Syllabus Book

Diploma Engineering
(Chemical Engineering)

P P Savani University

School of Engineering
Institute of Diploma Studies

Effective From: 2022-23
Authored by: P P Savani University

CONTENT

FIRST YEAR
DIPLOMA ENGINEERING

P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
INSTITUTE OF DIPLOMA STUDIES															
TEACHING & EXAMINATION SCHEME FOR DIPLOMA ENGINEERING PROGRAMME AY:2022-23															
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	IDSH1010	Fundamentals of Mathematics	SH	3	0	2	**5**	5	40	60	0	0	50	0	**150**
	IDSH1020	Engineering Physics	SH	3	2	0	**5**	4	40	60	20	30	0	0	**150**
	IDME1010	Basics of Mechanical & Civil Engineering	ME	2	4	0	**6**	4	40	60	40	60	0	0	**200**
	IDCE1010	Computer Applications	CE	3	4	0	**7**	5	40	60	40	60	0	0	**200**
	IDME1020	Engineering Workshop	ME	0	2	0	**2**	1	0	0	50	0	0	0	**50**
	CFLS1030	Functional English-I	CFLS	2	0	0	**2**	2	40	60	0	0	0	0	**100**
						Total	**27**	**21**							**850**
2	IDSH1040	Engineering Mathematics	SH	3	0	2	**5**	5	40	60	0	0	50	0	**150**
	IDSH1050	Fundamentals of Chemistry	SH	3	2	0	**5**	4	40	60	20	30	0	0	**150**
	IDCV1010	Engineering Mechanics	CV	3	2	0	**5**	4	40	60	20	30	0	0	**150**
	IDIT1010	Introduction to Computer Programming	IT	3	4	0	**7**	5	40	60	40	60	0	0	**200**
	IDSH1060	Electrical &Electronics Workshop	SH	0	2	0	**2**	1	0	0	50	0	0	0	**50**
	CFLS1040	Functional English-II	CFLS	2	0	0	**2**	2	40	60	0	0	0	0	**100**
						Total	**26**	**21**							**800**

P P Savani University
School of Engineering
Institute of Diploma Studies

Department of Applied Science & Humanities

Course Code: IDSH1010
Course Name: Fundamentals of Mathematics
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	
3	0	2	5	40	60	-	-	50	0	150

CE: Continuous Evaluation, ESE: End Semester Exam

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

- outlining logarithm properties.
- implementing concepts of Determinants and Matrices for solving science and engineering problems.
- presenting 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	14
2.	**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.	9	18
3.	**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 formulae, Inverse trigonometric function, Applications of trigonometry.	9	18
4.	**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, Tangent and normal, Equation of tangent and normal.	6	15
5.	**Vectors**	8	15

	Basic concept of vector and scalar, Addition and subtraction, Product of vectors, Geometric meaning of scalar and vector product, Angle between two vectors, Applications of dot and cross product, Work done and moment of force.		
6.	**Mensuration** Basic concept of Mensuration, Area of Triangle, Square, Rectangle, Trapezium, Parallelogram, Rhombus and Circle surface, Volume of Cuboids, Cone, Cylinder and Sphere.	8	20

List of Tutorials:

Sr. No.	List of Tutorial	Hours
1.	Logarithm-1	2
2.	Logarithm-2	2
3.	Determinants and Matrices-1	2
4.	Determinants and Matrices-2	2
5.	Determinants and Matrices-3	2
6.	Trigonometry-1	2
7.	Trigonometry-2	2
8.	Trigonometry-3	2
9.	Co-ordinate geometry-1	2
10.	Co-ordinate geometry-2	2
11.	Vectors-1	2
12.	Vectors-2	2
13.	Mensuration-1	2
14.	Mensuration-2	2
15.	Mensuration-3	2

Text Book:

Title	Author(s)	Publication
Advanced Mathematics for Polytechnic	Dr.N.R. Pandya	Macmillan Publication
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
Applied Mathematics for Polytechnics - 10th Edition	H. K. Dass	H. K. Dass
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 30 marks.
- MCQ based examination consists of 20 marks.

Course Outcome(s):

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

- Use Logarithm for solving mathematical problems.
- The students are expected to acquire necessary background in Trigonometry to appreciate the importance of the geometric study as well as for the calculation and the mathematical analysis.
- The students are expected to acquire necessary background in Determinants and Matrices so as to appreciate the importance of the Determinants are the factors that scale different parameterizations so that they all produce same overall integrals, i.e. they are capable of encoding the inherent geometry of the original shape.

