VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

SYLLABUS
OF
B.E. CHEMICAL

CHEMICAL ENGINEERING DEPARTMENT
Sarvajanik College of Engineering and Technology,
Dr. R.K. Desai Marg, Athwalines, SURAT

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

SCHEME OF TEACHING AND EXAMINATION B.E.-I

SEMESTER – 1

Course No.	Course	Teaching Scheme			Examination Scheme				Total Marks
		Theory	Tut.	Pract.	Theory	Prac./viva	TW	Tut.	
101	Mathematics-I	3	1	0	100	0			100
102	Engineering Mechanics	3	1	2	100	50			150
103	Basic Mechanical System	3	0	2	100	50			150
104	Engineering Graphics	1	0	4	100	50			150
105	Engineering Physics	3	0	2	100	50			150
205	Electro techniques	3	1	2	100	50			150
106	Engineering Chemistry	3	0	2	100	50			150
206	Computer Fundamental and Programming	2	0	2	50	100			150

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

SCHEME OF TEACHING AND EXAMINATION B.E.-II

SEMESTER – 2

Course No.	Course	Teaching Scheme			Examination Scheme				Total Marks
		Theory	Tut.	Pract.	Theory	Prac./viva	TW	Tut.	
201	Mathematics-II	3	1	0	100	0			150
202	Engineering Drawing	2	0	4	100	50			150
203	Basic Civil Engineering	3	0	2	100	50			150
204	English and Communication skill	2	0	0	50	0			50
205	Electro techniques	3	1	2	100	50			150
105	Engineering Physics	3	0	2	100	50			150
206	Computers Fundamental & Programming	2	0	2	50	100			150
106	Engineering Chemistry	3	0	2	100	50			150

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

SCHEME OF TEACHING AND EXAMINATION B.E. – III

(CHEMICAL ENGG.) SEMESTER – 3

Course No.	Course	TEACHING SCHEME *L* *T* *P*			Examination Scheme THEORY	PRACTICAL	TUTORIAL	T.W.	Grand total
301	Mathematics III	3	2	0	100	--	--	50	150
302	Engg. ChemistryII	3	0	2	100	30	20	--	150
303	Basic Electronics	3	1	2	100	30	20	25	175
304	Strength of Mat.I	3	1	2	100	30	20	25	175
305	Electrical Tech.	3	0	2	100	30	20	--	150
306	Unit Process	3	0	0	100	--	--	--	100
	TOTAL :-	**18**	**04**	**08**	**600**	**120**	**80**	**100**	**900**

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SCHEME OF TEACHING AND EXAMINATION BE –IV

(CHEMICAL ENGG.) SEMESTER – 4

Course No.	Course	TEACHING SCHEME *L* *T* *P*			Examination Scheme THEORY	PRACTICAL	TUTORIAL	T.W.	Grand total
401	Engg. ChemistryIII	3	0	2	100	30	20	--	150
402	Engg. Chem. IV	3	0	2	100	30	20	--	150
403	Chem. Engg. Mater.	3	0	0	100	--	--	--	100
404	Process calculation	3	2	0	100	--	--	50	150
405	Strength of Mat.II	3	1	0	100	--	--	25	125
406	Theory of Machines	3	1	4	100	60	40	25	225
	TOTAL :-	**18**	**04**	**08**	**600**	**120**	**80**	**100**	**900**

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

SCHEME OF TEACHING AND EXAMINATION B.E. – V

(CHEMICAL ENGG.) SEMESTER – 5

Course No.	Course	TEACHING SCHEME *L* *T* *P*			Examination Scheme THEORY	PRACTICAL	TUTORIAL	T.W.	Grand total
501	Gen. Chem. Tech.I	3	0	2	100	30	20	--	150
502	Chem. Engg. Therm-I	3	1	0	100	--	--	25	125
503	Fluid flow operation	3	1	2	100	30	20	25	175
504	MechanicalOperation	3	0	2	100	30	20	--	150
505	Heat Transfer	3	1	2	100	30	20	25	175
506	Mass Transfer – I	3	1	0	100	--	--	25	125
	TOTAL :-	**18**	**04**	**08**	**600**	**120**	**80**	**100**	**900**

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

SCHEME OF TEACHING AND EXAMINATION BE –VI

(CHEMICAL ENGG.) SEMESTER – 6

Course No.	Course	TEACHING SCHEME *L* *T* *P*			Examination Scheme THEORY	PRACTICAL	TUTORIAL	T.W.	Grand total
601	Gen. Chem. Tech.-II	3	0	2	100	30	20	--	150
602	Chem. Engg. therm-II	3	1	0	100	--	--	25	125
603	Chem. Reac.Engg.-I	3	1	2	100	30	20	25	175
604	Chem. SystemModel.	3	0	0	100	--	--	--	100
605	Instrumentation	3	0	2	100	30	20	--	150
606	Mass Transfer – II	3	0	4	100	60	40	--	200
	TOTAL :-	**18**	**02**	**10**	**600**	**150**	**100**	**50**	**900**

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

SCHEME OF TEACHING AND EXAMINATION BE –VII

(CHEMICAL ENGG) SEMESTER – 7

Course No.	Course	Teaching Scheme			Examination Scheme				Total Marks
		Theory	Tutorial	Practical	Theory	Practical	TW	Tut.	
CH701	Transport Phenonmena	3	0	0	100	30	20	25	175
CH702	C.R.E.-II	3	0	2	100	30	20	-	150
CH703	P.E.D.D.	3	0	3	100	60	40	25	225
CH704	Process Control	3	0	2					
CH705	Seminar	0	0	2	-	50	-	-	50
CH706	Project Preliminaries	0	0	3	-	50	-	-	50
CH707	Training	0	0	2	-	100	-	-	100
	Total	**12**	**02**	**14**					**900**

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SCHEME OF TEACHING AND EXAMINATION BE –VIII

(CHEMICAL ENGG) SEMESTER – 8

Course No.	Course	Teaching Scheme			Examination Scheme				Total Marks
		Theory	Tut.	Pract.	Theory	Prac./viva	TW	Tut.	
CH801	C.E.P.D.E	3	0	0	100	0	0	0	100
CH802	Safety & waste Management	3	0	2	100	30	20	0	150
CH803	CAD in Chemical	3	2	2	100	30	20	50	200
CH804	Elective - I	3	1	0	100	0	0	25	125
CH805	Elective -II	3	1	0	100	0	0	25	125
CH806	Project	0	0	8	0	200	0	0	200
	Total	**15**	**4**	**12**					**900**

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
B.E. Chemical Engineering 1st Semester

101	Mathematics-I
102	Engineering Mechanics
103	Basic Mechanical System
104	Engineering Graphics
105	Engineering Physics
205	Electro techniques
106	Engineering Chemistry
206	Computer Fundamental and Programming

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

MATHEMATICS – 1

SEMESTER -I

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

(A) THEORY

1) **complex variables** :
Reorientation of complex numbers. De mowers theorem for rational index and its applications, functions of complex variables, special functions, exponential, logarithmic, trigonometric and hyperbolic functions

2) **Calculus**
reorientation of calculus , graphs and differentiation of hyperbolic and inverse hyperbolic functions , successive differentiation , standard forms , Leibniz's theorem and application, techniques of partial differentiation.

Infinite series , convergency and divergency concepts, power series , expansion of functions : Taylor and Maclaurins series.
Indeterminate forms: $0/0$, ∞/∞, $\infty \rightarrow 0$, 1^{∞}, ∞^{0}, 0^{∞}, application of derivations, curvatures.

Curve classing: Cartesian, polar and parametric coordinates, application of integration, area, length of curve, volume of solids of revolution , C.G, M.I , Mass.

3) **Ordinary differential equations (first order) :**

Reorientation, exact differential equations and integrating functions, Ode's – first order and higher degree odes.
Modeling of real world problems, particularly engineering systems, first order differential equation, models in particular, RC and RL networks , spread of technical innovations, spread of epidemic.

(B) PRACTICAL/ DRAWINGS + TUTORIAL ASSIGNMENTS :
Based on the theory courses described above

(C) REFERENCES:

1) Srivastav R.S , engineering mathematics , Vol 1 , TMG, (1980)Thomas G.H, calculus and analytical geometry, Narosa, 1986.
2) Bajpal A C, Calcus I. H and Fairly J.A , mathematics for engineering , Vol 1, John Wiley and sons , 1986

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ENGINEERING MECHANICS

SEMESTER -I

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 20** **External evaluation Marks: 30**

(A) THEORY

(1) Definition of mechanics, definition of force and its SI units , method of problem solution , concurrent coplanar forces, forces in plane and space, applications of triangle law , parallelogram law, equilibrium of forces
(2) Rigid bodies, non concurrent forces, moment about an axis, equilibrium of non concurrent forces.
(3) Analysis of perfect truss, method of joints and methods of section, graphical methods
(4) Analysis of cable subjected to point loads, UDL and self weight.
(5) Centrola, center of gravity, area moment of inertia, mass moment of inertia .
(6) Application of friction to engineering problems , viz. wedge ladder , belt etc
(7) Graphical solution of rectilinear motion and its application, curvilinear motion, normal, tangential and transverse component of velocity and acceleration.
(8) Kinetics of particles, dynamic equilibrium, work, power and energy.
(9) Computer applications for few topics of engineering mechanics.

(B) **PRACTICALS/DRAWING + TUTORIAL ASSIGNMENTS**:
Based on theory courses prescribed above.

(C) REFERENCES:

(1) Desai J.A and Mistry B.B, "Engineering Mechanics- Statics and Dynamics" Popular Prakashan. 1995.
(2) Shames I.H "Engineering Mechanics- Statics and mechanics", Prentice hall of India private limited, 1999
(3) Timoshenko S. and Young D.H, " Engineering and Mechanics" McGraw Hill Book Company , Inc, 1956

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

BASIC MECHANICAL SYSTEMS

SEMESTER - I

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 20** **External evaluation Marks: 30**

(A) THEORY

(1) Conventional and non conventional energy source – types of fuels, calorific value of fuels, and calculation of minimum air required for complete combustion of fuel.

