CCl_4) in air.	08
3.	Liquid – Liquid Diffusion - To study the effect of temperature on the diffusion coefficient.	08
4.	York Scheibel's Extraction Unit	08
5.	Absorption in sieve plate column	08
6.	Vapor-Liquid Equilibrium Set-up	08
7.	Leaching Experiment	08
8.	Wetted Wall Column Experiment	04

Text Book(s):

Title	Author/s	Publication
Mass Transfer operation	R.E. Treybal	Mc-Graw Hill International Editions

Mass Transfer	Sherwood, Pigford & Wilke	Mc-Graw Hill International Editions

Reference Book(s):

Title	Author/s	Publication
Perrys Chemical Engineers Handbook	Perry & Green	Mc-Graw Hill International Editions
Chemical Engineering	Coulson, J.M., Richardson, J.F.	Pergamon and ECBS, 1970
Unit operations of Chemical Engg.	W.L. McCabe, J.C. Smith &Harriott	Mc-Graw Hill International Editions

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests of 30 marks each and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty Evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consist of performance of Practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 mark.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

IDCH2260	FUNDAMENTAL OF MASS TRANSFER
CO1	Distinguish the basics of mass transfer & important to build a knowledge of the mass regarding laws.
CO2	Identification of mechanisms of mass transfer, formulation of rate equations.
CO3	Evaluate the solutions of the differential equations for steady state & non steady state problems
CO4	Generalize various mass transfer equipments.
CO5	Apply mass transfer principles to industrial separation processes.

Mapping of CO with PO

IDCH2260	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1	-	-	-	-	-	-	-	-	1
CO 2	2	2	1	1	1	-	-	-	-	-	1
CO 3	2	2	1	2	1	-	-	-	-	-	1
CO 4	2	1	2	1	1	1	-	-	-	1	1
CO 5	2	2	2	1	1	1	1	-	1	1	1

Mapping of CO with PSO

IDCH2260	PSO1	PSO2	PSO3
CO 1	1	1	1
CO 2	2	2	1
CO 3	2	2	1
CO4	2	2	1
CO5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction	1,2
2	Molecular Diffusion Of Fluids	1,2
3	Inter phase Mass Transfer	1,2
4	Gas Absorption	2,3,4
5	Liquid-Liquid Extraction	2,5,6
6	Leaching	3,4,5
7	Equipment for Gas-Liquid Operation	3,5,6

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2070
Course Name: Instrumentation
Prerequisite Course(s): --

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	4	0	4	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- It is expected that this course will lay the foundation of basic knowledge about instrumentation skills that is frequently used in subsequent chemical engineering courses as well as professional life.

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Introduction to Instrumentation:** Elements of instruments, static and dynamic characteristics, basic concepts of response of first order type instruments, mercury in glass thermometer, bimetallic thermometer, pressure spring thermometer, static accuracy and response of thermometers.	03	10
2.	**Pressure Measurement:** Pressure, vacuum and head manometers, measuring elements for gage pressure and vacuum, measuring pressure in corrosive liquids, measuring of absolute pressure, static accuracy and response of pressure gages.	04	15
3.	**Temperature Measurement:** Industrial thermocouples, thermocouple wires, thermo couple wells and response of thermocouples.	06	20
4.	**Flow Measurement:** Head flow meters, open channel meters, area flow meters, flow of dry materials, viscosity measurement.	06	20
5.	**Level Measurement:** Direct measurement of liquid level, level measurement in pressure vessels, measurement of interface level, level of dry materials.	05	15
6.	**Instruments for Analysis:** Recording instruments, indicating and signaling instruments, instrumentation diagram.	06	20

		30	**100**

List of Practical:

Sr. No.	Name of Practical	Hours
1	Study and use Pressure sensing elements.	08
2	Study and use Flow measuring instruments.	08
3	Study and use level measuring instruments.	08
4	Study and use temperature measuring instruments.	08
5	Study block diagram of DCS.	08
6	Study block diagram of PLC.	08
7	Study applications of controllers.	06
8	Verify Ohm's law.	06

