

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemical Engineering
B.Tech. Chemical Engineering

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
First Semester (1st year of UG)					
1	Introduction to Chemical Engineering	CH101	3-1-0	4	70
2	Energy and Environment in Chemical Engineering	EG111	3-1-0	4	70
3	Mathematics	MA107	3-1-0	4	70
4	Engineering Drawing	ME110	2-0-4	4	100
5	Applied Chemistry	CY107	3-0-2	4	85
6	Workshop Practice	ME105	0-0-4	2	60
7	Indian Value System and Social Consciousness	HS120	2-0-0	2	35
			Total	24	480
8	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CHV01 / CHP01	0-0-10	5	200 (20 x 10)
Second Semester (1st year of UG)					
1	Process Calculations	CH102	3-1-0	4	70
2	Unit Processes	CH104	3-0-0	3	55
3	Fundamentals of Computer and Programming	CS110	3-0-2	4	85
4	English and Professional Communication	HS110	3-1-0	4	70
5	Numerical Methods in Chemical Engineering	CH106	3-1-0	4	70
			Total	19	350
6	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CHV02 / CHP02	0-0-10	5	200 (20 x 10)
Third Semester (2nd year of UG)					
1	Mechanical Operations	CH201	3-1-2	5	100
2	Fluid Flow Operations	CH203	3-1-2	5	100
3	Heat Transfer Operations	CH205	3-1-2	5	100
4	Mass Transfer Operations-I	CH207	3-1-0	4	70
5	Elective	CH2AA	3-X-X	3/4	55/70/85
			Total	22-23	425-455
6	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CHV03 / CHP03	0-0-10	5	200 (20 x 10)
Fourth Semester (2nd year of UG)					
1	Chemical Engineering Thermodynamics – I	CH202	3-1-0	4	70
2	Mass Transfer Operations – II	CH204	3-1-2	5	100
3	Chemical Reaction Engineering-I	CH206	3-1-2	5	100
4	Professional Ethics, Economics and Business Management	MG210	3-1-0	4	70
5	Elective	CH2BB	3-X-X	3/4	55/70/85
			Total	21-22	395-425
6	Minor / Honor (M/H#1)	CH2CC	3-X-X	4	70/85

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7	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CHV04 / CHP04	0-0-10	5	200 (20 x 10)
Fifth Semester (3rd year of UG)					
1	General Chemical Technology	CH301	4-0-2	5	100
2	Chemical Engineering Thermodynamics – II	CH303	3-1-0	4	70
3	Chemical Reaction Engineering – II	CH305	3-1-0	4	70
4	Elective	CH3AA	3-X-X	3/4	55/70/85
5	Elective (Specialization#1)	CH3BB	3-X-X	3/4	55/70/85
6	Seminar	CH307	0-0-2	1	40
			Total	20-22	390-450
7	Minor / Honor (M/H#2)	CH3CC	3-X-X	4	70/85
8	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CHV05 / CHP05	0-0-10	5	200 (20 x 10)
Sixth Semester (3rd year of UG)					
1	Instrumentation and Process Control	CH302	3-1-2	5	100
2	Process Equipment Design	CH304	3-1-0	4	70
3	Chemical Engineering Plant Design and Economics	CH306	3-0-0	3	55
4	Elective	CH3DD	3-X-X	3/4	55/70/85
5	Elective (Specialization#2)	CH3EE	3-X-X	3/4	55/70/85
6	Project-I	CH308	0-0-4	2	60
			Total	20-22	395-455
7	Minor / Honor (M/H#3)	CH3FF	3-X-X	4	70/85
8	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CHV06 / CHP06	0-0-10	5	200 (20 x 10)
Seventh Semester (4th year of UG)					
1	Process Modelling and Simulation	CH401	3-1-2	5	100
2	Elements of Transport Phenomena	CH403	3-1-0	4	70
3	Innovation Incubation and Entrepreneurship	MG110	3-1-0	4	70
4	Elective (Specialization#3)	CH4AA	3-X-X	3/4	55/70/85
5	Elective (Specialization#4)	CH4BB	3-X-X	3/4	55/70/85
6	Project-II	CH405	0-0-4	2	60
			Total	21-23	410-470
7	Minor / Honor (M/H#4)	CH4CC	3-X-X	4	70/85
8	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CHV07 / CHP07	0-0-10	5	200 (20 x 10)
Eighth Semester (4th year of UG)					
1	Industrial Internship / Professional Experience (Mandatory)	CHP08	0-0-40	20	800 (20 x 40)
			Total	20	800

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Sr. No.	Elective	Code	Scheme L-T-P
1.	Introduction to Engineering Statistics	CH251	3-0-0
2.	Electrochemistry and Energy	CH252	3-0-0
3.	Computational Heat Transfer and Fluid Flow	CH253	3-0-0
4.	Polymer Engineering	CH254	3-0-0
5.	Corrosion Science and Engineering	CH255	3-0-0
6.	Material Science and Technology	CH256	3-0-0
7.	Bioprocess Engineering	CH351	3-0-0
8.	Fuel and Combustion	CH352	3-0-0
9.	Cleaner Technologies in Chemical Process Industries	CH353	3-0-0
10.	Fundamentals of Colloid and Interfacial Science	CH354	3-0-0
11.	Petroleum Refinery Engineering	CH355	3-0-0
12.	Waste to Energy Conversion	CH356	3-0-0
13.	Biomass Conversion and Biorefinery	CH357	3-0-0
14.	Heterogeneous Catalysis	CH358	3-0-0
15.	Micro Process Engineering	CH359	3-0-0
16.	Safety and Pollution Control	CH360	3-0-0
17.	New Separation Techniques	CH361	3-0-0
18.	Computational Fluid Dynamics	CH362	3-0-0
20.	Process Plant Safety	CH451	3-0-0
21.	Sustainability, Green Chemistry and Engineering	CH452	3-0-0
22.	Pharmaceutical Technology	CH453	3-0-0
23.	Computer Aided Design in Chemical Engineering	CH454	3-0-0

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B.Tech. I (Chemical Engineering) Semester – I INTRODUCTION TO CHEMICAL ENGINEERING (CORE-1) CH101	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Understand the relevance of chemical engineering and its relation to other disciplines.
CO2	Identify and enlist chemical processes, operations and the corresponding equipment
CO3	Calculate and solve various chemical engineering related problems
CO4	Implementation of chemical engineering basics to simple systems
CO5	Evaluate and assess the environmental & safety aspects in chemical engineering