P P Savani University
School of Engineering
Institute of Diploma Studies

Department of Applied Science & Humanities

Course Code: IDSH1020
Course Name: Engineering 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	
3	2	0	4	40	60	20	30	0	0	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:

- The student will demonstrate the ability to think in core concept of their engineering application by studying various topics involved in branch specific applications.
- The student will demonstrate the ability to use appropriate mathematical techniques and concepts to obtain quantitative solutions to problems in physics.
- In courses involving laboratory, the student will demonstrate the ability to collect and analyze data and to prepare coherent reports of his or her findings.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**SI Units & Measurements:** Need of measurement and unit in engineering and science, Definition of unit and requirements of standard unit, Systems of units- CGS, MKS and SI, Fundamental and Derived quantities and their units, Least count and range of instrument, Vernier caliper, Micrometer screw gauge, Accuracy, Precision, Error and types of error, Estimation of errors - Absolute error, Relative error and Percentage error, Rules and identification of significant figures	5	10
2.	**Motion in a Plane:** Scalar and vector quantities, Position and displacement vectors, General vectors and their notations, Equality of vectors, multiplication of vectors by a real number, Addition and subtraction of vectors, Relative velocity, Unit vector, Resolution of a vector in a plane - rectangular components, Scalar and Vector product of vectors, Motion in a plane, Cases of uniform velocity and uniform acceleration-projectile motion, Uniform circular motion	6	15
3.	**Force and Motion:** Recapitulation of equations of motion, Newton's 1st law of	6	15

	motion, Force, basic forces in motion, Gravitational force, Electrostatic force, Electromagnetic force, Nuclear force, Inertia, types of inertia, Momentum and Newton's 2nd law of motion, Impulse of force, Impulse as the product of force and time, impulse as the difference of momentum, Newton's 3rd law of motion and its examples, Law of conservation of momentum		
4.	**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, Motion in a vertical circle, Elastic and inelastic collisions in one and two dimensions	5	10
5.	**Mechanical Properties of Solids and fluids:** 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. Pascal's law and its applications (hydraulic lift and hydraulic brakes), Effect of gravity on fluid pressure, 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	8	20
6.	**Heat Transfer:** Introduction to thermodynamics, Temperature and Heat, Transmission of heat - Conduction, Convection and Radiation, Good and bad conductor of heat with examples, 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	5	10
7.	**Oscillations:** Periodic motion - time period, frequency, displacement as a function of time, Periodic functions, Simple harmonic motion (S.H.M) and its equation, Phase Oscillations of a spring-restoring force and force constant, Energy in S.H.M. Kinetic and potential energies, Simple pendulum derivation of expression for its time period, Free, forced and damped oscillations (qualitative ideas only), resonance	5	10
8.	**Waves:** Wave motion, Transverse and longitudinal waves, Speed of wave motion, Displacement relation for a progressive wave, Principle of superposition of waves, Reflection of waves, Sanding waves in strings and organ pipes, Fundamental mode and harmonics, Beats, Doppler effect	5	10

List of Practical:

Sr. No.	List of Practical	Hours
1.	To study about basic unit conversion and dimension analysis.	4
2.	To measure length and diameter of the given object using Vernier callipers.	2
3.	To measure the thickness of slit and diameter of wire with help of micrometer Screw Gauge.	2
4.	To determine the surface tension of water by capillary rise method.	4
5.	To Verify Ohm's Law by using an Ammeter & Voltmeter	2
6.	To determine the wavelength of sound produced (i) in an air column and the velocity of sound in air at room temperature using a resonance column and a tuning fork.	4
7.	To determine Young's modulus of a material of a beam by the method of bending of a beam.	4
8.	To determine the modulus of rigidity of the material of wire by dynamical method.	2
9.	To determine the value of 'g' by using a Simple Pendulum.	2
10.	Measurement of g: Use of a Kater's Pendulum.	2
11.	To measure the temperature of given material by any temperature measuring instrument.	2

Text Book:

Title	Author(s)	Publication
Basic physics for Diploma group -1	-	Atul Prakashan

Reference Books:

Title	Author(s)	Publication
Physics Part-I and II	Resnick and Haliday	Wiley EasternPublication
Concept of Modern Physics	Arthur Beiser	Tata McGrawHill
Concept of Physics	H CVerma	-
Fundamental of physics	Gomber & Gogia	Pradeep publicationsJalandhar
NCERT Physics part 1 & 2	-	NCERT

Course Evaluation:

Theory:

- Continuous Evaluation Consist of Two Test Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination will consist of 60 Marks Exam.