Text Book(s):

Title	**Author/s**	**Publication**
Industrial instrumentation	Donald P Eckman	John Wiley and Sons Ltd, 1950
Industrial Instrumentation & Control	S. K. Singh	McGraw Hill Education India, 1987

Reference Book(s):

Title	**Author/s**	**Publication**
Process Control Instrumentation Technology	Johnson	John Wiley & Sons; 3rd edition (26 October 1988)

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests of 30 marks each and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty Evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

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

IDCH2270	**INSTRUMENTATION**
CO1	Apply the fundamentals of instrumentation in measurements and calibration of instruments.
CO2	Summarize information about common instruments on the chemical process systems.
CO3	Generalize the pressure, temperature & level instrument for the measurement of chemical devices.
CO4	Illustrate the construction and working principle of various type of transducers/sensor to measure physical quantities.
CO5	Design basic instrumentation systems for process monitoring and control.

Mapping of CO with PO

IDCH2270	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1	-	1	2	-	-	-	-	-	1
CO 2	2	1	-	1	2	-	-	-	1	-	1
CO 3	2	2	1	1	2	-	-	-	-	-	1
CO 4	2	1	1	1	2	-	-	-	1	-	1
CO 5	2	2	2	1	2	1	1	1	1	1	1

Mapping of CO with PSO

IDCH2270	PSO1	PSO2	PSO3
CO 1	2	1	1
CO 2	2	2	1
CO 3	2	2	1
CO4	2	2	1
CO5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Instrumentation	1,2
2	Pressure Measurement	1,2,3
3	Temperature Measurement	1,2,3
4	Flow Measurement	1,3,4
5	Level Measurement:	2,3,4
6	Instruments for Analysis:	3,4,5

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2280
Course Name: Plant Utilities & Energy Engineering
Prerequisite Course(s): -Industrial Safety & Environmental Engineering (IDCH2040)

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	0	0	2	40	60	00	00	00	00	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Know renewable source of energy and their futuristic scope.
- Understand the designing the process plants or creating design layouts of plant.
- Understand fundamentals of chemical engineering viz. development of flow diagrams, importance of various design consideration during the development and design of any process.
- Rapidly increase advancement of knowledge and relevant importance and application of various process auxiliaries and utilities used in industries.
- Deals with the basics as well as advanced understanding of various process auxiliaries and utilities used in chemical plant.

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Introduction:** Types of energy, energy crisis, Renewable sources of energy, conventional & Non-Conventional sources of energy, energy conservation.	02	10
2.	**Conventional fuels:** Classification, types, sources, properties, uses, storage, handling & selection factors of various conventional fuels in the form of Solid : Coal, Lignite, Coke; Liquid : Gasoline, Kerosene, Naphtha, Fuel oil, Diesel ;Gaseous : N.G., Refinery gas, Water gas, Producer gas, Coke oven gas, LPG, Oil gas, Industrial Gases etc	06	20
3.	**Non-conventional sources of energy:** Solar energy : Solar radiation, collectors, storage & applications Wind energy : Introduction, nature of wind & wind farm Biomass energy : Introduction, Biomass conversion technology by wet & Dry process Geothermal energy: Introduction & Sources of geothermal energy.	07	20

	Nuclear energy : Introduction, Nuclear Fuels & Nuclear reactions, types of Propellant & moderators		
4.	**Water & Steam:** Importance, Consumption & source of water, water analysis, types of hardness, methods of softening of water like lime soda, zeolite, ion exchange methods etc., Purification of water by screening, sedimentation, coagulation, filtration & sterilization, treatment for boiler feed water, Reuse & Recycling of process water, definition of enthalpy, wet steam, superheated steam, specific volume, Types-classification &comparison of steam generators, Factors affecting the selection of steam generator.	08	25
5.	**Air & Refrigeration:** Introduction, use of air as chemical raw material & utility, concept of compressed air, blower air, fan air, instrument air etc., various methods of refrigeration in brief like ice, evaporate, vapor, steam jet refrigeration etc, types of refrigerating agent like ammonia, carbon dioxide, methylene chloride, water brine etc., selection of refrigerating agents.	07	25
	Total	**30**	**100**