2.	Syllabus	
	INTRODUCTION	(04 Hours)
	Introduction: Unit Operations, Basic Laws, Useful Mathematical Methods, Unit and Dimensions, Dimensional Analysis,	
	FLUID MECHANICS	(05 Hours)
	Viscosity, Relationship Between Stress and Strain-Rate for Newtonian Fluids, Incompressible and Compressible Flows, Differences Between Laminar and Turbulent Flows, Newton's Law of Viscosity, Introduction to Non-Newtonian Behavior.	
	MATERIAL AND ENERGY BALANCE	(05 Hours)
	Introduction: Material Balance, Energy Balance, Material Balances for Reacting and Non-Reacting Chemical Systems, Energy Balances in Systems with and without Reactions	
	HEAT TRANSFER	(07 Hours)
	Introduction: Conduction, Convection, Radiation, Flow Arrangement in Heat Exchanger, Temperature Profile of Fluids in Heat Exchanger, Shell and Tube Heat Exchangers: Basic Construction and Features, TEMA Exchanger Types, Their Nomenclature, Fourier's Law, Evaporation	
	MASS TRANSFER	(08 Hours)

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Introduction: Diffusion, Mass Transfer Operations, Absorption, Vapour-Liquid Equilibrium, Relative Volatility, Boiling Point Diagram, Distillation, Reflux, Different Types of Distillation Process, Liquid-Liquid Extraction, Classification of Industrial Liquid-Liquid Contactors, Crystallization, Drying, Adsorption, Humidification and Cooling Towers, Membrane Separations	
CHEMICAL REACTION ENGINEERING	(07 Hours)
Introduction to Reaction Engineering: Classification of Reactions, Definitions of Reactions Rate, Variables Affecting Reaction Rate, Speed of Chemical Reactions. Kinetics of Homogeneous Reactions: Simple Reactor Types, The Rate Equation, Concentration Dependent Term of Rate Equation, Introduction: Batch Reactor (BR), Continuous Stirred Tank Reactor (CSTR), Plug Flow Reactor (PFR), Packed-Bed Reactor (PBR) and their Design Equation	
MEASURING DEVICES	(05 Hours)
Chemical Composition, Pressure, Temperature, and Flowrate Measurement, Other Common Parameter Measurements	
CHEMICAL ENGINEERING THERMODYNAMICS	(04 Hours)
Basic Concepts: Thermodynamics System and Surroundings, Types of Systems, Thermodynamic, Equilibrium and Phase Rule, Zeroth Law of Thermodynamics, Different Laws of Thermodynamics, Concept of Internal Energy and Enthalpy, Application of Laws to Open Systems, Latest Software for Graphical as Well as Numerical Problems.	
Tutorials will be based on the coverage of the above topics separately	(15 Hours)
(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	Tutorials
1	Find out Stress and Strain-Rate
2	Detail Material Balance
3	Energy balance in system
4	Find out Conduction, Convection, Radiation rate of the system
5	Find out Mass Transfer rate and diffusion coefficient
C	Calculate Reflux ratio and other distillation related term
7	Calculation % rejection, water flux and water recovery in membrane separation process
8	Find out Crystallization rate and % yield of crystallization process
9	Calculate rate of reaction, order of reaction and reaction time of chemical reaction
10	Different calculation based on CSTR and Plug Flow Reactor PFR
11	Calculations of Internal Energy, Enthalpy and other thermodynamic properties

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4.	Books Recommended
1	Salil K Ghosal, Siddhartha Datta, Shyamal K Sanyal, Introduction to Chemical Engineering, Tata McGraw - Hill Publication, 2004.
2	S. Pushpavanam, Introduction to Chemical Engineering, PHI Learning Pvt. Ltd., 2012.
3	Walter L Badger and Julius T Banchemo, Introduction to Chemical Engineering, McGraw – Hill Publication, 1955.
4	L. B. Andersen & L. A. Wenzel, Introduction to Chemical Engineering by McGraw Hill Publication, 1961.
5	D. M. Himmelblau, J. B. Riggs, Basic Principles & Calculations in Chemical Engineering Prentice Hall (India), 2012

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B.Tech. I (ME) Semester – II ENERGY AND ENVIRONMENTAL IN CHEMICAL ENGINEERING EG111	Scheme	L	T	P	Credit
		3	0	2	

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Explain the components of ecosystems, various biogeochemical cycles and importance of different urban network services
CO2	Differentiate between various types of environmental pollution along with their impacts and regulatory standards
CO3	Examine various global environmental issues and their management
CO4	Discuss the fundamental principles of energy, including classification, conservation and related policy frameworks and regulations.
CO5	Get acquainted with the concept of energy systems and their components

2.	Syllabus	
	ENVIRONMENT AND ECOSYSTEMS	(10 Hours)
	Introduction: Concept of an ecosystem - structure and functions of ecosystem; Components of ecosystem - producers, consumers, decomposers; Food chains, food webs, ecological pyramids, energy flow in ecosystem; Bio-geochemical cycles, hydrologic cycle Components of environment and their relationship, impact of technology on environment, environmental degradation, environmental planning of urban network services such as water supply, sewerage, solid waste management; closed loop cycle, concepts of sustainability	
	ENVIRONMENTAL POLLUTION	(10 Hours)
	Water, air, soil, noise, thermal and radioactive, marine pollution - sources, effects, and engineering control strategies; Centralized and decentralized treatment system, Drinking water quality and standards, ambient air and noise standards	
	GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT	(10 Hours)
	Engineering aspects of climate change, concept of carbon credit, CO ₂ sequestration, concepts of environmental impact assessment and environmental audit, life cycle assessment	
	BASICS OF ENERGY AND ITS CONSERVATION	(07 Hours)

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	Classification of energy sources, Global and national energy scenario, Fossil and alternate fuels and its characterization. General aspects of energy conservation and management; Energy conservation act, Energy policy of company; Need for energy standards and labelling; Energy building codes.
	INTRODUCTION TO ENERGY CONVERSION SYSTEMS (08 Hours)
	Energy conversion systems: Working principle, Basic components, General functioning and normal rating specifications of various energy conversion systems like Power plant, Pump, Refrigerator, Air-conditioner, Internal combustion engine, Solar PV cell, Solar water heating system, Biogas plant. Wind turbine, Fuel cells.
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)