Practical:

- Continuous Evaluation Consist of Performance of Practical which should be evaluated out of 10 for each practical in the next turn and average of the same will be converted to 10 Marks.
- Internal Viva component of 10 Marks.
- Practical performance/quiz/drawing/test of 20 Marks during End Semester Exam.
- Viva/Oral performance of 10 Marks during End Semester Exam.

Course Outcome(s):

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

- demonstrate the ability to think in core concept of their engineering application by studying various topics involved in branch specific applications.
- demonstrate the ability to use appropriate mathematical techniques and concepts to obtain quantitative solutions to problems in physics
- demonstrate the ability to collect and analyze data and to prepare coherent reports of his or her findings.
- learn some basics of laws of motion and mechanics.
- learn measuring all properties of solid, liquid and gases which use full further study in engineering program like thermodynamics, solid mechanics soil test etc.
- identify good & bad conductors of heat and proper temperature scale for temperature Measurement.
- understand idea about waves and their propagation which is useful for further study of digital communication.

P P Savani University
School of Engineering
Institute of Diploma Studies

Department of Mechanical Engineering

Course Code: IDME1010
Course Name: Basics of Mechanical and 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	
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

- acquire an inclusive knowledge of fundamental concept of Mechanical Engineering.
- understand working of simple mechanical devices.
- study and gain significance of Mechanical Engineering in various fields.
- read and interpret the building drawing
- select different types of construction materials as per requirements

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction of Mechanical Engineering:** Introduction, Scope, Importance, Basic terminologies in mechanical engineering, Basic mechanical components used in routine, Pipe and pipe fittings, Hand tools, Power tools	02	7
2.	**Heat interactive equipment:** Heat transfer and its Modes, Boilers, Classification and Working, Concept of Accessories and Mountings – Types, Applications, Primemovers, Meaning, Classification, Steam turbine working, Layout of thermal power plant, Working and applications, Internal combustion engines – Definition, Classification, Components, Working of two-stroke and four-stroke engines, S.I. and C.I. engines	04	13
3.	**Power Transmission and Safety:** Power transmission: Importance, Modes, Types, Applications, Couplings in power transmission, Safety norms to be followed for preventing accidents.	03	10
4.	**Hydraulic and pneumatic devices:** Concept of theory of fluid flow, general properties of fluid flow, Pumps, Water turbines, and Air compressors – working principle, types, parts, performance, troubles and remedies, applications.	03	10

5.	**Manufacturing processes:** Overview of manufacturing processes, Welding concept and overview, Types, Arc and Gas welding, Accessories and Consumables, Precautions and Safety during arc and gas welding, Casting - Introduction, Applications.	03	10
6.	**Civil Engineering: An Overview** Introduction, Branches, Scope, Impact, Role of Civil Engineer, Unit of measurement, Unit conversion (Length, Area, Volume).	02	7
7.	**Civil Engineering Surveying:** Surveying & leveling (its importance and types), Necessity for leveling, Principals of surveying, Instrument/tools used for survey and level, Various methods of finding the field survey measurements, Chain and Compass Survey	05	17
8.	**Civil Engineering Drawing**: Types of building drawings, Abbreviation, conventions & symbols in civil drawing, building byelaws for planning of residential building and industrial building, Planning of simple residential and industrial building	04	13
9.	**Construction Materials**: Common construction materials such as cement, Brick, Stone, Timber, Steel and Concrete, Properties of each materials & their acceptable standards, Quality parameters of materials, Estimations and costing for simple structure (only the material cost)	04	13

List of Practical:

Sr. No.	Details of Practical	Hours
1.	Study of few selected boilers, accessories and mountings	02
2.	Numerical based on heat interactive equipment	02
3.	Study of power and motion transmission systems	04
4.	Numerical based on power transmission and safety	02
5.	Study of various pumps	04
6.	Numerical based on hydraulic and pneumatic devices	02
7.	Study and demonstration of basic machine tools	04
8.	Numerical based on manufacturing processes	02
9.	Machine parameters of wheel and differential axel apparatus	04
10.	Study and demonstration of basic mechanical equipment	04
11.	Unit Conversation Exercise	02
12.	Linear Measurement.	04
13.	Angular Measurement (Prismatic Compass)	04
14.	Angular Measurement (Surveyor Compass)	04
15.	Determine R.L of given point by Dumpy level without change point.	04
16.	Determine R.L of given point by Dumpy level with change point.	04
17.	Brick masonry bonds	04
18.	Aggregate experiments	02
19.	Brick masonry tests	02

Reference Book(s):

Title	Author/s	Publication
Elements of Mechanical engineering	P. S. Desai and S. B. Soni	Atul Prakashan
Theory of Machines	R. S. Khurmi and J. K. Gupta	S. Chand
Heat engine	Shah and Pandya	Charotar Publishing House
Hydraulic machines	Jagdish Lal	Metropolitan Book Company
Elements of Workshop	Hazara Chaudhary	Asia Publishing House
Text book on Surveying& Levelling	S. B. Junnarkar and H. J. Shah	Laxmi Publication

Course Evaluation:

Theory:

- Continuous Evaluation Consist of Two Test Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination will consist of 60 Marks Exam.