Text Book(s):

Title	Author/s	Publication
Process Plant layout and Piping Design	Roger Hunt and Ed Bausbacher	PTR Prentice-Hall Inc
Process utility systems	Jack Broughton	Institution of Chem. Engineers, U.K.

Reference Book(s):

Title	Author/s	Publication
Chemical Engineering Plant Design	F.C. Vibrandt and C.E. Dryden	McGraw Hill, Fifth Edition.
Plant design and Economics for Chemical Engineers	M.S. Peters and Timmerhaus	Mc Graw Hill 3rd Edition

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests of 30 marks each and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty Evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

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

IDCH2280	Plant Utilities & Energy Engineering
CO1	Assess the basis of plant utilities and management process.
CO2	Justify the importance of process auxiliaries and utilities in a chemical industry.
CO3	Editorialize the conventional and non conventional sources and their utilization in industries.
CO4	Acquire an overview of key selection considerations of plant utilities.
CO5	Evaluate energy efficiency and optimization of plant utility systems.

Mapping of CO with PO

IDCH2280	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1	-	-	1	1	-	-	-	1	1
CO 2	2	2	1	-	1	2	-	-	-	1	1
CO 3	2	1	1	1	1	2	1	-	-	-	1
CO 4	2	2	1	1	1	1	-	-	-	1	1
CO 5	2	2	2	1	1	2	1	-	1	1	1

Mapping of CO with PSO

IDCH2280	PSO1	PSO2	PSO3
CO 1	1	1	1
CO 2	2	2	1
CO 3	2	2	1
CO4	2	2	1
CO5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction	1,2
2	Conventional fuels	1,2,3
3	Non-conventional sources of energy	1,2,3
4	Water & Steam	2,3,4
5	Air & Refrigeration	4,5,6

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2290
Course Name: Mechanical Operations
Prerequisite Course(s):--

Teaching & Examination Scheme:

Teaching Scheme(Hours/Week)				Examination Scheme(Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	04	00	04	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- Understand many basic principles of Chemical Engineering operations such as Size Reduction, Filtration, Sedimentation, Mixing and Agitation etc. and their mathematical co-relation.
- Understand the basic principles of particle preparation and their characterization.
- Study various methods for storage of solids and conveyors available for their transportation.
- Understand the performance of different equipment for separation of solids and size reduction

Course Content:

Module No.	Content	Hours	Weightage in%
1.	**Properties of Particulate Solids** Fundamentals of Unit operation and Unit process, Specific properties of solids : Particle density and Bulk density, diameter, sphericity, equivalent diameter, specific surface area, volume surface mean diameter, mass mean diameter, and shape factor, Calculation of particle diameter, sphericity, equivalent diameter, specific surface area, volume surface mean diameter, mass mean diameter, and shape factor, numbers of particles insolid.	06	20
2.	**Screen Analysis** Basics of Ideal and actual screen, Types of screen analysis, Capacity and effectiveness of screen, Derivation of formula for overall effectiveness of screen, Calculation of capacity and effectiveness of screen.	04	10