(2) Steam generator, definition, classification, general study of Cochran, Babcock Wilcox, Lancashire and locomotive boilers. Boiler mounting and accessories. Draught classification, Calculation of chimney height.

(3) Internal combustion engines – definition , classification , components, working of the two stroke and four stroke cycle engines , SI and CI engines , different systems of IC engines like fuel system like fuel energy systems , ignition system , cooling system.

(4) Layout of different types of power plants – thermal power plant, nuclear power plant, hydro power plant , gas turbine power plant.

(5) Refrigeration and air conditioning: definition of refrigeration, air conditioning, vapor compression system, domestic refrigerator, Ice Plant, Wind Air conditioner

(6) Machines tools: Introduction to different types of machine tool such as lathe, drilling machines, shapers and milling machines, various operations , introduction to various manufacturing processes.

(B) PRACTICALS/DRAWING + TUTORIAL ASSIGNMENT:

Based on the theory course prescribed above.

REFERENCES:

(1) S.K hazrachowdhari, “Elements of Workshop Technology, Vol – 1,” Asia publication co.ltd.1998.

(2) T. S Ranjan , “ Basic Mechanical engineering”, Wiley eastern Ltd.,1994.

(3) S.S Mathur , S.Domkundwar , “Elements of Mechanical Engineering”, dhanpat rai and sons , 1984.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ENGINEERING GRAPHICS

SEMESTER -I

TEACHING SCHEME	**L=1; P/D=4; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 20** **External evaluation Marks: 30** **Total Marks: 50**

(A) THEORY:

1. **Engineering Graphics:**
   Introduction, importance and role of graphics in engineering graphics equipments and instruments, standard drawing papers, drafting techniques lettering, Dimensioning and architectural symbols as per I.S. Codes.

2. **Graphic Presentations:**
   Development of graphs, scales and nomograms for two and three variables, scale Conversions and engineering illustrations.

3. **Setting of Curves:**
   Different types of engineering curves, characteristics, construction and drawing of Curves : ellipse, parabola, hyperbola and spirals.

4. **Technical sketching and detailing**:
   Sketching of building plans, building components, electrical circuits and machines Foundations.

5. **Engineering Projects:**
   Types, uses and principles of isometric and orthographic projections, projections of Points and lines.

6. **Computer Graphics:**
   Use of computers in graphic display and autocad applications.

(B) **PRACTICAL/DRAWINGS + TUTORIAL ASSIGNMENTS** :
Based on the theory course prescribed above.

(C) REFERENCES:

1. K. Venugopal, Engineering Drawing and Graphics, Wiley Eastern Ltd., New Delh1994
2. Narayan K. L., Engineering Graphics, TMG publications, 1994.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ENGINEERING PHYSICS

SEMESTER – I/ II

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks : 20** **External evaluation marks: 30**

(A) THEORY:

1. **Thermodynamics**:
   First law of thermodynamics and its application , reversible and irreversible processes, second law of thermodynamics, entropy and its calculation in reversible and irreversible processes, Entropy and second law of thermodynamics, Entropy and disorder, Enthalpy and free energy.

2. **Electromagnetism:**
   Ampere's theorem and its applications to determine magnetic induction in case

   (i) Conductor carrying current.
   (ii) Solenoid
   (iii) Toroid

   Lorentz force, wall effect in metals, High energy particles accelerators, Cyclotron and Betatron.

   Guass's law for magnetism, Types of matter magnetism, Diamagnetism, Paramagnetism, Ferromagnetism, Nuclear Magnetism, three magnetic vectors.

3. **Optics:**
   Spatial and termporal coherence, Interference by division of wave front and amplitude, interference by thin films, measurement of film thickness, Michelson's Interferometer, and light propagation, Frensel and Fraunhofer diffraction Fraunhofer diffraction at double slits, Multiple slits and circular Aperture, Raylengh criterian, Resolving power of grating, telescope and prism.

   Polarization, polarizing sheets, Nalus law, Polarization by reflection and Browster's law, Polarization by scattering of light, Huygen's theory for uni-axial and bi-axial crystals.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
ELECTROTECHNIQUES

SEMESTER -I

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks: 20**
	External evaluation marks: 30
	Total Marks: 50

(A) THEORY:

1. Electrostatics:

Coulombs Law, Electric field, Guass theorem and its application : potential & Potential gradient, point charge and charged spheres, capacitance concentric Spheres, parallel plates, coaxial cylinders and parallel conductors, capacitors, Capacitors in series and parallel, capacitors with composite dielectrics, Electric Field energy.

2. Electromagnetics:

Ampere's Law, Magnetic flux & flux density, Magnetic field strength due to straight conductor and circular coils, Field strength due to solenoid, Magnetomotive force, Magnetic circuit calculations, magnetic leakage,Magnetic hysteresis, Hysteresis and eddy current losses, magnetic field energy Lifting power of a magnet.

Electromagnetic Induction: Faraday's Law and Lenz's law, Dynamically and Statistically induced force, self and mutual inductance.

3 Network Theorems:

Kirchoff's Law – Loop and mode methods of Analysis, Superposition, Thevenin And reciprocity theorems, Star-Delta transformations, Compensation and Norton's Theorems, Maximum power transform theorem.

4. R-L-C Circuits:

Alternating voltages and currents and their graphical representations, Average and Effective values, form factor phase differences, power and power factor, purely Resistive, inductive and capacity circuits, R-L ,R-C, and R-L-C series circuits, Impedence and admittance, circuits in parallel, series and parallel resonance, Locus diagram for series circuits. Complex algebra and its application to Circuit analysis. Polyphase circuits: Balance two phase and three-phase systems,

star and Nesh Connections, calculation of balanced three-phae networks, Polyphase vector Diagram , measurement of power in three phase circuits.

5. Electrical wiring:
Various types of residential wiring circuits as simple parallel circuits, staircase Wiring, godown wiring etc., simple industrial wiring and testing of electricity.

(B) PRACTICAL / DRAWINGS + TUTORIAL ASSIGNMENTS:
Based on the theory course prescribed above.

(C) REFERENCES:

1. V.N. Mittal, Basic Electrical Engineering, Tata McGraw Hill Publications Ltd.
2. H. Cotton, Advanced Electrical Technology, Pitman Publication.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ENGINEERING CHEMISTRY

SEMESTER -I

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory: 3 hours Marks: 100**
PRACTICAL / DRAWING:	**Internal evaluation Marks: 20**
	External evaluation Marks: 30
	Total Marks: 50

A) <u>THEORY</u>:

(1) <u>Water</u> :

Sources, impurities, hardness, estimation and units, Treatment for (i) boiler-feed water (ii) Potable water, Desalination of brackish water.

(2) Cement:

Manufacture, main constituents, setting and hardening of Portland cement, heat if hydration, RCC decays and protection.

(3) Pollution:

Types, sources, effects and control of air and water pollutants, sewage , BOD, COD, waste water treatments.

(4) Polymers:

Chain and step polymerizations, mechanisms if chain polymerizations, Resins & plastics, thermoplasts and thermostats, Moulding methods, structures and uses of PE, PP, PVC, PVA, VC-VA copolymer, PMMA, Phenoplasts, Amino resins, polyesters, nylon epoxy, silicon resins, and polyurethane, No. average molecular masses.

(5) Corrosion:

Dry and wet, their mechanisms causes and remedial measures of Galvanic, Crevice, Pitting and Stress corrosion, corrosion control , surface preparations, Zn and Sn coatings cathodic and anodic protection, inhibitors and paints.

(6) Only types and uses of:
Insulators, semi-conductors, lubricants, abrasives, adhesives, composite materials, glasses, refractories and non-ferrous alloys.

(7) Outlines of instrumental methods & Chemical analysis:
pH-metry, potentiometry, conductometry, polarography, visible spectrophotometry and flame photometry.

B) PRACTICAL / DRAWINGS , TUTORIAL ASSIGNMENTS:

Based on the theory course prescribed above.

C) REFERENCES:

(1) M. Jain & Jain, Engineering Chemistry, Dhanpat Rai and sons publications. (1995)

(2) C.V. Agarwal, Chemistry of Engineering Materials, Tara Book Agency(1990)

(3) Chatwal & Anand , Instrumental Methods of Chemical Analysis (1990)

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
B.E. Chemical Engineering 2nd Semester

201	Mathematics-II
202	Engineering Drawing
203	Basic Civil Engineering
204	English and Communication skill
205	Electro techniques
105	Engineering Physics
206	Computers Fundamental & Programming
106	Engineering Chemistry

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

MATHEMATICS –II

SEMESTER -II

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

(**A) THEORY:**

1) Calculus:

Reorientations, Functions of several variables, Euler's theorem, chain rule, applications: Maxima, Minima, Errors & approximations, series expansions, Tangent planes and normal Lines, Transformations and jacobians.

2) Ordinary differential equations (higher order):

Re-orientations: Solution if linear mode of nth order with constant coeffs., complimentary functions, auxiliary equation having real or complex, distinct or repeated roots, particular integrals, General method, rules for finding P.I. for special forms viz. e^{an} , $\cos^{\sin}(ax + b)$, X^{m}, $v(x)\, e^{ax}$, $xv(x)$ including cases if failures, solution of nth order with variable coeffs. Of homogeneous type (Euler & Cauchy equation).

Modeling of real world problems particularly engineering systems, second order differential Equations, Models in particular LCR networks, bending of beams, detection of diabetes.

Method of variation of parameters, solution in series, regular points, regular singular points, Fibonacci method of solution, Bessel and begendre different equations, Introduction to Pn (x) and Jn(x).

3) Numerical Methods:

Motivation solution of Algebric and Tracendential equations, Bisection, false position, Newton Raphson methods.

A) Systems of Linear equations :

Guass-elimination, Gauss-seidel, Gauss-Jordon and Jacobi's method.

B) PRACTICAL / DRAWINGS + TUTORIAL ASSIGNMENTS:

Based on the theory course prescribed above.