Practical:

- Continuous Evaluation Consist of Performance of Practical which should be evaluated out of 10 for each practical in the next turn and average of the same will be converted to 10 Marks.
- Internal Viva component of 10 Marks.
- Practical performance/quiz/drawing/test of 20 Marks during End Semester Exam.
- Viva/Oral performance of 10 Marks during End Semester Exam.

Course Outcome(s):

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

- Understand basics of mechanical systems
- Understand importance of mechanical systems/engineering in various fields.
- Understand various surveying methods used in civil engineering
- Understand basic requirements of civil engineering

P P Savani University
School of Engineering
Institute of Diploma Studies

Department of Computer Engineering

Course Code: IDCE1010
Course Name: Computer Applications
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	04	00	05	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE :End Semester Exam

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

- Familiarize with components of computer and basic operations of it.
- Provide practical and hands-on experience of application used to create documents.
- Introduce internet and its usage.

Course Content:

Module No.	Content	Hours	Weightage in%
1.	**Basics of Computer System** Introduction and Characteristics, Generation, Classification, Applications, describe computer hardware and software, Identify I/O, Devices, describe functioning of CU, ALU and memory unit, differentiate various types of printers, Demonstrate various file handling operations, Introduction to Memory, Memory hierarchy, Primary memory and its type, Secondary memory, Classification of Secondary memory, Cache Memory and Virtual Memory.	08	20
2.	**Computer Software** Software concept Classification of Software, System software and Application Software, Overview of Operating System, Objectives and Functions of O.S, Types of Operating System, Batch Processing, Multiprogramming, Time Sharing OS, Features of DOS, Windows and UNIX, Programming Languages, Compiler, Interpreter, Computer Virus Different Types of computer virus, Detection and prevention of Virus Application of computers in different Domain. Installation of device drivers and other required software, need and method of backup.	08	15
3.	**Using MS-Word**	07	15

	Use basics text formatting features, manipulate text, use page Setup features, use spell and grammar utility, Work with graphics/ clipart, Create and manipulate table, use auto shapes and its formatting with text, Use Image and table formatting.		
4.	**Using MS-Excel** Use basic formatting and data entry features, use formula and functions, Work with graphics, Create and manipulate charts, Use header and footer options, Setup page layout and print worksheet	07	20
5.	**Using MS - PowerPoint** Create new presentation and apply basic formatting features, use master slide, Create and manipulate table, Work with objects and clips, Work with video, Work with audio, use special effects, Use navigation and hyper linking, Custom Animation and Transitions	07	15
6.	**Multi Media, Internet usage and Google Applications** Introduction of Multimedia, Types of Multimedia, and Use of Multimedia in various platforms, Describe Internet, WWW and Web Browsers: Web Browsing software, Surfing the Internet, Chatting on Internet, Basic of electronic mail, Using Emails, Document handling, Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Network Components: Severs, Clients, Communication Media. Introduction of Google Applications, Gmail, Google Drive, Docs, Spreadsheet	08	15

List of Practical(s):

Sr.No	List of Practical	Hours
1.	Introduction to different hardware components of PC and Assembling of PC.	02
2.	Installation of OS and other Software. Partitions of Drive, Compression Utilities: WinZip, Defragmenting Hard, Formatting Hard disk, etc.	04
3.	Use accessories utilities of windows OS the User Interface, Using Mouse and Moving Icons on the screen, The My Computer Icon, The Recycle Bin, Status Bar, Start and Menu & Menu-selection, Running an Application, Windows Explorer Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows, Control Panels, Setting the date and Sound, Create Users and password.	02
4.	Entering and editing text in document file. Apply formatting features on Text like Bold, Italics, Underline, font type, color and size, Apply features like bullet, numbering in Microsoft word.	04
5.	Create and manipulate tables, create documents, insert images, format tables, Smart art, Chart in Microsoft word, Insert Hyperlink, Page number and textbox in word.	04

