Veermata Jijabai Technological Institute (V.J.T.I)

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Programme: Diploma in CHEMICAL ENGINEERING (DCHE) **Semester: IV** **Implemented from: 2017**

COURSE CODE	COURSE	GR	TEACHING SCHEME (HRS/WK)				EXAMINATION SCHEME												
			L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
								Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
175EX41	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	C	4	-	2	6	3	80	32	20	100	40	-	-	-	-	25	10	125
175CH42	ORGANIC CHEMICALS MANUFACTURING	C	4	-	3	7	3	80	32	20	100	40	50*	20	-	-	50	20	200
175CH43	FLUID FLOW OPERATION	C	3	-	3	6	3	80	32	20	100	40	50*	20	-	-	50	20	200
175CH44	CHEMICAL ENGINEERING THERMODYNAMICS	C	3	2	-	5	3	80	32	20	100	40	-	-	-	-	25	10	125
175CH45	PLANT UTILITIES	C	4	-	-	4	3	80	32	20	100	40	-	-	-	-	--	-	100
175CH46	PROFESSIONAL PRACTICES (PERSONALITY DEVELOPMENT)	C	-	2	-	2	-	-	-	-	-	-	-	-	-	-	25	10	25
	TOTAL		18	4	08	30	-	400	-	100	500	-	100	-	-	-	175	-	775

Abbreviations: B – Basic; C – Core; A – Applied; M – Management; L – Theory Lecture; T – Tutorial; P – Practical; TH – Theory Paper; IST – In-Semester Test; PR – Practical Exam; OR – Oral Exam; TW- Term Work.

*** Indicates assessment by External Examiner**

NOTE: a) During Summer Break after IV semester (i.e. between IV and V Semester), students have to undergo mandatory 6 weeks industrial training in large or medium scale industries relevant to the branch or discipline of engineering. This training would be evaluated during V semester.

b) Students have to prepare report of training, which will be evaluated during V semester.

Curriculum Coordinator	Head	Dean - Diploma
	Diploma in CHEMICAL ENGINEERING (DCHE)	

T & A Chemistry Department

DIPLOMA PROGRAMME	: DIPLOMA IN CHEMICAL ENGINEERING
PROGRAMME CODE	: DCHE
SEMESTER	: FOURTH
COURSE TITLE	: BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING
COURSE CODE	: 175EX41

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
4	-	2	6	3	80	32	20	100	40	-	-	-	-	25	10	125

Course Objectives:

1. Understand basic laws and definitions of electric fundamentals.
2. Understand the concept and principle of A.C. fundamental.
3. Select and describe basic electronic circuit components for various applications.

Course Outcomes:

Student should be able to

CO1	To understand principles and laws used in basic electrical engineering.
CO2	To understand the basic principles of ac and dc fundamentals.
CO3	To understand the working of different electrical machines and their applications.
CO4	To understand the working of electronic components & their applications.

Course Content:

SECTION-I								
Unit & Sub-Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Electrical terminologies and fundamentals**	12	10	1	60%	20%	20%
	1.1	Atom and Atomic structure, Electrons and Protons, Electronic drift velocity						
	1.2	Electric charge: Electron charge, Charge velocity and velocity of field propagation, electron current and conventional current.						
	1.3	Potential Difference and EMF: Idea of electric potential. Potential difference and emf , Work, Power and Energy						
	1.4	Resistance, Ohm's Law, Series Circuit, Parallel Circuit and Kirchhoff laws for mesh analysis and Node analysis of simple electric circuits						
	1.5	Working principal of inductor and capacitor						