C) REFERENCES:

1. Srivastava R. S. L. , Engineering Mathematics Vol. I TMS publications, 1980.
2. Kreszig E. , Advanced Engineering Mathematics, Wiley, 1989.
3. J. N. Kapur, Mathematical modeling, Wiley Eastern Ltd., 1989.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ENGINEERING DRAWING

SEMESTER -II

TEACHING SCHEME	**L=2; P/D=4; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: - 20** **External evaluation Marks - 30** **Total Marks - 50**

(A) THEORY:

1. Orthographic Projections of Solids : Study of Indian standards for Engg. rawing, Simple solids like prism, Cube, Cylinder, cone, pyramid, sphere etc. with varying positions of axis with reference to principle plane, projections on auxiliary plane, sections of solids mentioned above, Interpretation of orthographic views and drawing of missing views, simple machine parts such as plumer blocks, brackets, fixtures etc.

2. Isometric Projections : principles of Isometric projection, Isometric views of simple solids and simple machine parts.

3. Development and Interpretation: Interpretation of simple solids such as cylinder, prism, cone and pyramid, curves of intersection, Development of surfaces of simple solids and interpenetrating solids, problems on industrial pipe lines, hoppers, funnel and tanks.

(B) PRACTICAL/DRAWING + TUTORIAL ASSIGNMENTS:

Based on the theory course prescribed above.

(C) REFERENCES:

1. K.L Gopal Krishna, “Engineering Drawing”, Subhas Publications, 1995.
2. N.D. Bhatt, “ Engineering Drawing”, Charotar Publishing house, 1989.
3. K. Venugopal, “Engineering Drawing Made Easy”, Wiley Eastern Ltd., 1993.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

BASIC CIVIL ENGINEERING

SEMESTER -II

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks: 20** **External evaluation marks: 30** **Total Marks: 50**

(A) THEORY:

1. Introduction to Civil Engineering, relation of Civil Engineering to other branches of Engineering.

2. Surveying and measuring techniques, need and type of surveys, conventional signs, linear distance measurement through chain and tapes, angle measurement with compass, notation of bearings, concept of contours and contour surveys and contour mapping.

3. Introduction to buildings, building components such as foundations, masonry work, different types of doors, windows and floorings. Basic building materials such as stones, bricks, mortar, concrete, wood and its important Properties. Reading of building and plant layout, basic types of roads adopted for different purposes.

4. Concepts of environment and ecosystems, impact on environment, types of pollution and remedial approaches.

(B) PRACTICAL/DRAWINGS + TUTORIAL ASSIGNEMENTS :

Based on the theory course prescribed above.

(C) REFERENCES:

1. Kanetkar and kulkarni, Surveying and Leveling, Publi. By Pune VIdyarthi, Griha Pune, 1981.
2. Sharma and Kaul, Textbook of Building construction, S. Chand & company, 1990.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ENGLISH AND COMMUNICATION SKILL

SEMESTER -II

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks: 20** **External evaluation marks: 30** **Total Marks : 50**

(A) THEORY:

2. Spoken English:

Following communication functions be discussed in mean natural dialogue forms: Greetings, introductions, making requests, suggestions, invitations, acceptance, refusal, seeking permission, giving a description, stating likes and dislikes, agreeing & disagreeing, stating performances, conversing on the telephone, inquiries & complaints, compliments, encouragement expressing thanks and apologies etc.

2. Written English:

Business letters – Structures of business letter, essentials of a good business letters. Letters of inquiry, complaints, and requests etc.
Report writing on general as well as scientific topics. Writing formal speeches for Occasions like inaugurations, introduction of guest speakers. Recording and Drafting of minutes of meetings.

(B) PRACTICALS/ DRAWINGS + TUTORIAL ASSIGNMENTS : NIL

(C) REFERENCES:

1. Krishna Mohan and Meera Banerji, " Developing communication Skills" Mc.Millan Co. , Publications 1990.
2. N. Krishnaswami and T. sriram, "Creative English for Communication", Mc.Millan Co., Publication 1992.
3. King & Cree – " Modern Business Letters"- Orient Lengman Publication.1990.
4. M.I. Joshi, "Lets Talk English", Gajjar prakashan, Ahmedabad., 1995.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
B.E. Chemical Engineering 3rd Semester

301	Mathematics III
302	Engg. ChemistryII
303	Basic Electronics
304	Strength of Mat.I
305	Electrical Tech.
306	Unit Process

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

MATHEMATICS III

SEMESTER- II

TEACHING SCHEME	**L=3; P/D=0; TA=2**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks: 20** **External evaluation marks: 30** **Total Marks: 50**

Multiple Integrals

Reorientation of concept of integrals, double and triple integrals, evalution techniques, change of order of integration, integrals in polar and cylindrical coordinated, change of variables of multiple integrals. Application of double and triple integrals for evaluation of area, volume and mass.

Vector Calculus

Basic concepts of Vector Calculus, line integrals, scalar and vector point functions, differential operator, gradient, directional derivative, divergence, curl and Laplacian with their properties and physical interpretation.
Surface integrals, Green's, Gauss and Stokes theorem (without proof), Applications.

Gamma, Beta and Error functions

Improper integrals and their convergence, Gamma and Beta functions and their properties. Error functions, Evaluation and application.

Fourier Series

Fourier expansion of functions with arbitrary period, in particular periodic functions with period $2\prod$, conditions of convergence. Fourier series of even and odd functions, Half range fourier series.

Partial Differential Equations (pde)

Basic mathematical concepts, First order pde of Lagrange's form, Pp+Qq=R,Second order pde of mathematical Physics(Heat, Wave and Laplace eq.)with standard bounfary conditions, Solution by separation of variable method using Fourier Series. Partial differential equations Modelling.

Complex Variables:

Basic mathematical concepts, Analytic functions, C-R equations, Harmonic functions, Related problems, Linear transformation, Conformal Mapping and applications, complex Integration including contour Integration (Simple cases).

REFERENCES:

1.E.Kreyszig, ‘ Advanced Engineering Mathematics’,John Wiley International Student Ed.(1995).
2.C.R.Wylle, ‘ Advanced Engineering Mathematics’, Mc Graw Hill, International Student Ed. (1993)

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

CHEMISTRY – II (ORGANIC)

SEMESTER- III

TEACHING SCHEME **L=3; P/D=2; TA=0**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

PRACTICAL / DRAWING **Internal evaluation marks: - 20**
External evaluation marks - 30
Total Marks - 50

i) Purification of organic compounds by crystalisations, sublimation & different types of distillation.
ii) Detection & estimation of C H N S P & X elements combustion Duma's, Kjeldahl's &
Carius method with chemical reactions.
iii) IUPAC Nomeclature of organic compounds including Hetero-and ali-cyclic compounds.
iv) Structural & Stero-isomerisms, optical isomers of lactic and tartaric acid ,geometrical isomerism.
v) General nature of substitutions, addition, elimination, rearrangement, neucleophilic & electrophilic reactions/mechanisms.
vi) Preperations and chemical properties and uses of: chloroform, carbon tetra chloride, Iodoform, ethanol, ethylene glycol,glycerine,formaldehyde,acetaldehyde,Acetone,Lactic-,oxalic-,citric-,and succinic acids, diethyl ether, acetoacetic ester, malonic ester.
vii) Preperation and industrial uses of organometallic compounds:
Lead, zinc, lithium and magnesium organometallic compounds.
viii) Aromatic halogenation, sulphonation, nitration, alkylation, acylation and addition reactions & their mechanisms.
ix) Study of chloro- and bromo- benzenes, benzyle chlorides, DDT & BHC.
x) Study of aniline, acetanilide, sulphanilic acid, sulphanilamide, diphenyleamine, Dimethylaniline. Tests to distinguish different amines.
xi) Preperations and chemical properties of phenol, catechol, Resorcinol,Quinol, And Phloroglucinol.
xii) Study of benzaldehyde,Salicaldehyde, Cinnamaldehyde, aceto-and benzo-phenones
xiii) Study of benzoic-salysilic-, pthalic-and cinnamice acids
xiv) Study of naphthalene, anthracene, furan, thiophene, pyrole, pyridene, quinoline and carbazole.

Qualitative analysis of Organic compounds, Preparations of important organic compounds, purifications and measurements of melting and boiling points of organic compounds etc.

REFERENCES:

1. P. L. Soni, A Text book of Organic Chemistry,
2. I. L. Finar, Organic Chemistry, Vol 1 &2, ELBS & Longamans, Green.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ENGG. CHEMISTRY PRACTICALS: (BASED ON THE THEORIES)

BASIC ELECTRONICS

SEMESTER -III

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks: - 20**
	External evaluation marks – 30
	Tutorial marks: - 25
	Total Marks - 75

1. Electron emission, work function, thermionic, secondary, photo electric and field emission, Richardson's equations, thermionic cathodes of different types.

2. Semi-conductor devices: Properties of intrinsic and doped semi-conductors, p-n junction diode, transistors, zener diode, uni-junction transistors, silicon controlled rectifiers, biasing circuits for transistors.

3. Rectifiers and filters: Analysis of single/half wave and full wave rectifiers using silicon diodes, 3-phase rectifiers circuits, introduction to bridge rectifiers and controlled rectifiers with resistive load, votage doublers, simple filters.

4. Amplifiers: Load line, classification of amplifiers, graphical and analytical treatment of R-C coupled amplifiers, introduction to choke coupled, transformer coupled and push-pull amplifier circuits, basic principles of feedback amplifiers.

5. Oscillators: General expression for the Berkhausen criterion for oscillators, introduction to LC and RC Transistorisied oscillators, Astable-multi-vibrators, saw tooth generator.

6. Photo-electricity: Photo conductive, photo voltaic and Photo-emissive effects, photo tubes, semi-conductor photo-diode and photo-transistor, photo-sensitive rely circuits, light emitting diode.

7. Industrial applications: C. R. T. and Cathode ray oscilloscope, deflection sensitivity of C. R. T. and Cathode Ray Oscilloscope, uses of C. R. O. , electronic voltmeters,

typical applications of electronic devices for the measurements of non-electrical quantities like temperature, pressure, displacement, velocity, accela=eration, vibration, strain etc. , Strain Gauge bridge, electronic timers, introduction to radio frequency, induction heating, industrial applications of heating, digital computers, basics.