6.	Create Event Registration Form and Resume in Microsoft word.	04
7.	Entering and editing data in worksheet, Fill Series, fill with formatting and without formatting Using Microsoft Excel.	02
8.	Create and manipulate Charts, Shape, Sparkline Charts, Clipart, and table.	04
9.	Filter Data Using Filter and advanced filter function with more than 2 conditions, Freeze row & Column in Microsoft Excel.	02
10.	Create Mark sheet, and Pay slips using Excel, Apply various formula and functions in the sheet.	06
11.	Print sheet using print area, Page setting, print titles, Adjusting margins, Page break, headers and footers.	02
12.	Basic operations of Power point, Create PPT and inset and delete slides in power point, Use of Master Slide in Presentation, Create Project presentations, Lecture presentations, Apply Custom animation & Transition. Apply basic formatting features in presentation like font, font size, font color, text fill, spacing and line spacing Formatting text boxes, word arts, styles bullet and numbering in Microsoft power point. Working with drawing tools, applying shape or picture styles, Applying object borders, object fill, object effects in Microsoft Power point.	16
13.	Working with video, Link to video and sound files using power point.	02
14.	Internet Searching, Browsers, Various functions of Browsers (Eg. Bookmark, Customize Settings), Study of components like switches, bridges, routers, Wi-Fi router,	02
15.	Introduction of Google application, Compose Gmail, File attachment, add signature.	02
16.	Demonstration of Google drive, Sharing File Using Google drive, Spreadsheet, Docs and Google slides	02

Reference Book(s):

Title	Author/s	Publication
Computer Course	R.Taxali	Tata McGraw Hills. New Delhi.
MS-Office for Dummies	Wallace Wang	Wiley India, New Delhi
Basic Computer Engineering	Petes S.J.,Francis.	TataMcGraw-Hill Education,2011

Web Material Link(s):

- http://www.digimat.in/nptel/courses/video/106104128/L01.html
- https://www.youtube.com/watch?v=3QiItmIWmOM

Course Evaluation:

Theory

- Continuous Evaluation Consist of two Tests 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 will consist of 60 Marks Exam.

Practical

- Continuous Evaluation Consist of Performance of Practical which should be evaluated out of 10 for each practical in the next turn and average of the same will be converted to 20 Marks.
- Internal Viva component of 20 Marks.
- Practical performance/quiz/test of 30 Marks during End Semester Exam.
- Viva/Oral performance of 30 Marks during End Semester Exam.

Course Outcome(s):

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

- Design assembles and disassemble computer component.
- Use MS Office software for word-processing, data analysis and preparing presentation.
- Use Internet and Google Application for better documentation.

P P Savani University
School of Engineering
Institute of Diploma Studies

Department of Mechanical Engineering

Course Code: IDME1020
Course Name: Engineering Workshop
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	00	01	00	00	50	00	00	00	50

CE: Continuous Evaluation, ESE: End Semester Exam

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

- Understand basic know-how of various hand tools and their use in different sections of manufacturing
- Understand the use of workshop practices in day to day industrial as well domestic life that help to dissolve the routine problems
- Build the understanding of the complexity of the industrial job, along with time and skills requirements of the job
- Learn about the safety measures to be taken while working in workshop.
- Learn about operation wise tool selection.

Course Content:

Module No.	Content	Hours
1.	**Introduction and Demonstration of Safety Norms and various shops:** Introduction to various shops / sections and workshop layouts, Safety norms to be followed in a workshop.	-
2.	**Fitting shop:** Introduction of fitting shop, Safety, Making a job as per drawing including marking and performing other operations	-
3.	**Carpentry shop:** Introduction of carpentry shop, Safety, Making a job as per drawing including marking and performing other operations	-
4.	**Smithy shop:** Introduction of smithy shop, Safety, Making a job as per drawing including marking and performing other operations	-
5.	**Sheet metal shop:** Introduction of sheet metal shop, Safety, Making a job as per drawing including marking and performing other operations	

6.	**Pipe fitting:** Introduction of pipe fitting shop, Safety, understanding various pipe fitting tools and performing operations	-
7.	**Machine Shop:** Introduction and demonstration of various machines likeLathe, Drilling, Grinding, Hack Saw Cutting etc.	-

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.	04
3.	To Perform a Job of Carpentry Shop.	06
4.	To Perform a Job of Black Smithy shop.	06
5.	To Perform a Job of Sheet metal Shop.	04
6.	To Perform a Job of Plumbing Shop	04
7.	Introduction to Machine Tool	04

Reference Book(s):

Title	Author/s	Publication
Workshop Technology-I	Hazra and Chaudhary	Media promoters & Publisher private limited.
Workshop practice manual	K.Venkata Reddy	B.S.Publications
Mechanical workshop practice	K.C. John	PHI

Course Evaluation:

Practical:

- Continuous Evaluation Consist of Performance of Practical which should be evaluated out of 10 for each practical in the next turn and average of the same will be converted to 20 Marks.
- Internal Viva component of 20 Marks.
- Practical performance/quiz/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 able to

- Understand basic know-hows of tool usage and safe working in workshop.
- Correlate industrial workings.
- Develop skills to work in industry.