2		**A.C Fundamental**	8	10	2	60%	20%	20%
	2.1	Definition of Alternating Current and Voltage Terms related with alternating quantity						
	2.2	R.M.S value, average value						
	2.3	Balanced star and delta connection. Their voltage current and power relationships.						
	2.4	Phasor representation of ac quantities						
3		**Magnetism and Electromagnetism**	8	10	2	20%	40%	40%
	3.1	Magnetism: Absolute and Relative Permeabilities of a Medium, Laws of Magnetic Force, Magnetic field strength, Flux & Flux Density.						
	3.2	Electromagnetism: Production of induced emf and current, Faraday's Laws of Electromagnetic Induction, Lenz'sLaw, statically & dynamically , Induced emf, self inductance, mutual inductance, coupling coefficient.						
4.		**AC and DC Motors**	8	10	3	20%	40%	40%
	4.1	Types of DC Motors - Shunt, Series, Compound, their working, speed torque characteristics and applications.						
	4.2	Types of AC Motors – Single phase Induction motor &three phase Induction motor, their working, speed torque characteristics and applications						
	4.3	Stepper Motor – working principle and applications						
		SECTION-II						
5		**Diodes**	10	15	4	20%	60%	20%
	5.1	Review of Intrinsic & Extrinsic Semiconductor materials. P type & N type Semiconductor materials.						
	5.2	Construction of Germanium & Silicon PN junction diodes, Forward and Reverse current/voltage characteristics of diode. Temperature effect on diode.						
	5.3	Application of diode in Half wave & Full wave rectifier (Center Tap Transformer & Bridge type) circuits. Formula for average load voltage & current (no derivation)						
	5.4	Light Emitting Diodes (LED) working, forward characteristics& applications. Seven segment display application						
	5.5	Photodiode construction and application						
6		**Bipolar Junction Transistor**	10	15	4	20%	60%	20%
	6.1	Construction of PNP & NPN type of BJT.						
	6.2	Common Base, Emitter & Collector configurations						
	6.3	Input and output characteristics of CE configuration.						
7		**Digital Electronics**	8	10	4	40%	40%	20%
	7.1	Study of logic gates (AND, OR, NOT, NOR, NAND)						
	7.2	Symbols and truth table.						
		Total	**64**	**80**				
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).								

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

List of Practicals:

Sr.No.	Practicals	Approx. Hours	CO
1	To verify Kirchhoff's Current and Voltage Laws.	02	1
2	To observe and study construction details of Transformer, DC Motors, Induction Motors.	02	3
3	To perform load test on single phase transformer and calculate its efficiency	02	3
4	To perform speed control of dc shunt motor.	02	3
5	To perform speed control of three phase slip ring induction motor.	02	3
6	To plot forward and reverse voltage/current characteristics of Germanium and Silicon diode.	02	4
7	To measure average load voltage and current for half wave and full wave rectifier circuits.	02	4
8	To provide capacitor filter for half wave and full wave rectifier circuits	02	4
9	To plot forward V/I characteristics of Red, Green, Yellow & Blue LED's	02	4
10	Use of Common Emitter Bipolar Junction Transistor in Voltage Amplifier	02	4
11	Use of Common Emitter Bipolar Junction Transistor as a Switch.	02	4
* Minimum 8 practical/experiment sessions to be included in a course in a term			

Books: -

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	B.L.Thereja	Fundamentals of Electrical Engineering and Electronics	S Chand Publications
2	J.B.Gupta	Basic Electrical & Electronics Engineering	S. K. Kataria & Sons Publications

Reference books:

Sr. No.	Author	Title	Publisher and Edition
1	Vincent Del Toro	Electrical engineering Fundamentals	PHI
2	D P Kothari, Mahima Jain, Shefali Jagwani	Electrical and Electronics Materials	Alpha Science International Limited, 2015

Curriculum Coordinator **Head** **Dean – Diploma**

Diploma in CHEMICAL ENGINEERING

DIPLOMA PROGRAMME	: DIPLOMA IN CHEMICAL ENGINEERING
PROGRAMME CODE	: DCHE
SEMESTER	: FOURTH
COURSE TITLE	: INDUSTRIAL ORAGANIC CHEMISTRY
COURSE CODE	: 175CH 42

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
4	-	3	7	3	80	32	20	100	40	50	20	-	-	50	20	200

Course Objectives:
1. To understand properties of organic compounds.
2. To understand manufacturing methods of organic compounds.