Practicals and Term Work will be based on above.

REFERENCES:

1. V. K. Mehta, Basic Electonics Principles.
2. A. K. Sawhany, Electonic Instrumentation and Measurements.
3. M. Morris, Digital Computer Fundamentals.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

STRENGTH OF MATERIALS – 1

SEMESTER –III

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks: 20**
	External evaluation marks: 30
	Tutorial marks: 25
	Total Marks : 75

1. Strength and Elasticity: Stress, strain, elasticity, stress-strain characteristics, Hook's law, elastic constants and proportionality, yield limit, ultimate strength, proof stress, factor of safery, working stress and load factor.
2. Mechanical properties of materials: Metals- ductility, brittleness, toughness, malleability, behaviour of ferrous and non-ferrous metals in tension and compression, shear and bending stress, standard test pieces, influence of various parameters on test results, true and nominal stress, modes of fracture, characteristics stress-strain curves, strain hardening, Izod, Charpy and tenson impact tests, fatigue strength, endurance limit, creeps of metals, co-relation between different mechanical properties, testing machines and special features, different types of extensometers and compressometers, measurement of strain by electrical resistance strain gauges.
3. Bending moment and shear force: Diagrams in statically determinate beams including cantilevers subjectd to concentrated uniformly distributed and varying loads and inplane moment loading, BM and SF diagrams by analytical and graphical methods, relation between bending moment, shear force and rate of loading, points of contraflexure.
4. Stress in beams: Theory of simple bending, bending stresses and their distribution, moment of resistances, modulus of section, built-up & composite beam sections, beams of uniform strength, distribution of shear stress.
5. Torsion: Circular, solid and hollo section shafts, shear stress and strain due to torsion, angle of twist, torsional moment of resistance, power transmitted by a shaft, keys and couplings, closed coiled helical springs.
6. Principal stresses and strains: Compound stresses, analysis of principal planes and principal stress, Mohr circle of stress, principal strains, angle of obliquity of resultant

stress, principal stress in beams and shafts subjected to bending and torsion, with and without axial stress.

7. Columns: Different end conditions, effective length, least radius of gyration, theory of long colums, application and limitations, secant formula used by I. S. Code.

REFERENCES:

1. Timoshenko and Young, Elements of Strength of Materials, Affliated East West Press.
2. Ryder G. H. , Strength of Materials, ELBS, Hong Kong.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ELECTRICAL TECHNOLOGY

SEMESTER -III

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks: 20** **External evaluation marks: 30** **Total Marks: 50**

THEORY:

D. C. Machines:

Construction, simple lap and wave windings, emf, torque and power equations, circuit model, characteristics, introduction to armature reaction and commutation, self excited generators, shunt series and compound motors, speed control, efficiency and losses.

Transformers:

Fundamentals and construction of single phase and three phase transformers, ideal transformer, emf equation, no load conditions, loading, accounting for finite permeability and core losses, equivalent circuit, no load and short circuit tests, per unit system, voltage regulation, efficiency, auto-transformer, three phase transformers, star and delta connections.

Synchronous Machines:

Construction and basic principles, three phase windings, rotating magnetic fields, distribution and pitch factors, emf equation, synchronous speed, armature reaction, synchronous reactance, voltage regulation, synchronizing to mains, damper winding, vector diagram for generating and motoring modes, synchronous motor starting, V curves.

Induction Machines:

Construction and simple theory of operation of three phase induction motor, equivalent circuit torque speed characteristics, no load and blocked rotor tests, load test, starting, speed control.

Fractional KW Motors:

Brief description of reluctance motor, hysterisis motor, two phase servo motor, stepper motors.

Practical work shall be based upon the theory course.

REFERENCES:

1. Nagrath I. J. : Basic Electrical Engineering (Tata McGraw-Hill Publication)

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
UNIT PROCESSES

SEMESTER – III

TEACHING SCHEME **L=3; P/D=0; TA=0**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

1. **Introduction:**
   Defination and importance of unit process in Chemical Eng., Outlines of unit processes and unit operations, Chemical process kinetics and factors affecting it, Symbols used in Chemical Eng., Process flow diagram.

2. **Nitration:**
   Defination and scope of nitration reactions, Nitrating agents, Aromatic nitration(Schmidt and Biazzi nitrators) Mixed acid for nitration, D.V.S and nitric ratio, Comparision of batch Vs continuous nitration, Mfg. of Nitrobenzene, Dinitrobenzene, o- and p-Chlorobenzene.

3. **Amination by Reduction:**
   Defination and scope of Amination reactions, Various methods of amination and factors affecting it, Batch and continuous methods for manufacture of Aniline from Nitrobenzene, Cont. mfg. of Nitrobenzene using catalytic fluidized bed reactor,
   M OC in such processes.

4. **Halogenation:**
   Definition and scope of various halogenation reactions, Halogenatig agents, Industrial halogenation with types of equipments and its material MOC., Mfg. of Chlorobenzene, BHC and Vinyl chloride from Ethylene and Acetylene.

5. **Sulfation and Sulfonation:**
   Defination and scope of such reactions, Sulfonating and sulfating agents and their applications, Chemical and physical factors affecting it, Industrial equipments and techniques for batch Vs cont. sulfonation, Mfg of benzenesulfonic acid and Dodecycle Benzene Sulfonates, Sulfation of Dimethyl Ether and Lauryl alcohol.

6. **Amination by Ammonolysis:**
   Defination and types of reactions, Aminating agents, Physical and chemical factors affecting it, Catalyst used in ammonolysis, Mfg. of Aniline from Chlorobenzene and Nitroaniline from Dichloronitroaniline.

7. **Oxidation:**

Definition of oxidation, Oxidizing agents, Liquid phase oxidation, Oxidation of Toluene with MnO_2, Mfg. of Acetic acid from Acetaldehyde, Mfg. of Acetic acid from Ethanol, Vapour phase oxidation of Methanol, Benzene and Naphthalene, Apparatus and its MOC for oxidation reactions.

8. Hydrogenation:

Definition and its scope, Properties of hydrogen and sources of hydrogen gas, Catalytic hydrogenation and hydrogenolysis, Factors affecting it, Apparatus and MOC, Industrial hydrogenation of fats and oil, Mfg. of Methanol from CO and H_2.

9. Hydrolysis:

Defination and types of hydrolysis, Hydrolysing agents, Equipments of hydrolysis, Industrial hydrolysis of fat, Hydrolysis of Carbohydrates, Starch to Dextrose, Mfg of Ethanol from Ethylene(Shell process), Mfg. of Phenol from Benzenesulfonic acid.

10. Polymerization:

Introduction and chemistry of polymerization reactions, Classification of polymers, Methods of polymerization

REFERENCES:

1. Groggins P.H., "Unit Processing of Organic Synthesis", McGraw Hill.
2. Dryden's, "Outlines of Chemical Technology"
3. Shreve and Brink, "Chemical Process Industries", McGraw Hill.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

B.E. Chemical Engineering 4th Semester

401	Engg. ChemistryIII
402	Engg. Chem. IV
403	Chem. Engg. Mater.
404	Process calculation
405	Strength of Mat.II
406	Theory of Machines

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

ENGG. CHEMISTRY – IV

SEMESTER –IV

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 20** **External evaluation Marks: 30** **Total Marks: 50**

THEORY:

1. General metallurgy
2. Chemistry of Beryllium, Lithium, Thorium, Tungsten, Uranium, Platinum and Molybdenum
3. Study of the Lanthanides La 57 to Lu 71
4. Theory of Elecolytic Dissociation, strong and weak electrolytes, Ostwald's dilution law, Buffer capacity, ionic activity and activity coefficient, theory of strong electrolyte (Debye Onsagar theory).
5. Electrical conductance, conductance of electrolyte, specific, equivalent, and molecular conductance, cell constant, transport numbers, Kohlrasch's law and its applications, Electro analysis and Coulometry.
6. Equilibrium electrode potentials, classification of electrodes, types of electrochemical systems (Electrochemical cells).
7. Classification of polarization, voltametry and polarography, decomposition potential and over voltage, all types of electro-metric methods.
8. Introduction, classification, preparations, properties and chemical constitutions of Glucose and Fructose, Extraction of Sucrose from Cane Juice, Starch and cellulose.
9. Introduction to alkaloids: Extractin of alkaloids, study of conine, piperine and nicotine.
10. Types of polymerizations, elastomers, natural and synthetic rubber, vulcanizationand compounding.

11. Introduction, composition, classification and isolation of proteins, qualitative tests of proteins. Classification of amino acids and their synthesis.

12. Synthesis of drugs antiseptics, halogens, halogenated compounds, antimalarials, quinoline derivatives, antibacterials, sulpha drugs.

REFERENCES:

I P. L. Soni, Text book of Inorganic Chemistry.
II P. L. Soni, Text book of Organic Chemistry.
III L. Antropov, Theoretical Electrochemistry

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
CHEMICAL ENGG. MATERIALS

SEMESTER – IV

TEACHING SCHEME **L=3; P/D=0; TA=0**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

1. Concept from physical metallurgy: crystal structure, solid solutions, point defects, fick's law, structure of high polymers phase transformation, mechanical properties, deformation of metals, failure of metals, creep, fracture, fatigue, radiation damage, equilibrium diagrams, Fe-C diagram.
2. Ferrous metals, cast iron, steel, alloy steel, effects of alloying elements.
3. Non-ferrous metals and alloys.
4. Inorganic, organic and other materials
5. Corrosion and its control, protective coatings, chemical principles involved.

Note: Topics (1) and (2) should include the study of the effect of acids and alkalies on metals and alloys.