3.	Practical
1	Performance Test on a computerised single cylinder diesel engine
2	Performance Test on Three-cylinder petrol engine
3	Determination of COP of vapor compression refrigeration system
4	Study of General Motors Cruze Vehicle Automotive System
5	Study of MG Hector Vehicle Automotive Systems
6	Measurement of direct and diffused Solar radiation using pyranometer
7	Determination of I-V Characteristics of solar PV Panel
8	Study of electricity and or gas bill
9	Study of pollutants from diesel Engine
10	Study of pollutants from petrol Engine

4.	Books Recommended
1	Daniel B Botkin & Edward A Keller, Environmental Sciences, John Wiley & Sons, 2010
2	R. Rajagopalan, Environmental Studies, Oxford University Press, 2015
3	Benny Joseph, Environmental Studies, McGraw Hill publishers, 2017
4	B. H. Khan, Nonconventional Energy resources, Second Edition, Tata McGraw Hill publishers, 2009
5	P. V. Bhale, National Mission Project on pedagogy main phase course on Energy Management and Energy Audit, 2018
6	C S Rao, Environmental Pollution Control Engineering, New Age International Publishers, 2018

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B. Tech. I (CH) Semester – I MATHEMATICS MA107	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Estimate the area and volume using integral evaluation techniques.
CO2	Explain various methods for solving ordinary differential equations and their importance to engineering problems.
CO3	Explain the fundamentals of partial differential equations and methods for solving linear and non-linear PDE of the first order.
CO4	Explain the fundamental concepts of vector calculus and their role in applied mathematics.
CO5	Apply special functions and their applications to evaluate some proper and improper integrals.
CO6	Explain the basics and importance of the Laplace transform and Fourier transform.

2.	Syllabus	
	MULTIPLE INTEGRALS	(07 Hours)
	Reorientation of concepts of integrals, Double and Triple integrals, Evaluation techniques, change of order of Integration, Change of variable, Application of double and triple integrals for evaluation of area and volume.	
	ORDINARY DIFFERENTIAL EQUATION	(10 Hours)
	Reorientation of differential equation of first order first degree, Exact differential equation and Integrating factors, Ordinary differential equation of first order higher degree, solvable for p, y and x, Solution of homogenous equations of higher order, Complementary functions, Particular Integrals, Linear differential equation with variable coefficient, Cauchy's, Euler and Legendre's equation with variable coefficients.	
	INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATION	(07 Hours)
	Basics of partial differentiation, Introduction to partial differential equation, Formation of partial differential Equation, Partial differential Equation of first order, Linear partial differential equation of first order ($Pp + Qq = R$) and method of obtaining its general solution, Non-linear partial differential equation of first order $f(p, q)=0$, $f(z, p, q)=0$, $f(x, p)=g(y, q)$, $z = px + qy + f(p, q)$.	

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	VECTOR CALCULUS	(07 Hours)
	Scalar and vector point function, Differential operator, Gradient, Directional derivative, Divergence, Curl and Laplacian operator with their properties, Line integral, Surface Integral, Volume integral, Green's, Gauss and Stokes theorem (Only statement) and application.	
	BETA, GAMMA AND HYPERBOLIC FUNCTION	(04 Hours)
	Beta and Gamma function with their properties and duplications formula without proof. Introduction of hyperbolic functions, Differentiation of hyperbolic and inverse hyperbolic functions.	
	LAPLACE AND FOURIER TRANSFORM	(10 Hours)
	Laplace transform, Existence theorem, Basic properties, Laplace transform of derivatives and integrals, Inverse Laplace transform and properties, Convolution Theorem, Applications to solve simple linear and simultaneous differential equations. Introduction to Fourier transform, Basic properties.	
	Tutorials will be based on the coverage of the above topics separately	(15 Hours)
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	Tutorials
1	Tutorial is based on the double and triple integrals
2	Tutorial is based on change of order of integration and change of variable
3	Tutorial is based on the application of double and triple integrals
4	Tutorial is based on complementary functions and particular integrals
5	Tutorial is based on the solution of Cauchy's Euler and Legendre's equation with variable coefficients
6	Tutorial is based on the linear partial differential equations
7	Tutorial is based on the non-linear partial differential equations
8	Tutorial is based on the gradient, divergence and curl
9	Tutorial is based on the line integral, surface integral and volume integral
10	Tutorial is based on the beta, gamma and hyperbolic functions
11	Tutorial is based on Laplace and Fourier transform
12	Tutorial is based on the applications to solve linear and simultaneous differential equations

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4.	Books Recommended
1	Kreyszing E., Advanced Engineering Mathematics, Int. Student Edition, John Wiley & Sons, Singapore, 2015.
2	O' Neel Peter, Advanced Engineering Mathematics, Int. Edition, Thompson, Singapore, 2002.
3	Wiley C. R., Advanced Engineering Mathematics, New York Ed, McGraw Hill Inc., 1993.
4	Ramana D. V., Higher Engineering Mathematics, The MaGraw-Hill Inc., New Delhi, 2007.
5.	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Co Ltd, 2007.

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B. Tech. I (DoME) Semester – I ENGINEERING DRAWING ME110	Scheme	L	T	P	Credit
		2	0	4	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	To read, understand and apply the knowledge of orthographic projections (production-related features and instructions) in the manufacturing industry, process industry and other allied engineering applications.
CO2	To communicate with globally recognized engineers of different disciplines of engineering for research and development activities.
CO3	To get knowledge of projections and sections of different solid objects
CO4	To perceive the idea of sectional view and its advantages of it.
CO5	To apply the concept of intersections of solids for various engineering applications
CO6	To create the image of three-dimensional figures with the help of isometric projections

2.	Syllabus	
	INTRODUCTION	(01 Hours)
	Introduction: Importance of Engineering Drawing, drawing instruments and materials, B.I.S. and IS Conventions, First angle and third angle projection method.	
	ENGINEERING CURVES	(03 Hours)
	Classification of engineering curves, construction of conics, cycloidal, involutes and spirals curves.	
	PROJECTION OF POINTS, LINES AND PLANES	(04 Hours)
	Introduction to principal planes of projection, Projections of the points located in the same and different quadrants, projection of lines with its inclination to the reference planes, true length of the lines and its inclination with reference planes, projection of planes with its inclination with two reference planes, concept of an auxiliary plane method for projection of planes.	