Course Outcomes:
Student should be able to

CO 1	Understand flow sheets used in process industry for the manufacturing of organic chemicals.
CO 2	Know the reaction mechanism of types of organic reactions.
CO 3	Demonstrate safe and proper use of chemicals, glass wares and equipments through laboratory experiments.

Course Content:

SECTION-I								
Unit & Sub -Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Manufacturing of Natural products**	8	10	1	40%	40%	20%
	1.1	Manufacturing process of starch from Maize and Dextrin by starch hydrolysis method with flow sheet.						
	1.2	Introduction of fermentation process. Manufacturing of ethanol by fermentation of molasses with flow sheet, major engineering problems. Manufacturing of Beer and wine						
2		**Oil and Fats Industry:**	10	10	1	40%	40%	20%
	2.1	Method of extracting vegetable oils by mechanical and solvent extraction, flow sheet and process description.						
	2.2	Soaps and Detergents: Distinction between soaps and detergents.						
	2.3	Different additives and their role in soaps and detergents.						
	2.4	Continuous hydrolysis and saponification process						
	2.5	Flow sheet for continuous process for fatty acids, soap and glycerine.						
	2.6	Manufacture of detergent.						
3		**Nitration**	8	8	2	40%	40%	20%
	3.1	Introduction to nitration processes, Nitrating agents						
	3.2	Kinetics and mechanism of nitration of paraffin hydrocarbons						

	3.3	Kinetics and mechanism of nitration of Benzene						
	3.4	Kinetics and mechanism of nitration of Chlorobenzene						
	3.5	Kinetics and mechanism of nitration of Acetanilide						
	3.6	Continuous and batch nitration of tolune						
4		**Sulphonation**	10	12	2	40%	40%	20%
	4.1	Introduction-sulophonating agents, Chemical and physical factors in sulphonation, Kinetics and mechanism of sulphonation reaction,						
	4.2	commercial sulfonation of benzene, naphthalene, alkyl benzene						
	4.3	Batch vs. continuous sulfonation.						
	4.4	Halogenations -kinetics of halogenations reactions. Reagents for halogenations,						
	4.5	Halogenations of aromatics-side chain and nuclear halogenations						
	4.6	Commercial Manufacturing process for chlorobenzenes, chloral, monochloractic and chloromethane, dichloroflouromethane						
		SECTION II						
5		**Hydrogenation**	8	10	2	40%	40%	20%
	5.1	Introduction, catalysts for hydrogenation reactions,						
	5.2	Hydrogenation of vegetable oil						
	5.3	Manufacturing of methanol from carbon monoxide and hydrogen, catalytic reforming.						
6		**Alkylation**	6	10	2	40%	40%	20%
	6.1	Introduction, types of alkylation, alkylating agents, mechanism of alkylation reactions						
	6.2	Manufacture of phenyl ethyl alcohol and ethyl benzene.						
7		**Esterification**	6	10	2	40%	40%	20%
	7.1	Introduction, esterification by organic acids, by addition of unsaturated compounds, esterification of carboxy acid derivatives						
	7.2	Commercial manufacture of ethyl acetate, vinyl acetate and cellulose acetate.						
8		**Amination (By Reduction)**	8	10	2	40%	40%	20%
	8.1	Introduction, methods of reduction, metal and acid, catalytic sulfide, electrolytic, metal and alkali sulfites, metal hydrides, sodium metal, conc. Caustic oxidation-reduction						
	8.2	Commercial manufacture of aniline, m-nitroaniline, p-aminophenol.						
	8.3	Aminolysis: Introduction, aminating agents, factors affecting.						
		Total	**64**	**80**				
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).								

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

List of Practicals:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	2	To find out the acid value of given oil	3	1, 3
2	2	To find out the saponification value of given oil.	3	1, 3
3	2	To find out the penetration of different soap cakes	3	1, 3
4	2	To find out the refractive index of sugar solution by refractometer.	3	1, 3
5	3	To carryout Nitration reaction	3	2, 3
6	4	To carryout Halogenation reaction	3	2, 3
7	4	To carryout Sulphonation reaction	3	2, 3
8	8	To carryout Amination reaction	3	2, 3
9	5	To carryout Hydrolysis reaction	3	2, 3
* Minimum 8 and maximum 12 practicals/experiment sessions to be included in a course in a term.				