REFERENCES:

1. D. Zaster Zebski, "Nature and Properties of Eng. Materials"
2. Van Vlack, "Elements of Material Science".

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

PROCESS CALCULATIONS

SEMESTER -IV

TEACHING SCHEME **L=3; P/D=0; TA=2**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

Tutorial = 50

1. Mathematical techniques in Chemical Engg. 'Dimensions & Units'.
2. Basic Chemical calculations involving solids, liquids, solutions & gases. Gas laws & phase equilibria.
3. Material Balance with and without chemical reactions.
4. Material Balance involving recycle, bypass and purge systems.
5. Humidity, Saturation, Crystallization and Combustion calculations.
6. Thermophysics & heat capacity calculations.
7. Enthalpy changes of reactions, dissolution & laws of thermochemistry.
8. Heat of reaction, effect of temperature & pressure on heat of reaction.
9. Combined material and energy balance for single stage processes like Distillation, Absorption & Stripping, Crystallization.
10. Material & Energy balance calculations for industrial processes.

REFERENCE:

1. B. I. Bhatt & S. M. Vora , 'Stochiometry'.
2. O. A. Hougen, K. M. Watson, R. A. Ragatz , 'Chemical Process Principles'.,part I.
3. D. M. Himmalblau , 'Basic Calculations In Chemical Engg.'
4. Richardson & Coulson , 'Chemical Engineering'., Volume VI.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

STRENGTH OF MATERIALAS -II

SEMESTER –IV

TEACHING SCHEME **L=3; P/D=0; TA=0**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

Term work: - 25

i) Thermal Stresses: Thermoplastic stress- srain relations, thin circular disc, temperature symmetrical at centre, long thin circular cylinder, thin sphere.

ii) Vortex Induced Stresses, vortex wake of a stationary circular cylinder, strouhal number, effect of cylinder motion on wake, correlation model, thermocouple probe example, tow cable example

iii) Energy Principles in solid continuum, Introduction to energy Work & internal energy, principles of virtual work, Bett's & Maxwell's laws, principles of minimum potential energy, Casti- gliano's theorem, principles of complementary work, simple deflection, problems based on above theorems, theories of failure , their significance in design.

iv) Rotating cylinders and discs, rtating discs of uniform strength, stresses in rotating cylinders.

v) Strength of welded joints, types of weld, eccentric loading in welded joints.

vi) Bending of curved bars: Stresses in bars of small initial curvature-strength in bars of large curvature, extension of curved bars.

REFERENCES:

1. L.S. Srinath, ' Advanced Mechanics Of Solids',Tata McGraw Hill Co.
2. R.D. Blevines, 'Flow induced vibrations', Van-Nostrand Reinhold Co. New York.
3. Ryder, ' Strength Of Materials', ELBS.
4. S.B. Junnarkar & Adavi, 'Mechanics Of Structures Vol. I', Charotar Publishing House, Anand.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

THEORY OF MACHINES AND MACHINE DESIGN

SEMESTER -IV

TEACHING SCHEME	**L=3; P/D=4; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 40**
	External evaluation Marks: 60
	Total Marks: 100

A] THEORY OF MACHINES (40% Weightage):

ii) Introduction to machines and mechanisms : four bar and slider crank mechanisms, Cams and cam followers, cam profiles.
iii) Eriction: Screw, bearings, lubrication, clutches, brakes, Belt drives.
iv) Gear drives : Types gears, gear nomenclature, applications.

B] MACHINE DESIGN [60% Weightage]:

i) Design process, Material selection, factor of safety, types failures and their causes.
ii) Design of joints: pin joints, threaded fasteners, welded joints
iii) Design of power transmission elements.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
B.E. Chemical Engineering 5th Semester

501	Gen. Chem. Tech.I
502	Chem. Engg. Therm-I
503	Fluid flow operation
504	MechanicalOperation
505	Heat Transfer
506	Mass Transfer – I

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
GENERAL CHEMICAL TECHNOLOGY – I

SEMESTER –V

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks : 20** **External evaluation marks: 30** **Total Marks: 50**

1. Water conditioning & Environmental protection : demineralisation, deionisation, Desalination industrial waste treatment and pollution.
2. Fuels & Energy : Coal, coal chemicals, Fuel gases
3. Chlor alkali industries : manufacture of soda ash, caustic soda chlorine hydrogen and hydrochloric acid.
4. Cement and glass manufacture.
5. Sulfuric acid manufacture.
6. Electrolytic manufacture of Al and Mg.
7. Pulp and paper industry.
8. Sugar and Starch industry
9. Oil, fats soaps and detergents
10. Nitrogeneous fertilisers.
11. Phosphatic fertilisers
12. Mixed fertilisers
13. Environmental aspects of various industries.

REFERENCES:

1. R.N. Shreve, J.A. Brink, " Chemical Process Industries" 4th edition.International Students edition
2. G.F. Austin . "Shreve's Chemical Process Industries" 5th edition., Mcgraw Hill Publications.
3. M.Gopala Rao and M. Sitting, " Dryden's Outline of Chemical Technology" 2nd edition., East-West publications.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

CHEMICAL ENGINEERING THERMODYNAMICS - I

SEMESTER -V

TEACHING SCHEME **L=3; P/D=1; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

Tutorial = 25

1. **Introduction** : Conservation of energy and first law of thermodynamics, application to steady state flow process, enthalpy, internal energy, equillibrium state, phase rule, reversible and irreversible processes, heat capacity and specific heat.
2. **Properties of pure substances** : P V T behaviour, ideal and non ideal gases, different equations of state for real gases.
3. Heat effects : Heat capacities of gases as a function of temp., of liquids and solids, heat of vapourisation, heat of fusion, heat of sublimation etc.
4. **Second law of thermodynamics** : Thermodynamic temperature scale, ideal gas temp., scale,concept of entropy,entropy change and irreversibility, third law of thermodynamics.
5. **Thermodynamic properties of fluids** : Mathematical relations among thermodynamic functions, Maxwells' relations, interrelations between H,S,U,G,C_p,C_v, properties of single and two phase systems. Types of thermodynamic diagrams.
6. **Thermodynamics of flow processes** : Fundamental relations for flow in pipes, max. velocity in pipe flow, throttling process, flow through nozzles, single stage and multistage compressors.
7. **Refrigeration and liquifaction** : Carnot refrigeration cycle, air refrigeration cycle, absorption refrigeration, heat pump, choice of refrigeration, liquifaction processes.

REFERENCE:

1. P. K. Nag , 'Chemical Engg. Thermodynamics'.
2. Smith & Vanness, 'Thermodynamics'.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

FLUID FLOW OPERATIONS

SEMESTER -V

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: - 20**
	External evaluation Marks – 30
	Tutorial = 25
	Total Marks - 75

1. Fluid properties and Dimensional Analysis
2. Fluid statics and its applications
3. Fluid flow phenomena: Types of flow-potential flow, one dimensional flow, laminar flow, turbulent flow, Reynolds number, Non-newtonian fluids, nature of tubulence, eddy viscosity, eddy diffusivity of momentum, flow in boundary layers, laminar and turbulent boundary layers, boundary layer thickness, boundary layer separation, wake formation
4. Basic equation of fluid flow
5. Friction in pipes and channels
6. Flow of compressible fluids and two phase flows.
7. Flow past immersed bodies
8. Fluid flow measurement
9. Pumping of fluids
10. Agitation and mixing of liquids

REFERENCE:

1. W.L. Mcabe, J.C. Smith & Peter Harriot, ‘ Unit operations of Chem. Engg.’ 4th Ed. , MGH, 1985, USA.
2. J.M. Coulson, J.F. Richardson, ‘ Chemical Engineering’ 3rd Ed., Peragmon International, 1984, UK.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

MECHANICAL OPERATION

SEMESTER –V

TEACHING SCHEME **L=3; P/D=2; TA=0**

EXAMINATION SCHEME **Theory = 3hours; marks= 100**

PRACTICAL / DRAWING **Internal evaluation Marks: 20**
External evaluation Marks: 30
Total Marks: 50

1. Solids, characteristics of solid particles, type of standard screen series.
2. Size reduction & enlargement, crushers, grinders, disintigraters for coarse, intermediate and fine grinding, energy and power requirements, law of crushing, work index, etc.
3. Screening and other separation methods: screen analysis, estimation of particle size, surface area and particle population based on screen analysis, ideal and actual screens, principle of elutriation, flotation, jigging, electrostatics and magnetic separation processes.
4. Sedimentation, settling velocity, flocculation etc.
5. Fluidization, Dense phase fluidization and boiling bed, min. fluidization velocity, min. porosity of bed and bed height, batch and continuous fluidization.
6. Filtration, filter media, filter aids, batch and continuous filtration, filtration equipments, filter press, leaf, cartridge, vacuum nauch and rotary drum filters.
7. Mixing and agitation: equipments, agitation of liquids, types of impellers, power consumption in agitated vessel etc.
8. Conveying: mechanical and pneumatic conveying, elevators etc.

REFERENCES:

1. WL MacCabe, JC Smith, “Unit Operations in Chemical Eng.” 4th Ed. And 5th ed., McGraw Hill Pub.
2. Brown et al., “Unit Operations”, John Wiley Sons.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

HEAT TRANSFER

SEMESTER –V

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks :- 20** **External evaluation marks – 30** **Tutorial = 25** **Total Marks - 75**

1. Modes of heat transfer: Fourier conduction equation, General conduction equation in cartesian, cylindrical and spherical co-ordinates.
2. Heat transfer by convection: Fluids with and without phase change, free and forced convection, laminar and turbulent flows heat transfer inside and outside tubes, concepts of thermal boundry layers, overall heat transfer coefficients, LMTD, Fouling factors, transfer units, flow over flat plates with heat transfer, empirical relations
3. Natural convection: grashoff number, heat transfer to molten metals.
4. Boiling phenomena: Regimes of boiling etc.
5. Condensation: Film and drop condensation etc.
6. Evaporation: Single effect, multi effect evaporation, forward and backward feed system.
7. Heat exchangers
8. Radiation heat transfer
9. Extended surfaces

REFERENCES:

1. J. P. Holman, Heat Transfer, McGraw Hill Publication
2. M. N. Ozisic, Heat Transfer – Basic Approach, McGraw Hill Publication-1985
3. B. U. Gebhart, Heat Transfer, McGraw Hill Publication

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

MASS TRANSFER-I

SEMESTER –V

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**
Tutorial = 25

1. Introduction to mass transfer operation: classification and methods.
2. Molecular diffusion in fluids: steady state diffusion in fluids at rest and in laminar flow (both gases and liquids), diffusivities of gases and liquids.
3. Mass transfer coefficient: in laminar, turbulent flows, theories of mass transfer, heat momentum and mass transfer analogies.
4. Introduction to diffusion in solids: Fick's law
5. Interphase mass transfer
6. Equipments for gas liquid operation
7. Distillation: VLE data, flash and simple distillation, continuous, McCabe thiele and ponchon savarit method etc.