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	PROJECTION AND SECTION OF SOLIDS	(03 Hours)
	Classification of the solids, projections of the solids like cylinder, cone, pyramid and prism with its inclination to two reference planes, Section of such solids and true shape of the section	
	DEVELOPMENT OF THE LATERAL SURFACES	(03 Hours)
	Method of development, parallel line development, radial line development, developments of cylinder, cone, prism, pyramid, true length of edges – oblique surface.	
	PENETRATION CURVE	(04 Hours)
	Classification, line of interaction, line/generator method and section plane method; intersection of two prisms, two cylinders, interaction of cone and cylinder, pyramid with prism, surface development.	
	ORTHOGRAPHIC PROJECTIONS	(04 Hours)
	Projections from a pictorial view of the object on the principal planes for view from front, top, and side using a first and third angle of the projection method	
	ISOMETRIC PROJECTIONS	(04 Hours)
	Terminology, isometric scale, construction of isometric view and isometric projection, isometric axes, and lines	
	INTRODUCTION TO COMPUTER-AIDED DRAFTING	(04 Hours)
	Introduction of the drafting and modeling software and demonstration of its application on the latest machines.	
	(Total Contact Time: 30 Hours)	

3.	Practical: Practice with drawing sheets
1	Orthographic views
2	Isometric views
3	Engineering curves
4	Projection of points and planes
5	Projection of solids
6	Section of solids

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

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7	Penetration curve and surface development
8	Demonstration of computer-aided drafting and demonstration of its application in the latest machines.
9	Determination of cloud point and pour point of biodiesel and its comparison with diesel

4.	Books Recommended
1	Bhatt, N.D.,2023. Engineering Drawing. Charotar Publishing House Pvt. Limited
2	Shah P. J., 2013, Engineering Graphics, S. Chand and Company.
3	Basant Agrawal, C M Agrawal, 2019, Engineering Drawing, McGraw Hill Education (India) Private Limited
4	S.R. Singhal, O. P. Saxena, 2014, Engineering Drawing, Asian Publisher
5	R. K. Dhawan, 2019, A Textbook of Engineering Drawing, S Chand Publishing

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B. Tech Semester – I APPLIED CHEMISTRY CY107	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Acquaint with the purpose and operational steps of key water treatment processes used to improve water quality
CO2	Adapt corrosion chemistry to protect various metals used in industry from corrosion
CO3	Adapt polymer chemistry process in industrial applications
CO4	Understand the characteristics, synthesis and applications of different materials in a wide range of sectors
CO5	Perform the quantitative determination of various ions by using instrumentation methods

2.	Syllabus	
	CHEMICAL ANALYSIS OF WATER	(08 Hours)
	Specifications for water in industries, types of water (raw water, cooling water, boiler water, nuclear water), cooling water (Langelier Index and its treatment); Hardness of water, Estimation and units of Hardness, Boiler feed water, Boiler Problems - Scales & Sludge, Priming, Foaming, Carryover, Caustic Embrittlement, Boiler corrosion, Desalination. Water softening (lime-soda, zeolite and ion-exchange) methods.	
	POLYMERS	(08 Hours)
	Introduction and classification of polymers, nomenclature, functionality in polymers, number and weight average molecular weight, degree of polymerization and molecular weight distribution (PDI), Chain Architecture (Linear/Branched, Tacticity, Isomerism), homopolymers, copolymers, graft copolymers; Types of polymerization: addition, condensation; Engineering polymers and applications, Biopolymers, conducting polymers.	
	CHEMISTRY OF MATERIALS	(07 Hours)
	Engineering materials and its classification, Ferrous metals and alloys (steel and stainless steels), Non-ferrous metals and alloys, their properties and applications; Composites-Introduction, classifications, structure-property relations and applications.	
	CORROSION	(06 Hours)
	Introduction, types and mechanism of (Chemical and Electrochemical) corrosion, Types of Electrochemical corrosion (Galvanic, Pitting, Crevice), Pourbiax diagram, Passivity, Polarization, Galvanic series, Factors influencing corrosion, Corrosion control.	
	SURFACE CHEMISTRY	(08 Hours)
	Liquid- liquid and solid liquid interfaces – contact angle, wetting and spreading, adhesion and cohesion, contact angle measurements; Colloids and its types, lyophilic and lyophobic sols; characteristics, preparations, purification and properties (optical, kinetic and electrical) and	

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	applications. Associated colloids (surfactants), emulsions (role, types and preparation) and gels (types and properties).	
	BASIC INSTRUMENTATION TECHNIQUES	(08 Hours)
	Principles and instrumentations: Conductometry, Colorimetry, Potentiometry, pH-metry; UV-Visible spectroscopy. Electrochemical measurements: methods and instruments.	
	Practical will be based on the coverage of the above topics separately	(30 Hours)
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	Practical
1	Determination of hardness of water
2	Estimation of COD
3	Determination of DO
4	Determination of Cu in brass alloy.
5	Acid-base pH metric titration
6	Trimetric determination of I - Ascorbic acid (Vitamin-C).
7	Estimation of Cl ⁻ ion.
8	Estimation of corrosion by weight loss method
9	Conductometric titration to determine the strength of strong acid.
10	Demonstration: Concentration determination of Co as a Pollutant using Spectrophotometer.

4.	Books Recommended
1	Jain P.C. and Jain M. 'Engg. Chemistry' Dhanpat Rai Publishing Co. New Delhi, 15th Edition 2006.
2	P. Atkins, Paula J. D., "Atkin's Physical Chemistry", Oxford (Indian Edition), Oxford University Press, 2012.
3	Tripathy S.K., Pandhy A.K. and Panda A.K. 'Material Science & Engineering', Scitech Publications (India) Pvt. Ltd., 2nd Edition, 2009.
4	Vogel A. I. and Mendham J., 'Vogel's Textbook of Quantitative Chemical Analysis Hall, 6th Edition, 2002. 5. Sharma B. K. 'Engg. Chemistry', Krishana Prakashan Media (P) Ltd, 2008
5	D. A. Skoog, F. J. Holler, T. A. Nieman, "Principles of Instrumental Analysis", sixth edition, 2006. 5. B. K. Sharma, "Engineering Chemistry", Krishna Prakashan Media (P) Ltd., Meerut, 2001.