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	G. T. Austin	Shrews Chemical Process Industries	McGraw Hill Publications, 5th edition
2	G. N. Pandey	Textbook of Chemical Technology - Vol. 2	Sangam Books Limited, 2nd edition
3	K.A. Gavhane	Chemical Process and Equipment Design	Nirali Publication

Reference books:

Sr. No.	Author	Title	Publisher and Edition
1	Klaus Weissermel, Hans-Jürgen Arpe	Industrial Organic Chemistry	Wiley International, 4th edition
2	Jacob A. Moulijn, Michiel Makkee, Annelies E. van Diepen	Chemical Process Technology	Wiley International
3	Lewis Hatch, Sami Mater	From Hydrocarbons to Petrochemicals	Gulf Publication Company
4	M. Gopala Rao, Marshell Sittig	Dryden's Outline of Chemical Technology	East West Press Publication

Curriculum Coordinator **Head** **Dean – Diploma**

Diploma in CHEMICAL ENGINEERING

DIPLOMA PROGRAMME	: DIPLOMA IN CHEMICAL ENGINEERING
PROGRAMME CODE	: DCHE
SEMESTER	: FOURTH
COURSE TITLE	: FLUID FLOW OPERATION
COURSE CODE	: 175CH 43

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	6	3	80	32	20	100	40	50	20	-	-	50	20	200

Course Objectives:

1. To understand the principle and working of different fluid flow machinery.
2. To be able to install and calculate the flow rate of fluid with different flow meters in closed pipe line.
3. To gain the knowledge of different flow control devices and different valves for different types of fluids and different flow situations.

Course Outcomes:

Student should be able to

CO 1	Understand the basic concept of fluid mechanics, burnollies equation, raynolds number.
CO 2	Understand different types of flow regimes, velocity profiles, friction factor and calculation of pressure drop.
CO 3	Know different types of pumps, working principle, calculation power required for pumps (application of burnollies equation), pipe fittings.
CO 4	Understand different types of flow measurement equipments, calculation of flow rate and design of pipes and meters to monitor.

Course Content:

SECTION-I								
Unit & Sub-Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Introduction of Fluid Mechnics**	12	20	1	40%	40%	20%
	1.1	Properties of fluids a) Density & viscosity (absolute & kinematic) b) Vapor pressure & surface tension c) Principle of Hydrostatic Equilibrium						
	1.2	Manometers- Types (U, Inclined, Differential), Equations, Uses						
	1.3	Types of fluids a) Ideal & Actual fluids, b) Compressible & Incompressible Fluids c) Newtonian & Non-Newtonian fluids including time dependent & time Independent fluids						
2		**Transportation of Fluids**	12	20	3	40%	40%	20%
	2.1	Centrifugal Pump: Parts of centrifugal pump, Working of Centrifugal pump, Performance of centrifugal pump (Characteristics of centrifugal pump), Characteristics curves, priming						