SECOND YEAR
DIPLOMA ENGINEERING

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

INSTITUTE OF DIPLOMA STUDIES

TEACHING & EXAMINATION SCHEME FOR DIPLOMA ENGINEERING SECOND YEAR CHEMICAL ENGINEERING PROGRAMME

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	IDCH2010	Fluid Flow Operation	CH	3	4	0	7	5	40	60	40	60	00	00	200
	IDCH2021	Industrial Stoichiometry	CH	2	0	2	4	4	40	60	00	00	00	00	100
	IDCH2030	Chemical Process Technology	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2040	Industrial Safety & Environmental Engineering	CH	1	2	0	3	2	00	00	20	30	00	00	50
	IDCH2050	Chemical Engineering Thermodynamics	CH	3	0	2	5	5	40	60	00	00	50	00	150
	IDME2010	Basic Engineering Drawing	ME	2	4	0	6	4	50	00	40	60	00	00	50
						Total	**28**	**22**							**750**
4	IDCH2060	Mass Transfer-I	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2070	Instrumentation	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2081	Plant Utilities & Energy Engineering	CH	2	0	0	2	2	40	60	00	00	00	00	100
	IDCH2090	Mechanical Operation	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2100	Process Heat Transfer	CH	2	4	0	6	4	40	60	40	60	00	00	200
	IDCH2110	Fertilizer Technology	CH	2	4	0	6	4	40	60	40	60	00	00	200
						Total	**26**	**22**							**900**

P P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2010
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	05	15

	tube: Construction, Principle and Working. Nozzle meter: construction, principal working, derivation for calculating flow rates.		
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

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 completion of the course, the student will be able to

- understand the relevance of fundamentals and applications of chemical sciences and chemistry.
- have sound knowledge on Electrochemistry.
- be aware about the role of chemical engineer in various chemical industries.

P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2021
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	00	00	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	04	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.	06	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.	06	15
4.	**Material Balance in Processes Without Chemical Reactions:** Law of conversation of mass, brief description and simple material balance calculation of drying, distillation,	08	15

	absorption, mixing, crystallization, evaporation, single stage material balance calculation of leaching and extraction, brief idea regarding recycling and by-passing operation.		
5.	**Material Balance in Processes Involving Chemical Reactions:** 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.	07	15
6.	**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	08	20
7.	**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.	06	10

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 completion of the course, the students will able to

- Determine material and energy balance for different unit operations and processes.

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**	05	25

	Different pulping process, Manufacturing of paper, Role of additives, Various engineering problems encountered in paper industry. Pollution abatement in pulp and paper industry.		
6.	**Polymer Industry** Types of polymer, polymerization process, manufacture of polyethylene, styrene nylon6, nylon 66, rayon. Manufacture of rubber	05	15

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 completion of the course, the student will be able to

- understand the relevance of fundamentals and applications of chemical sciences and chemistry.
- have sound knowledge on Electrochemistry.
- be aware about the role of chemical engineer in various chemical industries.

P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2040
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	
1	0	0	1	00	00	20	30	0	0	50

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.	**General Introduction & Concept of Safety:** Safety of organization, Safety measures Concept &Importance of safety in chemical industries.	01	10
2.	**Chemical & Fire Hazards & their Control:** Definition, sources & classification of hazards like chemical, fire, Different methods for controlling chemical & fire hazards, Objective & importance of fire prevention, fire extinguishing agents & devices with their working.	04	25
3.	**Personal Protective Devices:** Protective devices for head, ears, eyes, face, respiratory system, hand, feet etc.	01	10
4.	**Introduction to pollution:** Introduction to environmental pollution, sources of pollutants, effects of pollution on human health, vegetation, animal life & effect on environment.	02	15
5.	**Air Pollution:** Sources & Types of air pollutant, classification, properties of air pollutant, effect of air pollution, Air pollution control methods like gravitational settling, Diffusion, Electrostatic precipitation, Centrifugal impaction, Direct interception etc.	03	20

6.	**Water pollution:** Introduction, characterization of water, BOD, COD, VM, SM, classification of sources.	02	10
7.	**Solid waste of disposal methods:** Sources of classification, Methods of disposal like dumping, sanitary land filling, incineration, composting etc.	02	10

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:

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.
- 30 marks for the Report submission based on technical visit at one chemical industry.