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Department of Chemical Engineering
B.Tech. Chemical Engineering

B. Tech. I (DoME) Semester – I WORKSHOP PRACTICE ME105	Scheme	L	T	P	Credit
		0	0	4	02

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Observe safety precaution in the workshop
CO2	Operate various carpentry tools and create the wood working assignments
CO3	Operate various smithy tools and create the smith working assignments
CO4	Operate various metal fitting tools and metal fitting working assignments

2.	Syllabus	
	UNIT 1	(12 Hours)
	Introduction of the tools used in carpentry shop and skill development in carpentry works.	
	UNIT 2	(12 Hours)
	Introduction of the tools used in Fitting shop and skill development in fitting works	
	UNIT 3	(12 Hours)
	Introduction of the tools used in smithy shop, and skill development in smithy works	
	UNIT 4	(12 Hours)
	Introduction of the tools used in soldering and other joining processes and skill development in soldering and other joining works	
	UNIT 5	(06 Hours)
	Introduction to House wiring, different types of cables. Types of power supply, types of motors, Relays and Contractors, ELCB, distribution of power supply, LED lighting, MCB, Electrical wiring symbols, Energy Meter, SPDT/DPDT switches. Earthing and Grounding, EMI & EMC issue	
	UNIT 6	(06 Hours)
	Identifications of Electronics Components, Soldering of components, Components Mounting on Bread Board, Functioning of Power supply, Function Generator, CRO, DSO.	

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	(Total Contact Time: = 60 Hours)
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3. Books Recommended	
1	H.S. Bava, "Workshop Technology", Tata McGraw Hill Publishing Co. Ltd., 1995.
2	S.K. Hajra Chaudhary, "Elements of Workshop Technology Vol. I", Asia Publishing House, 1988
3	W.A.J. Chapman, "Workshop Technology", ELBS Low Price Text, Edward Donald Pub. Ltd., 1961
4	Gupta K.N. & Kaushish J.P., "Workshop Technology Vol. I, II", New Delhi Heights Pub., New Delhi, 1991
5	Raghuvanshi B. S., "Course in Workshop Technology", Dhanpat Rai & Sons, New Delhi, 1991
6	Tejwani V. K. "Basic Machine Shop Practice Vol. I, II", Tata McGraw Hill Pub. Co., New Delhi, 1989.
7	Arora B. D. "Workshop Technology Vol. I, II", Satya Prakashan, New Delhi, 1981

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B.Tech. I (CHE) Semester – II PROCESS CALCULATIONS (CORE-2) CH102	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Identify and calculate required process variables
CO2	Describe fundamentals of stoichiometry
CO3	Analyze and apply different approaches to perform Material balance
CO4	Employ the concepts of material balances for successful operation of complex industrial operations.
CO5	Apply energy balances for successful industrial operation.
CO6	Solve complex balance problems encountered in chemical engineering

2.	Syllabus	
	INTRODUCTION	(05 Hours)
	Introduction, Dimension and Units, system of units, conversion of units and equations, dimensional homogeneity and dimensionless quantities, Dimensional analysis.	
	PROCESS VARIABLES AND BASIC CHEMICAL ENGINEERING CALCULATIONS	(06 Hours)
	Process Variables: Density, Flow rate, Pressure and Temperature, moles, average molecular weight, Chemical Composition. Equation of States for Gases, Single phase and multiphase systems.	
	MATERIAL BALANCE ON NON-REACTIVE SYSTEMS	(04 Hours)
	Law of conservation of mass, differential and integral balances, Procedure to perform Material balances, specification of basis of calculations, calculation of scale factor for Scale up and scale down of balanced process, Material balances for unit operations including distillation, evaporation, drying, crystallization, extraction, mixing, gas absorption etc.	
	MATERIAL BALANCE ON NON-REACTIVE SYSTEMS WITH MULTIPLE UNITS AND RECYCLE	(04 Hours)
	Balances on multiple unit operations. The concept of recycle and bypass systems, Material balance with recycle and bypass with multiple units, calculation of recycle ratio, purge ratio in non-reactive system.	

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

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	MATERIAL BALANCE ON REACTIVE SYSTEMS	(04 Hours)
	The chemical equation and stoichiometry, limiting an excess reactant, Calculation of percentage excess reactant, percentage conversion, yield and selectivity, reactor yield and plant yield, Extent of reaction, relation between extent of reaction and conversion, Different approaches to solve material balance problems such as molecular balance, atomic balance and extent of reaction for reactive processes. Degrees of freedom analysis for reactive systems based on different approaches.	
	MATERIAL BALANCE ON REACTIVE SYSTEMS WITH MULTIPLE UNITS AND RECYCLE	(04 Hours)
	Material balances on reactive system with recycle. The concept of purge stream in a reactive system, concept of single pass conversion and overall conversion, calculation of recycle ratio, purge ratio in reactive system, Material balances on reactive system with recycle, purge using molecular species and atomic species balance.	
	ENERGY BALANCE WITHOUT CHEMICAL REACTION	(07 Hours)
	Law of conservation of energy, Forms of energy, Energy balance for closed and open system, calculations of enthalpy changes of processes, Energy balance procedures, Energy change due to changes in pressure at constant temperature, changes of temperature, phase change operations.	
	ENERGY BALANCE WITH CHEMICAL REACTION	(08 Hours)
	Calculations of enthalpy changes of reactions, heats of reaction, heat capacity calculations, Formation reactions and heats of formation and combustion, energy balances for reactive systems, Combustion reactions. Estimation of calorific values of fuels.	
	MATERIAL BALANCES ON UNSTEADY STATE PROCESSES	(3 Hours)
	Material balances for different types of Unsteady state processes.	
	Tutorials will be based on the coverage of the above topics separately	(15 Hours)
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	Tutorials
1.	Solving problem for unit change and change of non-homogenous equation from one unit to another unit system

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2.	Problem for dimensional analysis
3.	Problem for calculation of process variables
4.	Problem based on equation of state and estimation of properties of mixtures of gases and liquids.
5.	Problem based on material balance for unit operations
6.	Problem based on material balance for multiple unit operations
7.	Problem for solving material balance problems using stoichiometry
8.	Problem for solving material balance problems for reactive system with multiple units
9.	Problem for solving material balance problems for reactive system with recycle and purge
10.	Problem for solving Energy balance problems for non-reactive/reactive system

4.	Books Recommended
1	Felder R. M. & Rousseau R.W., "Elementary principles of chemical processes", 3 rd Ed., John Wiley & Sons, Inc., New York, 2000.
2	Himmelblau D.M., "Basics Principles and Calculations in Chemical Engineering" 6th Ed., Prentice-Hall India, 1996.
3	Bhatt B.I. & Vora S.M., "Stoichiometry", 4th Ed., Tata-McGraw-Hill, New Delhi, 2004.
4	Hougen O.A., Watson K.M. & Ragatz R.A., "Chemical Process Principals: Part-I", 2nd Ed., CBS Publishers and Distributors, New Delhi, 1995.
5	K.V. Narayanan & B. Lakshmikutty, "Stoichiometry and Process Calculations", 2 nd Ed., PHI, New Delhi, 2017

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Department of Chemical Engineering
B.Tech. Chemical Engineering

B. Tech. I (CH) Semester – II UNIT PROCESSES (CORE-3) CH104	Scheme	L	T	P	Credit
		3	0	0	

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Recognize the significance of unit processes and unit operations in chemical industries.
CO2	Explain the various manufacturing processes with their process flow diagram.
CO3	Determine various criteria like catalysts, reagents, appropriate equipments, kinetics and thermodynamics etc for different processes.
CO4	Apply and understand chemical process kinetics and types of reactors for different types of reaction.
CO5	Summarize the effect of various physical and chemical factors on different unit processes.