	2.2	Developed Head, Cavitations, NPSH Priming.						
	2.3	Positive displacement reciprocating pumps based on pressure component & based on action of piston/plunger, their construction & working						
	2.4	Gear pump, its construction & working						
	2.5	Diaphragm pump, its utility, construction & working						
	2.6	Fans, blowers & compressors & their applications						
	2.7	Blowers & Compressors, Reciprocating & centrifugal compressors, Vacuum Pumps, jet ejectors, its working & applications						
		SECTION II						
3		**Flow of Fluids (Incompressible)**	16	25	1,2,4	40%	40%	20%
	3.1	Equation of continuity, Calculation of mass flow rate, volumetric flow rate, average velocity & mass velocity						
	3.2	Bernoulli's equation for ideal fluid, actual fluid & with pump work done. Correction in Bernoulli's equation						
	3.3	Reynolds experiment & its significance in determining turbulent, laminar & transition regime						
	3.4	Concept of Boundary layer, Boundary layer formation in straight tubes						
	3.5	Form friction & skin friction: Relationship between pressure drop, wall shear & shear stress						
	3.6	Laminar flow in circular pipe. Relationship between maximum & average velocity in laminar flow. The Hagen-Poiseuille equation.						
	3.7	Friction in pipe, Fanning's friction factor, the standard friction factor chart. Friction losses due to sudden expansion/reduction of pipe & in pipefittings. Definition of equivalent length of pipe fittings.						
	3.8	Measurement of fluid flow with the help of flow meters a) Venturimeter: Construction, Principle, Working, Coefficient of discharge, Calibration, Derivation for calculating the flow rates. b) Orifice meter: Construction, Principle, Working, Coefficient of discharge, Calibration, Derivation for calculating the flow rates. c) Rotameter: Construction, Principle, Working, Calibration. d) Pitot tube: Construction, Principle, and Working. e) Measurement of flow in open channels with help of notches (V- notch, square-notch).						
4		**Pipe, fittings & valves**	08	15	3	40%	40%	20%
	4.1	MOC						
	4.2	Standard sizes of pipes, wall thickness, Schedule number						
	4.3	Joints & fittings Gate valve, Globe valve, Ball valve, Needle valve, NRV, Butterfly valve, Diaphram Valve						
		Total	**48**	**80**				
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).								

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

List of Practicals:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	3	Determination of coefficient of discharge of venturi meter & plot a calibration curve	3	4
2	3	Determination of coefficient of discharge of orifice meter & plot a calibration curve	3	4
3	3	To calibrate a rotameter for different liquids & plot the calibration curve.	3	4
4	3	To perform experiment on Bernoulli's Theorem and prove that the summation of pressure head, kinetic head and potential head is constant.	3	1
5	3	To perform Reynolds Experiment and determine the Reynolds number at the end of laminar region and beginning of turbulent region.	3	1,2
6	3	To determination of equivalent length of pipe fittings	3	3
7	2	To plot the characteristics curves of centrifugal pump	3	3
8	3	To determine the relationship between Fanning's friction factor & Reynolds Number	3	2
9	1	To measure the viscosity of different liquids (Ostwald's Viscometer or Redwood Viscometer)	3	1
10	3	To measure the flow rate of gases using flow meter.	3	4
* Minimum 8 and maximum 12 practicals/experiment sessions to be included in a course in a term.				

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	Bansal R. K	Fluid Mechanics	9th Edition Laxmi Publications
2	McCabe, Smith	Unit Operations of Chemical Engineering	7th Edition McGraw Hill

Reference Books:

Sr. No.	Author	Title	Publisher and Edition
1	Badger & Banchero	Introduction to Chemical Engineering	1st reprint Tata-McGraw Hill
2	Richardson & Coulson	Chemical Engineering Volume-I	6th Edition Butterworth-Heinemann Publications

Curriculum Coordinator **Head** **Dean – Diploma**

Diploma in CHEMICAL ENGINEERING

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE, MATUNGA, MUMBAI
T & A
Chemistry
Department

DIPLOMA PROGRAMME	: DIPLOMA IN CHEMICAL ENGINEERING
PROGRAMME CODE	: DCHE
SEMESTER	: THIRD
COURSE TITLE	: CHEMICAL ENGINEERING THERMODYNAMICS
COURSE CODE	: 175CH44

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	2	-	5	3	80	32	20	100	40	-	-	-	-	25	10	125

Course Objectives:

1. To understand properties of inorganic compounds.
2. To understand synthetic methods of inorganic compounds.

Course Outcomes:

Student should be able to:

CO1	Understand Basic concept of thermodynamics
CO2	To calculate molar volume or pressure of real gases
CO3	Apply of first and second law of thermodynamics to the various processes
CO4	Understand the concept of equilibrium and fugacity and activity concept of solutions

Course Content:

SECTION-I								
Unit & Sub-Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Introduction to Chemical Engineering Thermodynamics**	4	8	1	40%	40%	20%
	1.2	Basic Concept: System, Surrounding, Energy, Heat, Work, reversible process, irreversible process, state function, path function						
	1.3	Equilibrium: Gibbs free energy, entropy, concept of equilibrium, Criteria of equilibrium (mechanical, thermal, chemical), zeroth law of thermodynamics						
2		**P-v-T relation of fluids**	8	12	2	40%	40%	20%
	2.1	P-v-T behaviour of fluids, Ideal Gas theory, Boyl's law, charls law, ideal gas equation						
	2.2	Compressibility factor, empirical equation						
	2.3	Cubical equation of states: Vanderwalls equation of states, Redlich Kwong equation, Soave- Readlich Kwong equation and Peng Robinson equation. Problems						
3		**First Law of Thermodynamics**	10	20	3	40%	40%	20%

	3.1	Joules experiment, Internal energy, Enthalpy, statement of first law of thermodynamics, Mathematical equation for first law of thermodynamics						
	3.2	Application of first law of thermodynamics for constant volume process, constant pressure process, Adiabatic process, constant internal energy process and isothermal process						
	3.3	Throttling effect						
	3.4	Problems						
		SECTION-II						
4		**Second Law of Thermodynamics**	14	22	3	40%	40%	20%
	4.1	Limitation of first law of thermodynamics, statement of first law of thermodynamics,						
	4.2	Second Law of Thermodynamics, entropy, criterion for irreversibility Entropy change with phase change, application of entropy						
	4.3	Carnot cycle and Carnot therom						
	4.4	Work function, Exergy, Maxwells equation, property relation of homogeneous phase						
	4.5	Phase rule, Clausius clapeyorn equation for two phase and latent heat of vaporisation						
	4.6	Thermodynamic diagrams						
	4.7	Problems						
5		**Equilibrium in gas mixtures (ideal and real)**	8	12	4	40%	40%	20%
	5.1	The equilibrium constants Mathematical derivations of Kp and Kc of a chemical reaction Relationship between Kp , Kc, and Ka						
	5.2	Effect of Temperature Pressure and concentration on the equilibrium constant, Le chatelier`s principle Determination of equilibrium constant						
	5.3	Problems on chemical equilibrium						
6		**Properties of solutions**	4	6	4	40%	40%	20%
	6.1	Ideal solution, Phase equilibrium in ideal solutions, phase diagram for ideal solutions						
	6.2	Henry's law, raoults law, Non ideal solutions, deviation of properties from ideality						
	6.3	Concept of fugacity and activity						
		Total	**48**	**80**				

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

List of Assignments:

Sr. No.	Unit	Assignment	Approx. Hours	CO
1	1	Definition of some basic terminologies and parameters	2	1
2	2	Finding the pressure of real gas at give temperature	2	2

3	2	Finding of molar volume at given pressure	2	2
4	3	Enthalpy calculation for various process	4	3
5	3	Internal energy calculation	2	3
6	3	Specific heat calculations	2	3
7	4	Entropy change of the process	2	3
8	4	Carnot Cycle	2	3
9	6	Calculation of fugacity	2	4
10	6	Calculation of fugacity coefficient	2	4
* Minimum 8 and maximum 12 practicals/experiment sessions to be included in a course in a term.				

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	K. V. Narayanan	A Textbook of Chemical Engineering Thermodynamics	PHI Learning Pvt. Ltd.
2	Y. V. C. Rao	Chemical Engineering Thermodynamics	Universities Press (India) Pvt. Ltd.