3.	**Size Reduction** Principles of Size reduction and its application, Classification, comparison and selection of size reduction equipments based on size reduction principle, Laws of size reduction: (i) Rittingers law (ii) Bond's law (iii) Kick's law , Calculation of power required for size reduction using empirical laws.	04	15
4.	**Sedimentation** Fundamentals of sedimentation, Batch sedimentation, Inter phase height Vs time curve for Batch sedimentation, Principle of flocculation, Principle, construction and working of Gravity thicker, Fundamentals of free and hindered settling, Principle construction and working of Cyclone separator.	04	15
5.	**Filtration** Basics of filtration, Classification of equipments for liquid-solid separation, Filter media and its characteristics, Constant rate filtration and constant pressure filtration, Filter media and its characteristics.	04	10
6.	**Separation of Solid Particles** Definition and application of solid separation, Factors affecting selection of equipment for solid separation, Working principle and construction of a) Jigging, b) Elutriation, c) Double cone classifier d) Electrostatic precipitator, e) Magnetic separator f) Froth flotation cell, Differential settling methods, sink and float method	04	15
7.	**Agitation and Mixing** Define agitation and mixing, give their applications, Classification of Impellers and brief explanation, Vortex formation and swirling, Methods of Vortex prevention, Flow number, Factors affecting agitation.	04	15
		30	**100**

List of Practical:

Sr. No.	Name of Practical	Hours
1	Measure volume surface mean diameter, mass mean diameter, number of particles using sieve shaker	06
2	Carry out differential and cumulative screen analysis	06
3	Test Rittinger's law for grinding in ball mill and measure critical speed	06
4	Test Kicks law for crushing in jaw crusher	06
5	Test Bond's law for crushing in roll crusher	06
6	Measure efficiency of cyclone separator	06
7	Determine rate of settling by sedimentation	06
8	Measure rate of filtration in gravity filtration	06
9	Measure efficiency of separation in froth flotation cell	06
10	Measure rate of filtration in vacuum filtration	06

Text Book(s):

Title	Author/s	Publication
Unit Operations of Chemical Engineering	W L McCabe and J C Smith	McGraw-Hill International
Principles of Mineral Dressing	A M Gaudin	Tata McGraw-Hill Publishing Co. Ltd., New Delhi
Elements of Ore Dressing	A F Taggart	John Wiley and Sons, New York

Reference Book(s):

Title	Author/s	Publication
Chemical Engineering Vol.- II, 6th Ed.	J.M. Coulson & J.F. Richardson	Elsevier, 2003 or Pergamon Press
Unit Operations	G.G. Brown Ed.	John Wiley & Sons, 1950
Transport Processes and Separation Process Principles' 4th Ed,	C.G. Geankopolis	Prentice Hall India, 2003

Web Material Link(s):

- http://nptel.ac.in/syllabus/103107091

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests of 30 marks each and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty Evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation consist of performance of Practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

IDCH2290	MECHANICAL OPERATION
CO1	Identify the practical importance and relevance of unit operations used for crushing, grinding and size separation in chemical industry.
CO2	Understanding fluid flow through fluidized bed
CO3	Evaluate the parameters of various filtration equipment and sedimentation.
CO4	Identify the different types of mixing, agitation and conveying of solids.
CO5	Design and select suitable mechanical operations equipment for industries.

Mapping of CO with PO

IDCH2290	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	2	1	1	1	-	-	-	-	-	1
CO 2	2	1	1	1	1	-	-	-	-	-	1
CO 3	2	2	1	2	1	-	-	-	-	1	1
CO 4	2	1	1	1	1	-	-	-	1	-	1
CO 5	2	2	2	1	2	1	1	1	1	1	1

Mapping of CO with PSO

IDCH2290	PSO1	PSO2	PSO3
CO 1	2	2	1
CO 2	2	1	1
CO 3	2	2	1
CO4	2	2	1
CO5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Properties of Particulate Solids	1,2
2	Screen Analysis	2,3
3	Size Reduction	2,5
4	Sedimentation	2,3,4,5
5	Filtration	4,5,6
6	Separation of Solid Particles	3,4,5
7	Agitation and Mixing	2,3,4,6

P P Savani University
Institute of Diploma Studies
Department of Chemical Engineering

Course Code: IDCH2300
Course Name: Process Heat Transfer
Prerequisite Course(s): --