2.	Syllabus	
	INTRODUCTION	(04Hours)
	Definition and importance of Unit processes in Chemical Eng., Outlines of unit processes, and operations, Chemical process kinetics and Factors affecting it, types of reactors, Symbols used in Chem. Eng. Process flow diagram.	
	NITRATION	(04 Hours)
	Definition & scope of nitration reactions, Nitrating agents, Aromatic Nitration (Schimid and Biazz; nitrators) mixed acid for nitration, D.V.S. value and nitric reaction, Comparison of batch Vs. Continuous nitration, manufacture of Nitrobenzene, Dinitrobenzene.	
	AMINATION BY REDUCTION	(06 Hours)
	Definition & scope of Amination reactions, various methods of reductions and factors affecting it, Batch and Continuous process for manufacture of Aniline from Nitrobenzene, Continuous process for manufacture of Aniline from nitrobenzene using catalytic fluidized bed reactor, material of construction in such processes.	
	HALOGENATION	(04 Hours)

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	Definition and scope of various halogenation reactions, Halogenating agents, thermodynamics and kinetics of halogenations reactions. Benzene hexa-chloride and vinyl chloride from Ethylene and Acetylene.	
	SULFONATION AND SULFATION	(05 Hours)
	Definition and scope of such reactions, sulfonating and sulfating agents and their applications, Chemical and physical factors affecting it. manufacture of Benzene sulfonates, Sulfation of Dimethyl Ether and Lauryl Alcohol.	
	AMINATION BY AMMONOLYSIS	(04 Hours)
	Definition & types of reactions, Aminating agents, Physical and Chemical factors affecting it. Catalyst used in Ammonolysis, manufacture of Aniline from chlorobenzene and Nitroaniline from Dichloro Nitro Benzene.	
	OXIDATION	(05 Hours)
	Definition and Types, Oxidizing agents, Liquid phase oxidation. Thermochemistry and kinetics. manufacture of Acetaldehyde from Acetic acid and manufacture of Acetic acid from Ethanol. Vapor phase oxidation of Benzene and Naphthalene, Apparatus and its material of construction for oxidation reactions.	
	HYDROGENATION	(06 Hours)
	Definition and its scope, properties of hydrogen and sources of hydrogen, gas catalytic hydrogenation and hydrogenolysis, Kinetics and thermodynamics of hydrogenation reactions, Apparatus and material of construction, Industrial hydrogenation of fat & oil, manufacture of Methanol from CO ₂ & H ₂ .	
	HYDROLYSIS	(04 Hours)
	Definition and types of hydrolysis, Hydrolyzing agents, thermodynamics and kinetics of Hydrolysis, Industrial Hydrolysis of fat, manufacture of ethanol from ethylene (shell process).	
	POLYMERIZATION	(03 Hours)
	Introduction, Methods of Polymerization- Polycondensation methods, Addition Polymerization methods (Bulk, Solution, emulsion and Pearl polymerization).	
	(Total Contact Time: 45 Hours)	

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

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3.	Books Recommended
1	Groggins P. H., "Unit Processes in Organic Synthesis", 5th edition, Tata-McGraw Hill, New Delhi, 2001.
2	Gopalarao. M., Sitting M., "Dryden's Outlines of Chemical Tech.", 2nd Ed., East-West Pub., New Delhi, 1997.
3	Austin G. T., "Shreve's Chemical Process Industries", 5th Ed. McGraw-Hill Pub., 1994.
4	Kent J.A., "Kent & Riegel's Handbook of Industrial Chemistry and Biotechnology", Springer publisher, 11 th Ed., 2007.
5	Morrison R.T., et al., "Organic Chemistry". 7 th Ed., Pearson Publications, 2014.

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Department of Chemical Engineering
B.Tech. Chemical Engineering

B.Tech. I Semester – I FUNDAMENTALS OF COMPUTER AND PROGRAMMING CS110	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to
CO1	Acquire knowledge about computer architecture, network and software development.
CO2	Install an operating system and configure the network along with programming skills to solve the given problem.
CO3	Debug network and operating system related issues and analyse the given problem.
CO4	Evaluate programming solutions with different aspects.
CO5	Design and develop solution for given problems.

2.	Syllabus	
	INTRODUCTION TO COMPUTER AND ITS ARCHITECTURE	(02 Hours)
	Introduction and Characteristics, Computer Architecture, Generations, Classifications, Applications, Central Processing Unit and Memory, Communication between various Units, Processor Speed, Multiprocessor System, Peripheral Buses, Motherboard Demonstration.	
	MEMORY AND VARIOUS INPUT AND OUTPUT DEVICES	(02 Hours)
	Introduction to Memory, Input and Output Devices, Memory Hierarchy, Primary Memory and its Types, Secondary Memory, Classification of Secondary Memory, Various Secondary Storage Devices and their Functioning.	
	NUMBER SYSTEMS	(01 Hour)
	Introduction and type of Number System, Conversion between Number System, Arithmetic Operations in different Number System, Signed and Unsigned Number System.	
	INTRODUCTION TO SYSTEM SOFTWARES AND PROGRAMMING LANGUAGES	(04 Hours)
	Classification of Computer Languages, Introduction of Operating System, Evolution, Type and Function of OS, Unix Commands, Evolution and Classification of programming Language, Feature and Selection of good Programming Language, Development of Program, Algorithm and Flowchart, Program Testing and Debugging, Program Documentation and Paradigms, Characteristics of good Program.	

