ACADEMIC REGULATIONS COURSE STRUCTURE

AND

DETAILED SYLLABUS

For

CHEMICAL ENGINEERING

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2005-2006)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

KUKATPALLY, HYDERABAD - 500 072.

1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

B.TECH. CHEMICAL ENGINEERING

I Year

COURSE STRUCTURE

Code	Subject	T	P	C
HS05231	English	2+1*	0	4
MA05363	Mathematics-I	3+1*	0	6
PY05226	Engineering Physics	2+1*	0	4
CM05036	Analytical Chemistry	2+1*	0	4
CM05449	Physical Chemistry	2+1*	0	4
CS05106	C Programming & data structures (CSE)	3+1*	0	6
CH05584	Introduction to Chemical Engineering	2+2*	0	4
CS05142	Computer Programming & Numerical Methods Lab	0	6	8
CM05037	Analytical Chemistry Lab	0	3	4
HS05232	English Language Communication Skills Laboratory	0	3	4
ME05230	Engineering Work Shop Practice	0	3	4
ME05220	Engineering Drawing Practice Lab	0	3	4
	TOTAL	24	18	56

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HYDERABAD
B.TECH. CHEMICAL ENGINEERING
COURSE STRUCTURE

II Year

Ist Semester

Code	Subject	T	P	C
MA05364	Mathematics-II	4+1*	0	4
EE05192	Electrical Engineering	4+1*	0	4
CE05258	Fluid Mechanics for Chemical Engineers	4+1*	0	4
CM05441	Organic Chemistry	4+1*	0	4
CH05122	Chemical Process Calculations	4+1*	0	4
ME05224	Engineering Mechanics	4+1*	0	4
CE05259	Fluid Mechanics for chemical engineers Lab	0	3	2
CM05448	Physical & Organic Chemistry Lab	0	3	2
	TOTAL	30	6	28

IInd Semester

Code	Subject	T	P	C
MA05476	Probability & Statistics	4+1*	0	4
CH05485	Process Heat Transfer	4+1*	0	4
CH05120	Chemical Engineering Thermodynamics-I	4+1*	0	4
CH05127	Chemical Technology	4+1*	0	4
CE05239	Environmental Studies	4+1*	0	4
CH05359	Material Science for Chemical Engineers	4+1*	0	4
CH05486	Process Heat Transfer Lab	0	3	2
CH05128	Chemical Technology Lab	0	3	2
	TOTAL	30	6	28

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HYDERABAD
B.TECH. CHEMICAL ENGINEERING
COURSE STRUCTURE

III Year

Ist Semester

Code	Subject	T	P	C
CH05218	Energy Engineering	4+1*	0	4
CH05371	Mechanical Unit Operations	4+1*	0	4
CH05121	Chemical Engineering Thermodynamics-II	4+1*	0	4
CH05124	Chemical Reaction Engineering-I	4+1*	0	4
CH05355	Mass Transfer Operations-I	4+1*	0	4
CH05487	Process Instrumentation	4+1*	0	4
CH05126	Chemical Reaction Engineering Lab	0	3	2
CH05370	Mechanical Unit Operation Lab	0	3	2
	TOTAL	30	6	28

IInd Semester

Code	Subject	T	P	C
HS05352	Management Science	4+1*	0	4
CH05356	Mass Transfer Operations - II	4+1*	0	4
CH05125	Chemical Reaction Engineering-II	4+1*	0	4
CH05481	Process Dynamics and Control	4+1*	0	4
CH05075	Bio Chemical Engineering	4+1*	0	4
	Elective - I	4+1*	0	4
CH05456	Polymer Technology			
CH05246	Fertilizer Technology			
CH05447	Petroleum and Petro Chemical Technology			
CH05260	Fluidization Engineering			
CH05482	Process Dynamics and Control Lab	0	3	2
CH05358	Mass Transfer Operation Lab	0	3	2
	TOTAL	30	6	28