Reference books:

Sr. No.	Author	Title	Publisher and Edition
1	J. M. Smith, H. C. Van Ness, M. M. Abott	Introduction to chemical engineering thermodynamics	McGraw Hill Publication, 7th edition
2	S. I. Sandler	Chemical, Biochemical, and Engineering Thermodynamics	Wiley International, 4th edition

Curriculum Coordinator **Head** **Dean – Diploma**

Diploma in CHEMICAL ENGINEERING

T & A Chemistry Department

DIPLOMA PROGRAMME	: DIPLOMA IN CHEMICAL ENGINEERING
PROGRAMME CODE	: DCHE
SEMESTER	: FOURTH
COURSE TITLE	: PLANT UTILITIES
COURSE CODE	: 175CH45

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
4	-	-	4	3	80	32	20	100	40	-	-	-	-	-	-	100

Course Objectives:

1. To understand the principles involved during water treatment, generation of steam and its uses, refrigeration cycles.
2. To learn the different equipment used to run the process plant with different utilities.
3. To acquire the knowledge for composition and selection of different utilities.
4. To understand basic calculation involved in steam generation, psychometric operation and refrigeration.

Course Outcome:

Students should be able to

CO 1	Justify the requisites of boiler feed water and Supervise working of steam generator
CO 2	Knowledge of Boiler parts, valves, Explain basic principles involved in refrigeration cycles
CO 3	To read and interpret the psychometric chart, air, fuel properties
CO 4	Calculate enthalpy associated with steam & the amount of steam required for the given duty
CO 5	Analyse hardness, alkalinity of water sample and psychometric properties Air-water vapour mixture, non-steam fluids.

Course Content:

SECTION I								
Units & Sub-Unit		Topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Importance of utilities :**	6	5	1	40%	40%	20%
	1.1	Hard and soft water, Units of hardness.						
	1.2	Requisites of industrial water and its uses						
	1.3	Methods of water treatment						
	1.4	Resins used for water softening						
	1.5	Ultra filtration, Reverse osmosis and membrane separation						
2		**Refrigeration**	8	10	2	40%	40%	20%
	2.1	Refrigeration cycles						
	2.2	Different methods of refrigeration used in industry						
	2.3	Different refrigerants						
	2.4	Simple calculation of C.O.P., Tons of Refrigeration.						

3		**Industrial fuel**	6	10	3	40%	40%	20%
	3.1	Salient features of common solid , liquid and gaseous fuels						
	3.2	Classification, common properties and uses						
4		**Steam and steam generation**	12	15	4	40%	40%	20%
	4.1	Properties of steam						
	4.2	Problems based on enthalpy calculation for wet steam, dry saturated steam, superheated steam						
	4.3	Types of steam generator / boilers						
	4.4	Problems based on performance of boilers for equivalent evaporation, actual evaporation, thermal efficiency of boilers						
	4.5	Scaling, trouble shooting, preparing boiler for inspection						
	4.6	Steam traps, boiler mountings and accessories						
		SECTION II						
5		**Psychrometry**	20	25	3	40%	40%	20%
	5.1	Different terminologies used in humidification operation such as wet bulb temperature, humidity, and %RH, %Saturation, humid heat, and humid volume.						
	5.2	Use of humidity chart wet bulb temperature, humidity, %R H, %Saturation, humid heat, and humid volume.						
	5.3	Problems based on calculation of humidity, %RH, %Saturation, humid heat, humid volume knowing vapour pressure at dew point temperature & dry bulb temperature						
	5.4	Equipment used for humidification, dehumidification						
	5.5	Evaporative cooling, spray ponds, cooling towers						
6		**Air**	4	5	3	40%	40%	20%
	6.1	Use of Compressed air, process air and instrument air						
	6.2	Process of getting instrument air.						
7		**Non steam heating system**	8	10	5	40%	40%	20%
	7.1	Thermic fluid heater, Downtherm heater						
	7.2	Temperature range						
	7.3	Principle, construction & working.						
		Total	**64**	**80**				
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).								