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
2	4	0	4	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Understand how to formulate and be able to solve one- and two-dimensional conduction.
- Most of the Chemical Engineering operations will involve either heat addition or heat removal in one way or the other.
- It is, therefore, extremely necessary to have good understanding about the heat transfer mechanisms.
- This subject enables the students to apply this knowledge for understanding the performances of various heat transfer equipment such as heat exchangers, condensers, evaporators etc. used in almost all chemical and related industries

Course Content:

Module. No.	Content	Hours	Weightage in %
1.	**Fundamentals & Modes of Heat Transfer:** Introduction to heat transfer and its industrial applications; modes of heat transfer—conduction, convection, radiation; comparison of modes; concept of steady-state and unsteady-state heat transfer; heat flux and temperature gradient; thermal properties of materials; basic governing equations; significance in chemical process industries.	04	10
2.	**Conduction Heat Transfer:** Fourier's law of heat conduction; thermal conductivity of solids, liquids, and gases; effect of temperature on thermal conductivity; one-dimensional steady-state conduction through plane walls, cylinders, and spheres; composite walls and multi-layer cylinders; concept of thermal resistance; insulation materials and selection; critical thickness of insulation; introduction to unsteady-state conduction (lumped system analysis); numerical problems.	06	20

3.	**Convective Heat Transfer:** Natural and forced convection; boundary layer concepts; dimensional analysis; important dimensionless numbers—Reynolds, Prandtl, Nusselt, Grashof, Stanton, Peclet numbers and their physical significance; empirical correlations for convection; Dittus-Boelter and Sieder-Tate equations; heat transfer in pipes and over surfaces; numerical problem solving; applications in industrial heat exchangers.	05	15
4.	**Thermal Radiation:** Nature of thermal radiation; reflection, absorption, and transmission; emissive power; black body and grey body concepts; Kirchhoff's law; Planck's law; Wien's displacement law; Stefan-Boltzmann law; radiation heat exchange between surfaces; shape factor (view factor) basics; radiation shields; practical applications and simple problems.	04	10
5.	**Heat Exchangers:** Introduction and industrial applications; classification of heat exchangers; individual and overall heat transfer coefficients; fouling factor and surface roughness effects; LMTD for parallel and counter-current flow; effectiveness and NTU concept (basic introduction); construction and working of double pipe, shell-and-tube (1–1 and 1–2), and plate heat exchangers; design considerations; performance analysis; simple numerical problems.	05	20
6.	**Boiling, Condensation & Evaporation Equipment:** **Boiling:** Pool boiling, nucleate and film boiling, boiling regimes, heat transfer correlations. **Condensation:** Film-wise and drop-wise condensation, heat transfer coefficients, applications. **Evaporation:** Evaporation capacity and economy; types of evaporators—open pan, vertical tube, falling film, agitated thin film; multiple effect evaporators; feeding arrangements (forward, backward, mixed, parallel feed); industrial applications and performance considerations.	06	25
	Total	**30**	**100**

List of Practical

Sr No	Name of Practical/Tutorial	Hours
1.	To determine Heat Transfer through Composite Wall at different temperature.	04
2.	Determination of Thermal Conductivity of Insulating Powder (Asbestos Powder).	08
3.	To find out Heat transfer in Double Pipe Heat Exchanger in Laminar Flow and Turbulent Flow.	08

4.	Calculation of Heat transfer Coefficient by Natural and Forced Convection.	08
5.	Heat Transfer Calculation in Plate Heat Exchanger.	08
6.	Shell and Tube Heat Exchanger.	08
7.	Heat Transfer by Radiation: Stefan-Boltzmann Law.	08
8.	Heat Transfer in Drop and Film wise Condensation Apparatus.	08

Text Book(s):

Title	Author/s	Publication
Heat Transfer Principles and Applications	K Dutta	Prentice Hall, India.
Heat Transfer	KA Gavahane	Nirali Publications.

Reference Book(s):

Title	Author/s	Publication
Heat Transfer: Principles and Applications	Dutta B. K	PHI
Heat Transfer	Chapman, A.J.	Maxwell Macmillan International Edition, 1984.