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HYDERABAD
B.TECH. CHEMICAL ENGINEERING
COURSE STRUCTURE

IV Year — **Ist Semester**

Code	Subject	T	P	C
CH05558	Transport phenomena	4+1*	0	4
CH05357	Mass Transfer Operations – III	4+1*	0	4
CH05119	Chemical Engineering Plant Design and Economics	4+1*	0	4
CH05123	Chemical Process Equipment design	4+1*	0	4
CH05488	Process Modeling and Simulation	4+1*	0	4
	Elective-II			
CH05154	Corrosion Engineering			
BT05307	Industrial biotechnology			
CS05434	OOPS Through JAVA	4+1*	0	4
MA05118	Chemical Engineering Mathematics			
CH05484	Process Equipment Design And Drawing Lab	0	3	2
MT05519	Simulation Lab	0	3	2
	TOTAL	30	6	28

IV Year — **IInd Semester**

Code	Subject	T	P	C
CH05312	Industrial Pollution Control Engineering	4+1*	0	4
	Elective-III			
CH05313	Industrial safety and Hazard Management			
CH05161	Design and Analysis of Experiments			
CH05542	Technology of Pharmaceuticals and Fine Chemicals	4+1*	0	4
HS05233	Entrepreneurship			
	Elective - IV			
CH05438	Optimization Of Chemical Process			
ME05436	Operations Research			
CS05159	Data Base Management Systems	4+1*	0	4
CS05048	Artificial Intelligence			
CA05315	Industrial Oriented Mini Project	0	0	2
CA05515	Seminar	0	0	2
CA05495	Project Work	0	0	12
	TOTAL	15	0	28

NOTE: All University Examinations (Theory and Practical) are of 3 hours duration.

* : Tutorials
T : Theory periods per week P: Practical /Drawing Periods per week
C : Total Credits for the subject

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

I Year B.Tech. (Ch.E.) **T P C** **2+1 0 4**

(HS 05231) ENGLISH

1. INTRODUCTION :

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks, to encourage them to develop their language skills. The two textbooks identified by the Board of Studies serve the purpose of illustrating the conceptual framework within which the syllabus is to be administered in the classroom. When a TEXT BOOK is prescribed content is generally paid attention to. However, the stress in this syllabus is on language acquisition and skill development, calling for both the teacher and the taught to go beyond the prescribed texts and innovate exercises and tasks.

2. OBJECTIVES :

1. To promote the language proficiency of the students with emphasis on improving their LSRW skills.
2. To impart training to the students through the syllabus and its theoretical and practical components.
3. To improve communication skills in formal and informal situations.

3. SYLLABUS :

Listening Skills :

• Listening for general content
• Listening to fill up information gaps
• Intensive listening
• Listening for specific information
• Note-taking - guided and unguided
• Post-listening testing

Speaking Skills :

- Oral practice
- Developing confidence
- Introducing oneself/others
- Asking for/ giving information
- Describing objects/offering solutions
- Describing situations
- Role play
- Expressing agreement/disagreement

Reading Comprehension

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Understanding discourse features
- Recognizing coherence/sequencing of sentences

NOTE : The student, through the training imparted to him/her by means of the text-based approach, will be examined in answering questions on an unseen passage.

Writing Skills :

- Writing a sentence
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Interpreting data
- Formal and informal letter writing
- Sending e-mails
- Information transfer
- Editing a passage

4. TEXTBOOKS PRESCRIBED :

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Eight Units, are prescribed:

1. **LEARNING ENGLISH:** A Communicative Approach, Hyderabad: Orient Longman, 2005.(Selected Lessons)

2. **WINGS OF FIRE:** An Autobiography – APJ Abdul Kalam, Abridged version with Exercises, Hyderabad: Universities Press (India) Pvt. Ltd., 2004.