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

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WINDOWS OPERATING SYSTEM AND ITS ENVIRONMENT	(02 Hours)
Introduction to GUI based OS, Configuration, Setup, Services, Network Configuration.	
LINUX OPERATING SYSTEM AND ITS ENVIRONMENT	(02 Hours)
Introduction to Unix based OS, Configuration, Setup, Services, Scripting, Network Configuration.	
DEBUGGING TOOLS AND COMPILER OPTION	(04 Hours)
Different Debugging tools, Commands, Memory dump, Register and Variable Tracking, Instruction and Function level debugging, Compiler Options, Profile Generation.	
DATA COMMUNICATION, COMPUTER NETWORK AND INTERNET BASICS	(02 Hours)
Data Communication and Transmission media, Multiplexing and Switching, Computer Network and Network Topology, Communication Protocols and Network Devices, Evolution and Basic Internet Term, Getting Connected to Internet and Internet Application, Email and its working, Searching the Web, Languages of Internet, Internet and Viruses.	
PROGRAMMING USING 'C' LANGUAGE – INTRODUCTION	(06 Hours)
Characteristics of C Language, Identifiers and Keywords, Data Types Constants and Variables, Declarations and Statements, Representation of Expressions, Classification of Operators and Library Functions for Data Input and Output Statements, Formatted Input and Output Statements.	
PROGRAMMING USING 'C' LANGUAGE – CONTROL STATEMENTS, STRUCTURES, ARRAYS, POINTERS	(12 Hours)
Conditional Control Statements, Loop Control Statements, One Dimensional Array of Numbers and Characters, Two-Dimensional Array, Introduction and Development of User Defined Functions, Different Types of Variables and Parameters, Structure and Union, Introduction to Pointers, Pointer Arithmetic, Array of Pointers, Pointers and Functions, Pointers and structures, File Handling Operations.	
PROGRAMMING USING 'C' LANGUAGE – FUNCTIONS	(06 Hours)
Functions, Passing the arguments, Return values from functions, Recursion, Header Files Design, File handling operations, Read and Write to Secondary Devices, Read and Write to Input and Output Ports.	
PROGRAMMING USING 'C' LANGUAGE – GRAPHICS, DEBUGGING	(02 Hours)
Include Graphics Library, Debugging, Linking, Compilation Option for Optimization, Make file.	

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

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	Practicals will be based on the coverage of the above topics separately.	(30 Hours)
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	Practical
1	Basic commands of Windows and Linux
2	Flow chart drawing and writing pseudo steps or algorithms steps
3	Programming for logic development using different control statements
4	Programming for familiarity with control statement, array, pointers
5	Programming using structures, pointers, programming using functions

4.	Books Recommended
1.	“Introduction to Computer Science”, Fourth Impression, Pearson Education, ITL Education Solutions Limited, 2009.
2.	Gottfried B.S., “Programming with C Schaum’s outline Series”, Outline Series, 2 nd Edition, Tata McGraw-Hill, 2006.
3.	Brian W. Kernighan, Dennis M. Ritchie, “The C Programming language”, 2 nd Edition, Prentice Hall PTR publication, 1988.
4.	E. Balagurusamy, “Programming in ANSI C”, 6 th Edition, Tata Mc-Graw Hill, 2012.
5.	Pradip Dey, “Programming in C”, 2 nd Edition, Oxford University Press, 2012.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemical Engineering
B.Tech. Chemical Engineering

B.Tech.1 /M.Sc. 1 Semester I/ II ENGLISH AND PROFESSIONAL COMMUNICATION HS110	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Show enhanced reception towards the use of English language.
CO2	Choose and employ appropriate words for professional communication.
CO3	Develop sentences and text in English coherently and formally.
CO4	Demonstrate overall improvement in oral communication.
CO5	Analyze and infer from written and oral messages.

2.	Syllabus	
	COMMUNICATION	(05 Hours)
	Introduction to Communication, Different forms of Communication, Barriers to Communication and some remedies, Non-Verbal Communication – Types, Non-Verbal Communication in Intercultural Context.	
	VOCABULARY AND USAGE OF WORDS	(05 Hours)
	Common Errors, Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words.	
	LANGUAGE THROUGH LITERATURE	(09 Hours)
	Selected short stories, essays, and poems to discuss nuances of English language.	
	LISTENING AND READING SKILLS	(06 Hours)
	Types of listening, Modes of Listening-Active and Passive, Listening and note taking practice, Practice and activities Reading Comprehension (unseen passage- literary /scientific / technical) Skimming and scanning, fact vs opinion, Comprehension practice	
	SPEAKING SKILLS	(10 Hours)
	Effective Speaking, JAM, Presentation Skills- types, preparation and practice. Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice	

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	WRITING SKILLS	(10 Hours)
	Prerequisites of effective writing, Memo-types, Letter Writing- types, Email etiquette and Netiquette, Résumé-types, Report Writing and its types, Editing.	
	Tutorials will be based on the coverage of the above topics separately	(15 Hours)
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	Tutorials
1	Letter and Resume
2	Group Discussion
3	Presentation Skills (Individual)
4	Role Play on Nonverbal communication
5	Group Presentation
6	Debate
7	Body language and intercultural communication
8	Listening Activities
9	Editing
10	Report Writing
11	Mock interviews
12	JAM

4.	Books Recommended
1	Kumar, Sanjay and Pushp, Lata. <i>Communication Skills</i> , 2 nd Edition, OUP, New Delhi, 2015.
2	Raman, Meenakshi & Sharma Sangeeta. <i>Technical Communication Principles and Practice</i> , 3 rd Edition, OUP, New Delhi, 2015.
3	Raymond V. Lesikar and Marie E Flatley. <i>Basic Business Communication skills for Empowering the Internet generation</i> . Tata McGraw Hill publishing company limited. New Delhi 2005.
4	Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi. "Business Communication Today." Ninth Edition. Pearson, 2009.
5	Mike Markel. "Practical Strategies for Technical Communication," Bedford/ St. Martin's Second Edition, 2016
6	Laura J. Gurak and John M. Lannon. "Strategies for Technical Communication in the Workplace," Pearson, 2013.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemical Engineering
B.Tech. Chemical Engineering

B. Tech. I (CH) Semester – II NUMERICAL METHODS IN CHEMICAL ENGINEERING CH106	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Apply curve fitting techniques to approximate a function in interpolating and extrapolating a given data.
CO2	Analyze the different samples of data at different level of significance using various hypothesis testing.
CO3	Solve system of linear and non-linear equations using direct and iterative methods.
CO4	Compare various numerical methods for solving ordinary and partial differential equations.
CO5	Solve chemical processes and design problems.