Course Outcome(s):

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

- understand different types of pollution caused due to industrialization.
- Understand various safety related issues and their corrective solutions.
- have knowledge of different Acts and rules about the environmental protection.

P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2050
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	
3	0	2	4	40	60	00	00	50	0	150

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

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.

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 completion of the course, the student will be able to

- Know about basic concepts of thermodynamics.
- Understands laws of thermodynamics.
- Understand the application of laws of thermodynamics.
- Know about the phase equilibrium.

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	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	04	00	06	50	00	100	00	00	00	150

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	05	15

	and arcs shape only		

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, the student will able to

- know and understand “Drawing is a language of Engineers.
- interpret general assembly technical drawing.
- create traditions and the strategies for Engineering Drawing.
- evaluate basic and intermediate geometry.

- apply the knowledge of principles of projections.
- develop their hallucination/imagination skills.
- enhance their technical communication skill in the form of talkative drawings.

P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2060
Course Name: Mass Transfer - I
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:** Importance of mass transfer operations, classification of mass-transfer operations, methods of conducting mass transfer operations and fundamental design principles.	02	10
2.	**Molecular Diffusion Of Fluids:** Concept of molecular and eddy diffusion, Fick's law for diffusion, general equation for steady-state molecular diffusion in fluid within laminar flow, thermal diffusion, simple problems on diffusion by direct use of formula.	05	15
3.	**Inter phase Mass Transfer:** Concept of equilibrium, local and average overall mass transfer coefficient, film theory, penetration theory, analogy between mass and momentum transfer and concept of stage, stage efficiency, cascade etc.	05	20
4.	**Gas Absorption:** Definition and application of absorption, equilibrium solubility of gases in liquids, effect of temperature and pressure on solubility, characteristics of ideal liquid	06	20

	solutions of Raoult's law, choice of solvents, material balance for the component transfer in countercurrent and concurrent flow, concept of HETP and simple problems on absorption.		
5.	**Liquid-Liquid Extraction:** Definition and application of liquid extraction, liquid equilibrium for three component system, equilibrium triangular coordinates, system of three liquids one pair partially soluble, effect of temperature and pressure on the solubility curve, choice of solvents for the operation, simple problems using direct formula.	05	15
6.	**Leaching:** Definition and industrial application of leaching, preparation of solid, methods of operations and equipment for in place leaching and heap leaching, shanks system, filter press leaching and equipment like Rotacel, Kennedy extractor and Balloman extractor.	04	10
7.	**Equipment for Gas-Liquid Operation:** Construction and working of gas dispersed equipment like bubble column (Sparged vessel), agitated vessel, tray tower etc. and liquid dispersed equipment like venturi scrubbers, wetted wall column, spray tower, packed tower and comparison between tray and packed tower.	03	10

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. CCl4) 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 completion of the course, the students will able to

- familiar with the basic phenomenon of mass transfer involving phases.
- understand the various types of unit operations such as diffusion, leaching, absorption etc.
- solve problems in absorption using theory of mass transfer as applied to absorption columns.
- understand main categories of equipment for gas/liquid mass transfer.

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

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):

The course taught should be able to develop required skills in students so that they are able to acquire competency in operating different utility plants and various types of instruments.

P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2081
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	1	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 a. Solid : Coal, Lignite, Coke b. Liquid : Gasoline, Kerosene, Naphtha, Fuel oil, Diesel c. 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	07	20

	Biomass energy : Introduction, Biomass conversion technology by wet & Dry process Geothermal energy: Introduction & Sources of geothermal energy. 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

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 completion of the course, the students will able to

- Learn different conventional and non-conventional fuels available.
- able to know the futuristic scope of renewable energy source and their applications.
- learn about the overall knowledge about the process plant.
- understand the importance of process auxiliaries and utilities in process industries.
- learn the conceptual design of chemical process plant.
- build a bridge between theoretical and practical concepts used for process auxiliaries and utilities in any process industry.

P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2090
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 in solid.	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, Work index.	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

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 completion of the course, the student will be able to

- understand the basic principles of particles preparation and their characterization.
- have an understanding of solid storage and their conveying in chemical process industries.
- have an understanding of design of sedimentation tanks and other solid fluid separation equipment.
- have knowledge about different size reducing equipment and power requirements during size reduction.
- develope an ability to design chemical engineering processes while including economic safety, environment and ethical consideration.