REFERENCES :

1. R. E. Treybal, Mass transfer operations, 3rd Edition, McGraw Hill Publication
2. McCabe and Smith, Unit operation in chemical engineering, McGraw Hill Publication

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
B.E. Chemical Engineering 6th Semester

601	Gen. Chem. Tech.-II
602	Chem. Engg. therm-II
603	Chem. Reac.Engg.-I
604	Chem. SystemModel.
605	Instrumentation
606	Mass Transfer – II

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

GENERAL CHEMICAL TECHNOLOGY – II

SEMESTER –VI

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 20** **External evaluation Marks: 30** **Total Marks: 50**

1. Petroleum Refining
2. Petrochemical industry.
3. Polymer industry: Manufacture of phenol and urea formaldehyde resins, PVC, Polyethylene, Synthetic rubber etc.
4. Synthetic fiber industry : Nylon polyester, Acrylics, rayons.
5. Fine Chemicals and drugs : Classification of dyes, Azo dyes, Reactive dyes, disperse dyes.
6. Intermediates & Dyes classification of dyes, Azo dyes, Reactive dyes & Disperse dyes.
7. Bio-chemical Engineering Fundamentals, micro-organisms,strains culture etc., kinetics of biochemical reaction, fermentation aeration.
8. Environmental aspects of various industries.

REFERENCE:-

1 R.N. Shreve, J.A. Brink, " Chemical Process Industries" 4th edition.International Students edition

2 G.F. Austin . "Shreve's Chemical Process Industries" 5th edition., Mcgraw Hill Publications G.F. Austin . "Shreve's Chemical Process Industries" 5th edition., Mcgraw Hill Publications.

3 M.Gopala Rao and M. Sitting, " Dryden's Outline of Chemical Technology" 2nd edition., East-West publications

4 Bailey & Ollis, 'Bio-chemical Engineering Fundamentals', 2nd edition., International Student Edition.

5 Nelson. 'Petroleum refinery Processes', McGraw Hill Publication.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

CHEMICAL ENGG. THERMODYNAMICS –II

SEMESTER –VI

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**
Tutorial = 25

1. Thermodynamic properties of fluids: Partial molar properties, chemical potential, non-ideal solutions, fugacity, fugacity coefficient, for pure component and for mixture of gases. For liquids- Lewis randall rule, Henry's law, excess property, activity and activity coefficient.

2. Phase equilibrium: Phase rule, Duhem theorem, miscible system, immiscible system, partially miscible systems, testing of vapor liquid equilibrium data, Gibbs Duhem equation, Van laar equation, Margules equation, Redlich kister equation, P-x-y , T-x-y and x-y diagrams, Vapour liquid equilibrium of ideal and nonideal solutions, Raoult's and Henry's law.

3. Chemical equilibrium: criteria, equilibrium conversion(x), constant(k), effect of temperature and pressure on k, evaluation of k, evaluation of equilibrium conversion for gas phase reaction.

4. Introduction to Statistical thermodynamics: Stefan Boltzmann, Bose Einstein and Fermi Dirac distributors, corrected Boltzmann statics, partition functions, etc.

REFERENCE:

1. J.M.Smith and H.C. Vanness, 'Introduction to Chemical Engg. Thermodynamics', 3rd and 4th Ed., MGH.
2. Nag P.K "Engineering "
3. B.F. Dodge, 'Chemical Engineering Thermodynamics', MGH.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

CHEMICAL REACTION ENGINEERING – I

SEMESTER –VI

TEACHING SCHEME	**L=3; P/D=2; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 20**
	External evaluation Marks: 30
	Tutorial: 25
	Total Marks:75

1. Introduction: Chemical Kinetics, Classification of reactions, variable affecting reaction.
2. Kinetics of homogenous reactions.
3. Instrumentation of Batch Reactor data.
4. Introduction to Reactor Design : Material and energy balances, single ideal reactor, ideal batch reactor.
5. Design of single reaction : Size comparison of single reactors, batch reactor-mixed versus plug flow reactors, first & second order reactions, Gen. Graphical comparison.
6. Multiple reaction system : Plug flow reactors in series and/or parallel, equal sized mixed reactors, recycle factor.
7. Temperature & pressure effects : Single & Multiple reactions.
8. Industrial applications.

REFERENCES:

1. Octave Levenspiel , 'Chemical Reaction Enfineering' , 2nd ed. , John-Wiley.
2. J.M. Smith, 'Chemical Engg. Kinetics' , McGraw Hill Co.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

CHEMICAL SYSTEM MODELLING

SEMESTER –VI

TEACHING SCHEME **L=3; P/D=0; TA=0**

EXAMINATION SCHEME **Theory = 3hours; marks= 100**

1. Introduction; Physical and mathematical modelling, principle of similarity, definition of independent variables and dependent variables, boundary conditions.
2. Mathematical modelling of Chem. Engg. Systems: single, two and n-stage extraction steady state mass transfer processes, Un steady state formulations of a single stage extraction, steady state heat conduction through hollow cylindrical pipe using various boundary conditions, unsteady process of steam heating of a liquid, heat transfer through extended surface(triangle and rectangular), steady state counter current cooling of a tank, diffusion with chemical reaction in a tubular reactor etc.
3. Lapalace Transforms: Thermometer systems, mixing tanks, fixed bed reactor formulations
4. Partial differential equations and finite differences; a review
5. Numerical methods: a review
6. Treatment of experimental results
7. Optimization

REFERENCES:

1. V.G.Jenson and G.V. Jeffers, ‘ Mathematical methods in chemical engineering’, Academic press, NY.
2. H.S. Mickley, T.S. Shrewood and C.E. Reed, ‘Applied mathematics in chemical engineering’, TMGH, New Delhi.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
INSTRUMENTATION

SEMESTER –VI

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation marks :- 20** **External evaluation marks - 30** **Total Marks - 50**

INSTRUMENTATION:

1. Measuring instruments for temperature, pressure, level and flow.

MICRO-PROCESSOR APPLICATIONS:

1. Micro-processor architecture & instruction set for Intel, Zilog and Motorola.
2. Logic structure, combinational logics.
3. Karnaugh Maps, assembly language programming.
4. Timing diagrams, counter & timing delays, stack & subroutines.
5. Interfacing, parallel & seriel, programmable peripheral interface, interrupts, data conversion.
6. Data conversion – ADC & DAC data logging, microcontrollers, program logic controllers, application to process control and drafting.

REFERENCES:

1. Donald Eckman, ‘ Industrial Instrumentation ‘.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

MASS TRANSFER-II

SEMESTER –VI

TEACHING SCHEME	**L=3; P/D=4; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: - 25** **External evaluation Marks - 75** **Total Marks - 100**

1. Absorption: Equilibrium, material balances for single component transfer, multistage and packed tower operation.
2. Humidification: Vapor gas mixtures, gas liquid contact operations, adiabatic and nonadiabatic operation.
3. Liquid extraction: stage wise, stage type contactor etc.
4. Adsorption and ion exchange: stagewise operation etc.
5. Drying: Batch drying, mechanism, continuous drying.
6. Leaching: Steady state and unsteady state operations.
7. Crystallization: Equilibria, operations, equipments.
8. Introduction to recent separation techniques using mass transfer.

REFERENCES:

1. R. E. Treybal, Mass transfer operations, 3rd Edition, McGraw Hill Publication
2. McCabe and Smith, Unit operation in chemical engineering, McGraw Hill Publication

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
B.E. Chemical Engineering 7th Semester

701	Transport Phenonmena
702	C.R.E.-II
703	P.E.D.D.
704	Process Control
705	Seminar
706	Project Preliminaries
707	Training

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

TRANSPORT PHENOMENA

SEMESTER –VII

TEACHING SCHEME **L=3; P/D=0; TA=0**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

1. **Transport by molecular motion**: review of momentum, energy and mass transport by molecular motion.
   - Newton's law of viscosity - Non-newtonian fluids press. and temperature depending of viscosity - viscosity of liquids - Fouriers' law - Temperature and pressure depending of thermal conductivity in gases and liquids - Thermal conductivity of liquids and solids .- Fick's law - Temperature and pressure dependence - diffusion in liquids.
2. **Transport in laminar one dimensional flow**
   - shell and momentum balances - falling film flow through circular tube and annulus - Heat conduction with electrical heat source - Viscous heat source - Forced and Natural convection - Diffusion through stagnant gas film. - with homogenous chemical reaction - Forced convection mass transfer .
3. **Transport in arbitary continum**
   - Equation of continuity - motion and mechanical energy - equation of change for Incompressible non-Newtonian flow - Dimensional analysis of the equilibrium change.
4. **Transport with two independent variables**
   - Unsteady viscous flow - steady viscous flow two dimensional potential flow - Boundary layer theory.
5. **Transport in turbulent flow**
   - Time smoothed quantities - for incompressible fluids - expression for the Reynold stresses - Time smoothed temperature - energy equation - Turbulent energy flux - Concentration.fluctuations. - equation of continuity of Turbulent mass flux.
6. **Transport between two phases**
   - Friction factors - flow in tubes - Flow around sphres - packed column - heat transfer coefficients for forced convection in tubes - Forced convection thorugh packed beds. - free convection - mass transfer coefficient in one phase - Binary mass transfer coefficient in two phases.
7. **Transport to layer flow systems.**
   - Macroscope balance - mechanical energy balance - estimation of friction loss - steady flow problems - steady flow problems - unsteady flow.