2.	Syllabus	
	INTERPRETATION OF ENGINEERING DATA	(08 Hours)
	Curve fitting: Least square regression. Interpolation: Newton's Forward/Backward interpolation, Lagrange's interpolation and their applications.	
	ENGINEERING STATISTICS	(10 Hours)
	Errors and its propagation. Significance tests: Null hypothesis, alternative hypothesis, p-value, Type-I and Type-II error, confidence interval, central limit theorem. Z-test, t-test, f-test, chi square test, etc. Analysis of variance (ANOVA)	
	NUMERICAL SOLUTION OF ALGEBRAIC EQUATIONS	(10 Hours)
	Linear systems of equations, Solutions by Cramer's Rule, Matrix methods, Gauss-Jordan, Gauss Elimination, Gauss Jacobi, Gauss-Seidel and Relation methods. Non-linear equations: Bisection, Regula-falsi, Secant and Newton- Raphson methods.	
	NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS	(10 Hours)
	Initial value problems for ordinary differential equations: Euler's, Runge-Kutta and Milne's predictor-corrector methods. Boundary value problems: Finite difference methods, Partial differential equations: Solutions of elliptic, parabolic and hyperbolic types of equations.	

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	FORMULATION OF PHYSICAL PROBLEMS	(07 Hours)
	Mathematical statement and representation of problems, Exponential growth and decay, Newton's law of cooling, Batch reaction kinetics, Radial heat transfer through a cylindrical conductor, salt accumulation in a stirred tank.	
	Tutorials will be based on the coverage of the above topics separately	(15 Hours)
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	Tutorials
1	Tutorial is based using curve fitting methods.
2	Tutorial is based on interpolation methods.
3	Tutorial is related to tests of significance
4	Tutorial based on ANOVA.
5	Tutorial is based on finding solutions to linear equations by direct methods.
6	Tutorial is based on finding solutions to non-linear equations by iterative methods.
7	Tutorial is based on finding solutions to initial value problems.
8	Tutorial is based on finding solutions to boundary value problems.
9	Tutorial is based on formulation of physical problems.

4.	Books Recommended
1	S.S. Sastry, Introductory Methods of Numerical Analysis, 5 th Edition, PHI Learning Private Limited, 2012.
2	M. K. Jain, S.R.K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computations, 8 th Edition, New Age International publications, 2022.
3	Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers, 8 th Edition, Mc. Graw Hill, 2021
4	Pradeep Ahuja, Introduction to Numerical Methods in Chemical Engineering, 2 nd Edition, PHI Learning Private Limited, 2019.
5	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., Probability and Statistics for Engineers and Scientists, 9 th Edition, Pearson Education, Asia, 2011.
6	Norman W. Loney, Applied Mathematical Methods for Chemical Engineers, 3 rd Edition, CRC Press, 2015.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemical Engineering
B.Tech. Chemical Engineering

B.Tech.1 /M.Sc. 1 Semester I/ II INDIAN VALUE SYSTEM AND SOCIAL CONSCIOUSNESS HS120	Scheme	L	T	P	Credit
		2	0	0	02

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	interpret the important values that need to be cultivated
CO2	analyse the cultures depicted in Ramayana, Mahabharata, Jainism and Buddhism
CO3	review the structure of Indian knowledge system
CO4	discuss the significance of constitution of India
CO5	demonstrate social responsibility

2.	Syllabus	
	HUMAN VALUES AND CONSCIOUSNESS	(08 Hours)
	Human Values Definition and Classification of Values; The Problem of Hierarchy of Values and their Choice; Self-Exploration; 'Basic Human Aspirations; Right understanding, Relationship and Physical Facility; fulfilment of aspirations; Understanding Happiness and Prosperity, Harmony at various levels. What Is Consciousness? ; Can We Build A Conscious Machine?; Levels Of Consciousness; Mind, Matter And Beyond; Holistic Lifestyle; Dealing With Anxiety; Connecting Mind To Brain; Minds, Brains, And Programs.	
	INDIAN CULTURE AND HERITAGE	(07 Hours)
	Culture and its salient features: The Vedic – Upanishadic Culture and society, Human aspirations in those societies; Culture in Ramayana and Mahabharata: The Ideal Man and Woman, Concepts Maitri, Karuna, Seela, Vinaya, Kshama, Santi, Anuraga – as exemplified in the stories and anecdotes of the Epics; The Culture of Jainism: Jaina conception of Soul, Karma and liberation, Buddhism as a Humanistic culture; The four Noble truths of Buddhism; Vedanta and Indian Culture;	
	INDIAN KNOWLEDGE SYSTEM	(08 Hours)
	Indian knowledge as a unique system, Place of Indian knowledge in mankind's evolution, Relevance of Indian knowledge to present day and future of mankind, Nature of Indian Knowledge; Structure of Indian Knowledge: Types of knowledge (para, apara), The scientific and the unscientific, Instruments for gaining and verifying knowledge, Knowledge traditions: Lineages, Instruments - debate, epistemology and pedagogy, The inverted tree – axiomatic, deductive, empirical knowledge, and evolution of knowledge; Disciplines of Study: A brief outline of the subjects, the major contributions and theories along with timelines where	

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	relevant: Mathematics; Astronomy; Physical Sciences; Cosmogony; Language studies; Astrology; Moral studies/righteousness; Statecraft and political philosophy
	INDIAN CONSTITUTION (04 hours)
	History of Making of the Indian Constitution; Philosophy of the Indian Constitution: Preamble; Salient Features; Contours of Constitutional Rights & Duties; Organs of Governance: Parliament; Composition; Qualifications and Disqualifications; Powers and Functions
	SOCIAL RESPONSIBILITY (03 Hours)
	Social Responsibility: Meaning and Importance, Different Approaches of Social Responsibility. Social Responsibility of Business towards different Stakeholders. Evolution and Legislation of CSR in India.
	(Total Contact Time: 30 Hours)

3.	Books Recommended
1	D. K. Chaturvedi, Professional Ethics Values and Consciousness, Ane Books Pvt. Ltd., 2023.
2	R.R. Gaur, R Sangal, G. P. Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
3	A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
4	P R Rao, Indian Heritage and Culture, Sterling Publishers Pvt. Ltd, 1988.
5	D. Singh, Indian Heritage and Culture, APH Publishing Corporation, 1998.
6	Sri Prashant Pole, Treasure Trove of Indian knowledge, Prabhat Prakashan, 2021.
7	Sri Suresh Soni, Sources of our cultural heritage, Prabhat Prakashan, 2018.
8	D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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