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	D. B. Dhone	Plant Utilities	Nirali Prakashan
2	S. Manickkam	Chemical Plant Utilities	LAP LAMBERT Academic Publication

Curriculum Coordinator **Head** **Dean – Diploma**

Diploma in CHEMICAL ENGINEERING

DIPLOMA PROGRAMME	: DIPLOMA IN CHEMICAL ENGINEERING
PROGRAMME CODE	: DCHE
SEMESTER	: FOURTH
COURSE TITLE	: PROFESSIONAL PRACTICES (PERSONALITY DEVLOPMENT)
COURSE CODE	: 175CH 46

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
-	2	-	2	-	-	-	-	-	-	-	-	-	-	25	10	25

Course Objective

1. Do self analysis.
2. Develop an outlook for future career planning
3. Develop communication skills required for interviews, group discussions and aptitude tests

Course Outcomes:

Student should be able to

CO1	Know the ways to manage the stress levels
CO2	Understand the importance of time management and its benefits in day to day life
CO3	Do the self-analysis, apply SWOT concept
CO4	Improve soft skills, language proficiency

Course Content

SECTION I								
Units & Sub-Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Stress Management**	4		1	40%	40%	20%
	1.1	Definition of stress and stress, Sources of stress						
	1.2	Yoga and stress control.						
	1.3	Emotional Maturity, Emotional Stability and Emotional Intelligence.						
	1.4	How to control Emotion						
2		**Time management**	4		2	40%	40%	20%
	2.1	Time planning						
	2.2	How to plan time						
	2.3	Time wasters.						
	2.4	Time matrix						
3		**Personality development**	6		2	40%	40%	20%
	3.1	Self-analysis						
	3.2	Types of personality						
	3.3	Interpersonal Skills						

	3.4	Interpersonal Relations						
	3.5	Factors of Attraction,						
	3.6	Personal Effectiveness, Assertiveness/ Non-assertiveness ,						
	3.7	Self-Development						
		Section II						
4		**Introduction to SWOT Analysis**	**8**		**3**	**40%**	**40%**	**20%**
	4.1	Concept of SWOT						
	4.2	Scope of SWOT,						
	4.3	SWOT as decision making tool, How to go about SWOT						
	4.4	Concept of SWOT						
5		**Group discussion & Interview techniques**	**10**		**4**	**40%**	**40%**	**20%**
	5.1	Importance of Objective GD						
	5.2	Procedure for GD,						
	5.3	Evaluation criteria for GD.						
	5.4	Types of interviews						
	5.5	Preparation for interviews						
	5.6	Some Do's and Don'ts for interview, FAQ in interview						
		Totals	**32**					

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

List of Practicals:

Sr. No.	Unit	Practical	Approx. Hours	CO
1	3	Identify your areas of self-development and plan strategies to improve it.	2	3
2	2	Enlist your time- wasters. And write down how you use your time on any average day, and see how you can improve time utility	2	2
3	1	Expose yourself to situations that irritate and make you angry. Enlist the thing you will do to remain calm	2	1
4	1, 2	Look back in your life and list five occasions, when you were frustrated, Recall the strategies you used to overcome that frustration	2	1
5	1, 2, 4	What are the things that motivate you (Friendliness, Warmth, Honesty, Appreciation) and Things that Demotivate you (Rejection , Criticism, Fear of failure , insult)	2	3
6	1, 4	Enlist the ten various sources of interpersonal conflicts, and Methods to resolve it.	2	3
7	5	Listen to lecturer on particular topic and take down notes and check how good you were in capturing the structure, hierarchy of concepts and essence of speech.	2	4
8	2	What are the things you would do, if you have only One week to live?	2	2
9	4	Make a general purpose SWOT analysis to discover your strengths and learning areas and on the basis of that decide a career	2	3
10	4	Identify some negative attitudes you have and find solutions for replacing it.	2	3
11	4	Identify your values and prepare a code of ethics for yourself	2	3

* Minimum 8 and maximum 12 practicals/experiment sessions to be included in a course in a term.

Reference Books:

Sr. No.	Author	Title	Publisher and Edition
1	Fred Luthans	Organizational Behavior	Tata McGraw Hill Sixth 1992
2	E .H. Megrath	Basic managerial skills for all	Prentice Hall of India Ltd 1989

Curriculum Coordinator **Head** **Dean – Diploma**

Diploma in CHEMICAL ENGINEERING

T & A
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