Web Material Link(s):

https://nptel.ac.in/courses/103103032/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of Practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

IDCH2300	PROCESS HEAT TRANSFER
CO1	Classify and solve conduction, convection and radiation problems
CO2	Remembering the design and analyze the performance of heat exchangers.
CO3	Discriminate the design and analyze heating and cooling systems.
CO4	Validate the heat loss around various equipments.

CO5	Design heat transfer equipment for industrial applications.

Mapping of CO with PO

IDCH2300	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	2	1	1	1	-	-	-	-	-	1
CO 2	2	2	2	1	1	1	-	-	-	1	1
CO 3	2	2	2	1	1	1	-	-	-	1	1
CO 4	2	1	1	1	1	1	-	-	-	-	1
CO 5	2	2	2	2	2	1	1	1	1	1	1

Mapping of CO with PSO

IDCH2300	PSO1	PSO2	PSO3
CO 1	2	1	1
CO 2	2	2	1
CO 3	2	2	1
CO4	2	1	1
CO5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Modes of Heat Transfer	1
2	Conduction	2,3
3	Convection	2,3,5
4	Radiation	3,4,5
5	Heat Exchanger	2,3,5
6	Boiling and condensation	3,4,5
7	Evaporators	3,4,6

P P Savani University
Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2310
Course Name: Fertilizer Technology
Prerequisite Course (s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	00	02	04	40	60	00	00	20	30	150

CE: Continuous Evaluation, ESE: End Semester
Exam Objective(s) of the Course:
To help learners to

- identify different types of fertilizers and their applications for crops
- provide comprehensive and balanced understanding of essential link between chemistry and the synthetic fertilizer industry
- understand the manufacturing of fertilizers based on different nutrients

Course Content:

Module No.	Content	Hours	Weightage in%
1.	**Overview of Fertilizers & Plant Nutrition:** Introduction to fertilizers and their importance in agriculture; classification of fertilizers (organic, inorganic, straight, complex, mixed); essential plant nutrients; macro (N, P, K) and micro elements (Zn, Fe, Mn, Cu, etc.); role of nutrients in plant growth; nutrient deficiency symptoms; concept of nutrient balance; soil fertility and soil testing basics; methods and timing of fertilizer application; environmental impact of fertilizer use.	04	10
2.	**Nitrogenous Fertilizers – Ammonia & Nitric Acid:** Properties and applications of ammonia; synthesis gas production (steam reforming, partial oxidation); purification of synthesis gas; ammonia synthesis (Haber-Bosch/Linde process fundamentals); operating conditions and catalysts; storage and transportation of ammonia; nitric acid properties and applications; manufacturing by ammonia oxidation process (Ostwald process – pressure and intermediate pressure methods); process flow diagrams and industrial considerations.	06	20

3.	**Nitrogenous Fertilizers – Urea & Ammonium Compounds:** Properties and uses of urea; urea manufacturing (Stamicarbon CO_2 stripping process); process conditions and equipment; prilling and granulation techniques; ammonium nitrate manufacturing (prilling process); safety considerations (explosion hazards); ammonium sulphate production; fertilizer handling, storage, and quality control; numerical material balance concepts (basic).	04	10
4.	**Phosphatic Fertilizers: Phosphatic Fertilizers:** Properties and applications of phosphorus and phosphoric acid; sources of phosphate rock; manufacturing of elemental phosphorus (electric furnace method); phosphoric acid production (wet process); leaching techniques (sulphuric acid, hydrochloric acid); superphosphate fertilizers (SSP, TSP); reaction mechanisms; impurities and purification; environmental issues (phosphogypsum disposal).	05	15
5.	**Potassic Fertilizers:** Properties and uses of potash fertilizers (KCl, KNO_3, K_2SO_4); sources of potash (sylvinite, carnallite); manufacturing of potassium chloride from sylvinite (flotation, crystallization); preparation of potassium nitrate and potassium sulphate; applications in agriculture; quality specifications; handling and storage; role of potassium in plant metabolism.	05	20
6.	**Complex Fertilizers & Biofertilizers:** Manufacturing of complex fertilizers (NPK fertilizers, ammonium sulphate phosphate (ASP), calcium ammonium nitrate (CAN)); granulation techniques; mixed vs complex fertilizers; advantages and limitations; biofertilizers—types (nitrogen-fixing, phosphate-solubilizing, potash mobilizing); microbial strains and mechanisms; production and formulation of biofertilizers; application methods; advantages over chemical fertilizers; sustainability and integrated nutrient management (INM).	05	25
		30	100