REFERENCES:

1. R.B. Bird, W.E. Stewart & F.W. Lightfoot, "Transport phenomena", John Wiley & Sons, 1960.
2. D.D. Holland, 'Multicomponent distillation', Prentice Hall India.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

CHEMICAL REACTION ENGG. –II

SEMESTER –VII

TEACHING SCHEME **L=3; P/D=2; TA=0**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

PRACTICAL / DRAWING **Internal evaluation Marks: 20**
External evaluation Marks: 30
Total Marks: 50

1. Non- ideal fluids
2. Mixing of fluids
3. Kinetics & design for uncatalyzed heterogenous system
4. Fluid - Fluid reactions
5. Fluid particles rections
6. Catalysis
7. Porous catalysis
8. Deactivating catalysis
9. Solid catalyzed reactions
10. Fixed bed reactors,
11. Slurry reactors
12. Fluid bed reactors
13. Optimization
14. Industrial applications

REFERENCES:

1. Octave Levenspeil, 'Chemical Reaction Engg.', 2nd ed.1995,John-Wiley
2. J.M. Smith , 'Chemical Engg. Kinetics', 3rd ed. 1981, McGraw Hill Co., New York.
3. S.M.Walas, 'Reaction kinetics for Chemical Engg.'published in 1959 McGraw Hill Co., New york.
4. Fogler Scott II."Elements of Chemical Reaction Engineering".Prentice hall of India Pvt. Ltd., 1997
5. Perry Robert H. Green Don W. "Perry's Chemical Engineer's Handbook", Mcgrawhill,1984

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

PROCESS EQUIPMENT DESIGN & DRAWING

SEMESTER –VII

TEACHING SCHEME	**L=3; P/D=4; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: - 40** **External evaluation Marks – 60** **Tutorial = 25** **Total Marks - 125**

DESIGN:

1] Basic consideration of mechanical design of process equipments, selection of type of vessel

2] Criteria in vessel design.

3] Design of pressure vessels under internal pressure, constructional features, pressure vessel code, design of shell, types of heads for pressure vessel, design of thickness of heads.

4] Design of storage vessel, storage of nonvolatile and volatile liquids and gases. Codes for storage vessel design, bottom and shell designs.

5] Design of vessels under external pressure of vaccum stress analysis, use of stiffness, design of shell analytical and graphical methods, design of circumferential stiffners, design of covers, pipes and tubings under external pressure.

6] Design of distillation and fractionation column.

7] Design of heat exchangers, shell and tube exchangers, tube sheet channels, shell joints, baffles, tie rods, expansion provisions.

8] Design and construction of reaction vessels, evaporators, crystallizers, dryers, filters.

9] Supports for Vessels, types of brackets or leg support, skirt support, Saddle supports, design considerations.

10] Process hazards & Safety, measures in equipment design analysis of hazards, pressure relief devices.

DRAWING

1] Drawing based on actual design of selected process equipment, such as pressure vessels, storage vessels, heat exchangers, distillation columns, reaction vessels, crystallizers, absorbers, dryers etc.

2] Sketches of equipment accessories such as supports, roofs for storage vessel, jackets, cooling coils, tube sheet for heat exchangers, baffles in heat exchangers, trays for distillation column, packing for distillation towers, liquid distributor etc.

TUTORIAL:
Continuous internal evaluation based on above topics along with assignments.

REFERENCE:

1] M.V.Joshi , ‘ Process Equipment Design’, McMillan Co., India, 1976.
2] L.E. Brown, E.H. Young, ‘Process Equipment Design’ Wiley Eastern Ltd., New Delhi, 1977.
3] E.E. Ludwig, ‘ Applied Process Design for Chemical and Petrochemical Plants-Vol. I, II, III’ , Gulf Publishing Co.
4] J.M. Douglas, ‘ Conceptual Design of Chemical Processes’ , MGH.
5] Kern Donald Q. “Process Heat Transfer”, Mcgrawhill, 1997.
6]Bhattacharya B.C. “Introduction to Chemical Equipment Design Mech Aspects”, CBS Publishers, 2000.

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PROCESS CONTROL

SEMESTER –VII

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: - 20**
	External evaluation Marks - 30
	Total Marks - 50

1. Introduction: Steady and unsteady state design equation for an agitated heated tank. Introduction to P,PI, PID controls.
2. Dynamics of first order systems subjected to various disturbances like step, ramp, impulse & sinusoidal, eg. liquid level tanks, mixing process, thermometer etc.,response of first order systems in series.
3. Dynamics of second order systems subjected to various disturbances like step, impulse, sinusoidal.
4. Linear closed loop systems, servo and regulator problem.
5. Closed loop transfer functions, block diagrams for various simple systems. Transient response of a control system.System compensation.
6. Stability of control system. Routh test criterion. Frequency analysis, simple order systems, Bode diagrams.Nyquist stability criterion.
7. Advanced controls like feed forward, case and ratio controls.
8. Controller and control elements, control valves.

REFERENCE:

1. Coughanowr, “Process Systems and control”, 2nd edition, 1991, Mcgraw Hill co NY
2. Kopell & Coughanowr, “Process system” published 1965, Mcgraw Hill co NY

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SEMINAR

SEMESTER –VII

VIVA = 50

Under the above subject each student will be assigned one topic related to Chemical Engg. field by the concerned staff member. The student will make an up-to-date **literature survey / research oriented experimental work / design of (equipment / plant / system) / modeling and simulation of any system** with reference to the topic assign to him/her under the supervision of the concerned staff member & submit two copies of the report. He/she will present **material / literature / assigned work** in the form of a paper by giving a talk to be followed by discussion. The copies of the report submitted by him/her will be evaluated as term work followed by **Viva-Voce of each student.**

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

PROJECT PRELIMINARIES

SEMESTER –VII

Marks: 50

- Each student is required to submit Project report **on the designing of Chemical Plant/ exhaustive research oriented experimental work / exhaustive design work / modeling and simulation of any system / exhaustive work on industrial problem**. The report will consist of important Chapters(with reference to the assigned topics) – for example on the designing of chemical plant - such as the follows.

1] Introduction

2] Literature Survey

3] Selection of the Process & process details with Justification

4] Thermodynamic & kinetics consideration

5] Physico-Chemical data & properties

6] Material Balance with flowsheet

The copies of the report submitted by him/her will be evaluated as term work followed by **Vice – voce of each student.**

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TRAINING

Total Marks: 100

Each student is required to undergo practical training in a **Chemical Industry / R & D organization** for Four to Six weeks & has to prepare a report covering the following aspects.

1] Introduction of the Industry. (Company Profile)

2] Process discription & flow sheet. (Details about the process)

3] Details of equipment- Data sheet, types of the equipment, material of construction, internals.

4] Process utilities

5] Material Storage & handling

6] Instrumentation & Process control

7] Safety & environmental aspects.

8] Conclusion.

The copies of the report submitted by him/her will be evaluated as term work followed by **Vice – voce of each student.**

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT
B.E. Chemical Engineering 8th Semester

801	C.E.P.D.E
802	Safety & waste Management
803	CAD in Chemical
804	Elective – I A – MCD B – ENV. ENGG. C – F. T.
805	Elective –II A – BIO CHEM. B – Energy Cons. C - PRPC
806	Project

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

CHEMICAL ENGG PLANT DESIGN AND ECONOMICS

SEMESTER –VIII

TEACHING SCHEME **L=3; P/D=0; TA=0**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

1. Introduction, basic consideration in chemical engg. Plant design, project identification, preliminary techo econonic feasibility.
2. Process design aspects, selection of process, factors affecting process selection, types of flow diagrams.
3. Selection of process equipments, standard versus special equipment, materials of construction.,selection criteria etc
4. Process auxiliaries, piping design, layout, support for piping insulation, type of valves process control and instrumentation control system design.
5. Process utilities, process water, boiler feed water, water treatment and disposal,steam, oil heating system, chilling plant compresed air and vacuum.
6. Plant location and layout, principles, factors affecting plant location, use of scale models.
7. Cost estimation, factors involved in project cost estimation.,total fixed & working capital, types & methods of estimation of total capital investment.
8. Estimation of total product cost, factors involved.
9. Depreciation, types and methods of determinations, evaluation.
10. Profitability, alternative investment & replacement methods for profitability evaluation
11. Economic considerations in process and equipment design, inventory control.
12. Optimum design, general products rates in plant operation,optimum conditions.etc.

REFERENCE:

1. M.S. Peters & K.D. Timmerhaus, "Plant design &Economics for Chemical engineers", McGraw Hill (Japan) 2nd Edition., 1968
2. F.C. Vilbrandt & C.E. Dryden, "chemical Engineering plant design" McGraw Hill (New York), 4th Edition.1959.

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

SAFETY AND WASTE MANAGEMENT

SEMESTER –VIII

TEACHING SCHEME	**L=3; P/D=2; TA=0**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks - 20** **External evaluation Marks - 30** **Total Marks - 50**

1. Types of hazards in chemical industries, Hazards due to high pressure and explosions, dust and vapour cloud explosions, inflammable materials, toxic materials, electrostatics, ionising radiations etc.
2. Noise hazards, Effect of noise hazard on personal, plant operation.
3. Fire and explosion indices and hazard analysis.
4. Safety protection, equipments for personal and plant various hazards.Safety procedures.
5. Disaster management, insurance, worker's safety act etc.
6. Sources and effects of environmental pollution.

- Air Pollution : Sources and effects materiological aspects of air pollutant dispersion, air pollution sempelling and measurment, air polluiton control methods and equipment, control of specific gaseous pollutants.
- Water Pollution : Origin of waste water and waste water flow rate, Waste water characteristics, Waste water sampelling , methods of analysis and water quality standards, Waste water treatment.
- Land Pollution (Solid waste): Sources and classification, methods of collection and disposal.

7. Management of industrial waste reuse, recycling, impact of pollution on environment and it's assessment.
8. Magnitude of industrial waste problem, effluent standards and stream standard.
9. Environmental legislation.