P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2100
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.	**Modes of Heat Transfer** Conduction, Convection, Radiation, concept of steady state and unsteady state heat transfer.	05	10
2.	**Conduction** Fourier's law of heat conduction, thermal conductivity of materials – solids, liquids and gases and effect of temperature on thermal conductivity, one dimensional steady state heat conduction through a plane wall, composite wall and cylinder, multi-layer cylinder. Insulation and insulating materials, critical thickness of insulation.	05	15
3.	**Convection** Natural and forced convection, dimensional analysis and significance of various dimensional groups such as Reynolds number, Prandtl number, Nusselt number,	05	15

	Grasshof number, Stanton number. Peclet number, empirical correlations for free and forced convection. Dittus Boelter's equation, Sieder Tate Equation, simple numerical problems using Dittus Boelter equation, Sieder Tate equation.		
4.	**Radiation** Reflection, absorption and transmission of thermal radiation, Emmisive power, Wein's displacement law, Stefan Boltzmann Law, Planck's law, Kirchhoff's law, Concept of black body, Grey body.	04	10
5.	**Heat Exchanger** Introduction, classification, individual and overall heat transfer coefficient, fouling factor, roughness of surfaces and their effect, LMTD for parallel and counter current heat exchangers, construction and description of:- Concentric double pipe, Shell and tube (1-1 heat exchanger and 1-2 heat exchanger), Plate type heat exchanger.	04	20
6.	**Boiling and condensation** Interface, bubble and film boiling, boiling regime, Concept of condensation, types of condensation i.e. drop wise and film wise condensation.	02	15
7.	**Evaporators** Evaporation Capacity, Evaporation Economy, construction and description of open pan, long type vertical evaporator, falling film evaporator and agitated thin film evaporator, multiple effect evaporator, feeding arrangements- forward, backward, mixed and parallel feed.	05	15

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 completion of the course, the student will be able to

- Understand basic laws of heat transfer
- Analyze problems involving steady heat conduction in simple geometries.
- Understand the concept of convective heat transfer and to analyze the problems
- involving heat transfer coefficients for natural and forced convection
- Analyze heat exchanger performance using LMTD and use it for parallel or counter flow
- Recognizer various type of heat exchanger working principle, and basic geometries of heat exchanger.

P P Savani University

Institute of Diploma Studies

Department of Chemical Engineering

Course Code: IDCH2110

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	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

- 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** Synthetic fertilizers, Classification of fertilizers, Role of essential Elements in plant Growth, Macro elements and Micro elements, Application of fertilizers considering Nutrient, Balance and types of crop	05	15
2.	**Nitrogenous Fertilizers** Ammonia: Physical, chemical properties and applications, Synthesis gas by Catalytic partial oxidation Steam Hydrocarbon reforming, Manufacturing of ammonia by Linde Ammonia concept process, Storage and Transportation of Ammonia, Nitric acid: Chemical, physical properties and applications, Manufacturing of Nitric Acid by Pressure ammonia oxidation process and Intermediate pressure ammonia oxidation process, Urea : Physical, chemical properties, Manufacturing of Urea by Stamicarbon's CO2 stripping process, Manufacturing of Ammonium nitrate by Prilling process.	10	30

3.	**Phosphatic Fertilizer** Physical, chemical properties and applications of Phosphorus and Phosphoric acid, Manufacturing of elemental phosphorous by Electric furnace method, Manufacturing phosphoric acid by Wet Process, Strong Sulphuric Acid Leaching Hydrochloric Acid Leaching Electric Furnace Process.	05	15
4.	**Potassic Fertilizers** Physical, chemical properties and uses of Potassium Chloride, Potassium nitrate, Potassium sulphate, Manufacturing of potassium chloride from sylvinite, Preparation of Potassium nitrate, Potassium sulphate	05	20
5.	**Complex Fertilizer and Bio Fertilizer** Manufacturing of NPK, Ammonium Sulphate Phosphate (ASP), Calcium Ammonium Nitrate(CAN), Types of Biofertilizers, Biofertilizers Nitrogen-fixing biofertilizers Phosphate-solubilizing biofertilizers, Preparation of a biofertilizers	05	20

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 completion of the course, the student will be able to

- Use reactions and unit operations steps in manufacturing of various fertilizers.
- Characterize fertilizers on the basis of different properties.
- Identify engineering problems in fertilizer manufacturing.
- Handle the fertilizers.
- Select appropriate synthesis fertilizer.