List of Practical:

Sr. No.	Name of Practical	Hours
1	Prepare chart for fertilizer classification with chemical formula and nutrient content	06
2	Estimate nutrient content (% N, %P_2O, % K_2O) in different fertilizers from their chemical formula	06
3	Estimate percentage of Nitrogen in Ammonium chloride by substitution method	06
4	Estimate percentage of Nitrogen in Ammonium sulfate by substitution method	06
5	Estimate percentage of Nitrogen in Ammonium chloride by back titration	06
6	Estimate percentage of Nitrogen in Ammonium sulphate by back titration	06
7	Prepare potassium sulphate	06

8	Estimate ratio from Ammonia to Phosphoric acid in DAP	06
9	Prepare bio-fertilizer	06
10	Estimate percentage of Nitrogen in DAP by Formaldehyde method	06

Text Book(s):

Title	Author/s	Publication
Dryden's Outlines of Chemical Technology	M. Gopala Rao Sitting Marshall	Affiliated East West Press (Pvt) Ltd, 3rd Ed., New Delhi
Chemical Technology -Vol. I and II, 2nd edition	Pandey G.N. and Shukla	Vani Books Company - Hyderabad
Biofertilizers in Agriculture, 2nd edition	N. S. Subba Rao	Oxford & IBH Publishing Company, New Delhi 1988

Reference Book(s):

Title	Author/s	Publication
Shreve's Chemical Process Industries, 5th edition	Austin G.T.	McGraw Hill publication, New Delhi

Web Material Link(s):

- http://nptel.ac.in/courses/103107086/4

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Tutorial/Practical:

- Continuous Evaluation consists of performance of tutorial which will be evaluated out of 10 marks for each tutorial and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 20 marks during End Semester Exam.
- Viva/Oral presentation consists of 20 marks during End Semester Exam.

Course Outcome(s):

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

IDCH2310	FERTILIZER TECHNOLOGY
CO1	Identify the different nutrients and significance of feed stocks for the production of fertilizers.
CO2	Classify various methods for the production of nitrogenous fertilizers.
CO3	Apply different manufacture methods for various phosphorous fertilizers.

CO4	Assess the production methods for potassium and mixed complex fertilizers.
CO5	Evaluate fertilizer production processes for industrial implementation.

Mapping of CO with PO

IDCH2310	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1	-	-	1	1	-	-	-	-	1
CO 2	2	2	1	1	1	1	-	-	-	-	1
CO 3	2	2	2	1	1	1	-	-	-	1	1
CO 4	2	2	2	1	1	1	-	-	-	1	1
CO 5	2	2	2	2	1	2	1	1	1	1	1

Mapping of CO with PSO

IDCH2310	PSO1	PSO2	PSO3
CO 1	1	1	1
CO 2	2	2	1
CO 3	2	2	1
CO4	2	2	1
CO5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Overview of Fertilizers	1,2
2	Nitrogenous Fertilizers	1,2,3
3	Phosphatic Fertilizer	2,3,5
4	Potassic Fertilizers	3,4,5
5	Complex Fertilizer and Bio Fertilizer	4,5,6

P P Savani School of Engineering

P P Savani University Campus, NH 48, GETCO, Near Biltech,
Village: Dhamdod, Kosamba, Dist.: Surat – 394125