PRACTICALS:

1. To determine : COD/TOC, TDS/SS, Ammonical nitrogen, Chlorides, Phosphates, Sulfates, Sulfur, Hardness, Acidity/Alkalinity, Organic/Inorganic matter, Cynide, Colour, Phenol.
2. Gypsum sludge : Leachate in acetic acid and distilled water, Moisture, Organic/Inorganic matter.
3. To study BOD, AAS, Heavy metals analysis.
4. To study stack analysis.

REFERENCES :

1. C. S. Rao, Environmental and pollution control engineering, Wiley eastern limited
2. Metcalf and Eddy, Waste water engineering: treatment, disposal and reuse, Tata McGraw Hill

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CAD IN CHEMICAL ENGINEERING

SEMESTER –VIII

TEACHING SCHEME	**L=3; P/D=2; TA=2**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 20** **External evaluation marks: 30** **Tutorial: 50** **Total Marks: 100**

1. Introduction to CAD.
2. Elementary ideas of numerical techniques such as finite difference & finite element methods applied to chem. Engg. Problems.
3. Computer aided design of chemical process equipments, concept of modular design, optimum design, parameter optimization etc., development of simple algorithms for problems related to above topics.

PRACTICALS:
Development of Simple Programmes based on above topics.

TUTORIAL:
Continuous internal evaluation based on above topics along with assignments.

REFERENCE:

1. M.V.Joshi , ‘ Process Equipment Design’, McMillan Co., India, 1976.
2. L.E. Brown, E.H. Young, ‘Process Equipment Design’ Wiley Eastern Ltd., New Delhi, 1977.
3. E.E. Ludwig, ‘ Applied Process Design for Chemical and Petrochemical Plants-Vol. I, II, III’ , Gulf Publishing Co.
4. J.M. Douglas, ‘ Conceptual Design of Chemical Processes’ , MGH.
5. Kern Donald Q. “Process Heat Transfer”, Mcgrawhill, 1997.
6. Bhattacharya B.C. “Introduction to Chemical Equipment Design Mech Aspects”, CBS Publishers, 2000.
7. Balarurusamy E “Object Oriented Programming with C++”, Mcgrawhill, 2002.

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CH 804 A : ELECTIVE 1:Multi Component Distillation

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**
Tutorial = 25

1. Fundamental Concepts Involved in Multi-Component Distillation
2. Calculations for Bubble Point and Dew Point Temperatures
3. Equilibrium Data
4. Thermodynamics of Vapor Liquid Equilibrium
   - The first and Second Laws of Thermodynamics
   - Ideal and Non Ideal solutions
   - Lewis and Randall Rule for Vapor and Liquid
   - Physical Equilibrium
   - Relation between Enthalpy to Fugacity and Acitivity
   - Excess Free Energy
5. Correlation of Vapor Liquid Equilibrium
   - Method of Lewis and Kay
   - Method of Souders, Selheimer and Brown
   - Method of Gamson and Watson
   - The Kellog Charts
6. Material Balance
7. Enthalpy Balance
8. Case Studies

Reference:

1. Unit Operations, Brown Geroge and Associates, 1st Edition, CBS Publishers and Distributors, New Delhi – 1995.
2. Chemical Engineering, Coulson J. M., Richardson J. F., Volume II, 3rd Edition, Pergamon Press, Oxford 1978
3. Multi-Component Distillation, Holland Charles D., Prentice Hall Inc, Englewood Cliffs N.J., U.S. A. 1963.

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CH 804 B : ELECTIVE I: ENVIRONMENTAL ENGINEERING

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**
Tutorial = 25

SYLLABUS

1. Environmental Engineering aspects of air, water and solid pollution
2. Waste Treatment Plant Design
3. Ecology and diversity
4. Environmental Impact Assessment
5. ISO 14000 Certification & Environmental Laws
6. Environment Audit and Case studies

RECOMMENDED BOOKS

1. Gilbert Masters, Introduction to environmental engineering & science, Prentice Hall, 1991.
2. C. S. Rao, Environmental and pollution control engineering, Wiley Eastern Limited, 1991.
3. Metcalf and Eddy, Waste water engineering: treatment, disposal and reuse, Tata McGraw Hill, IIIrd 2000/ IVth ed. 2003.
4. S.M. Khopkar, Environmental pollution monitoring and control, New Age International Publishers, 2004.
5. R.K. Trivedy, Industry and Environment, Daya Publishing House, Delhi, 2002.
6. Internet resources and Journals

VEER NARMAD SUTH GUJRAT UNIVERSITY,SURAT

Elective – I 804 C- (FERTILIZER TECHNOLOGY)

SEMESTER –VIII

TEACHING SCHEME	**L=3; P/D=0; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
	Tutorial = 25

Following aspects to be addressed to for various fertilizers and their intermediates such as Ammonia, Urea, Ammonium Sulfate, etc.

1] Present technologies available for the production, their technical along with energy consumption.

2] Operating conditions and unit operations involved.

3] Catalysis of process.

4] Instrumentation and process control.

5] Materials of construction and typical engineering problems.

6] Simulation and Optimization of the process.

7] Considerations for plant lay-out.

8] Economics of production.

9] Storage, handling, and transportation.

10] Hazop and Risk analysis study of the process.

11] Environmental aspects

TUTORIAL:

Continuous internal evoluation based on above topics alongwith assignments.

REFERENCES:

1] Dryden “Outlines of Chemical Technology” by Gopal Rao 3rd edition, 1997 Estern Wiley Publication.

2] Austin & Shreve “Chemical Process Industries” 5th edition 1984, McGraw Hill Co.

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4. CH 805 A : ELECTIVE II : BIOCHEMICAL ENGINEERING

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**
Tutorial = 25

Syllabus

1. Cell Structure and Cell types, Chemicals of life (RNA, DNA, enzymes etc.)
2. Principles of biochemical reaction kinetics
3. Mass and energy balance in biological system, Transport phenomena, Enzymatic reaction kinetics
4. Free and immobilised enzyme cell systems
5. Microbial growth and product formation kinetics
6. Classification, design and analysis of bioreactors
7. Upstream processing - media and air sterilisation, Downstream bioprocessing
8. Interaction of Mixed Microbial Populations
9. Physical separation processes, Chromatography; Membrane processes
10. Biological Wastewater Treatment
11. Modern Biotechnological applications

References:

1. Bailey, James E.; Ollis, David F. “Biochemical engineering fundamentals” McGraw-Hill, 1986.
2. Aiba, Shuichi; Humphrey, Arthur E.; Millis, Nancy F. “Biochemical engineering” Academic Press N.Y.
3. Blanch, Harvey W.; Clark, Douglas S. “Biochemical engineering” Marcel Dekker, N.Y.

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CH 805 B: ELECTIVE – II : Energy Conservation

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**
Tutorial = 25

1. Introduction- energy, types, resources, demand and supply
2. Need and opportunities to conserve energy
3. General strategies for energy savings
4. Equipments for energy conservation
5. Materials for saving energy
6. Non-conventional energy sources
7. Alternative fuel development
8. Energy audit and case studies

References:

1. S. Rao and B.B. Parulekar, Energy technology: non-conventional, renewable and conventional, Khanna Publisher, 1997.
2. Guide book for national certification examination for energy managers and energy auditors, General aspects of energy management and energy audit. Bureu of Energy Efficiency (A statutory board under Ministry of Power, Government of India), 2005.
3. Guide book for national certification examination for energy managers and energy auditors, Energy efficiency in thermal utilities. Bureu of Energy Efficiency (A statutory board under Ministry of Power, Government of India), 2005.
4. Guide book for national certification examination for energy managers and energy auditors, Energy performance assessment for equipment and utility systems. Bureu of Energy Efficiency (A statutory board under Ministry of Power, Government of India), 2005.
5. Internet resources and Journals

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ELECTIVE- II 805 C (PETROLEUM REFINING AND PETROCHEMICALS)

SEMESTER –VIII

TEACHING SCHEME	**L=3; P/D=0; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
	Tutorial = 25

1. Oil fields and Refineries in India- Indian petroleum Industry, crude and gas reserves, refining picture.
2. Types of Crudes- composition, classification of petroleum.
3. Evaluation of oil stocks and Refinery Products- TBP distillation, ASTM distillation, equilibrium flash vaporization, interconversion of boiling points, refinery products.
4. Properties of crudes and products- Thermal properties, Test for various refinery products.
5. Processing of petroleum- Atmospheric distillation, Vaccum Distillation, various ways of operating distillation columns.
6. Treatment techniques-impurities, treatment of LPG, Gasoline, Kerosene and Lubes, Wax and purification.
7. Petrochemical Industry-Classification, Chemicals form C1, C2, C3, C4 compounds, chemicals from aromatics, Petrochemicals from various unit processes like oxidation, chlorination, alkylation etc., recent developments in the manufacturing processes.

TUTORIAL:

Continuous internal evaluation based on above topics along with assignments.

REFERENCE:

1. B.K. Rao, ‘Modern Petroleum Refinery Process’, Oxford-IBH Publishing Co.(1990).
2. Nelson, ‘Petroleum Refinery Engineering’, MGH.

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PROJECT

SEMESTER –VIII

Marks= 200

- Each student is required to submit Project report **on the designing of Chemical Plant/ exhaustive research oriented experimental work / exhaustive design work / modeling and simulation of any system / exhaustive work on industrial problem**. The report will consist of important Chapters(with reference to the assigned topics) – for example on the designing of chemical plant - such as the follows.

1] Introduction
2] Literature Survey
3] Selection of the Process & process details with Justification
4] Thermodynamic & kinetics consideration
5] Physico-Chemical data & properties
6] Material Balance with flowsheet
7] Energy Balance with flowsheet
8] Process design & various equipments & optimum operation condition.
9] Fabrication drawing of one of the major equipment with all relavant necessary details.
10] Other important consideration such as instrument & process control, plant layout, safety precuation etc.
11] Environmental aspects.
12] Cost estimation
13] Conclusion.
14] Bivliograpy & refrences.

The copies of the report submitted by him/her will be evaluated as term work followed by **Vice – voce of each student.**