The following lessons from the prescribed texts are recommended for study :

A. STUDY MATERIAL :

Unit – I

1. **Astronomy** from **LEARNING ENGLISH: A Communicative Approach,** Orient Longman, 2005.

2. Chapters 1-4 from Wings of Fire: An Autobiography – **APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004**

Unit – II

3. Information Technology **from** LEARNING ENGLISH: A *Communicative Approach,* **Orient Longman, 2005.**

4. Chapters 5-8 **from** Wings of Fire: An Autobiography – **APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004**

Unit – III

5. Humour **from** LEARNING ENGLISH: A *Communicative Approach,* Orient **Longman, 2005.**

6. Chapters 9-12 **from** Wings of Fire: An Autobiography – **APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004**

Unit – IV

7. Environment **from** LEARNING ENGLISH: A *Communicative Approach,* Ori- **ent Longman, 2005.**

8. Chapters 13-16 **from** Wings of Fire: An Autobiography – **APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004**

Unit – V

9. Inspiration **from** LEARNING ENGLISH: A *Communicative Approach,* Orient **Longman, 2005.**

10. Chapters 17-20 **from** Wings of Fire: An Autobiography – **APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.**

Unit – VI

11. Human Interest **from** LEARNING ENGLISH : *A Communicative Approach*, **Orient Longman, 2005.**

12. Chapters 21-24 **from** Wings of Fire: An Autobiography – **APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.**

* Exercises from the lessons not prescribed shall also be used for classroom tasks.

Unit – VII

Reading and Writing Skills

Reading Comprehension

Situational dialogues

Report writing

Letter writing

Essay writing

Information transfer

Unit – VIII

Remedial English

Common errors

Subject-Verb agreement

Use of Articles and Prepositions

Tense and aspect

Vocabulary – Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms & phrases, words often confused.

TEXT BOOKS

1. **Effective Technical Communication,** M Ashraf Rizvi, Tata McGraw-Hill Publishing Company Ltd.

2. **Everyday Dialogues in English,** Robert J Dixson, Prentice Hall of India Pvt Ltd., New Delhi.

REFERENCES

1. **Strengthen Your English,** Bhaskaran & Horsburgh, Oxford University Press

2. **English for Technical Communication,** K R Lakshminarayana, SCITECH

3. **Strategies for Engineering Communication,** Susan Stevenson & Steve Whitmore (John Wiley and sons).

4. **English for Engineers: With CD,** Sirish Chaudhary, Vikas Publishing House Pvt. Ltd. With CD.

5. **Basic Communication Skills for Technology,** Andrea J Rutherfoord, Pearson Education Asia.

6. **Murphy's English Grammar with CD,** Murphy, Cambridge University Press

7. **A Practical Course in English Pronunciation, (with two Audio cassettes),** Sethi, Sadanand & Jindal , Prentice –Hall of India Pvt Ltd., New Delhi.

8. **English for Professional Students,** by S S Prabhakara Rao.

9. **The Oxford Guide to Writing and Speaking,** John Seely, Oxford.

10. **Grammar Games,** Renvolucri Mario, Cambridge University Press.

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HYDERABAD

I Year B.Tech. Ch.E.

(MA 05363) MATHEMATICS – I

T	P	C
3+1	0	6

UNIT – I

Sequences – series – Convergences and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence. Rolle's theorem– Lagrange's Mean Value Theorem – Cauchy's Mean value Theorem – Generalized Mean Value theorem (Taylor's Theorem).

UNIT – II

Functions of several variables – Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints or without constraints- Radius, Centre and Circle of Curvature – Evolutes and Envelopes.

UNIT – III

Curve tracing – Cartesian , polar and Parametric curves - Applications of integration to lengths , volumes and surface areas in Cartesian and polar coordinates.

UNIT – IV

Differential equations of first order and first degree – exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, Orthogonal trajectories-Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, $e^{ax}V(x)$, $xV(x)$, method of variation of parameters.

UNIT – V

Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms-Application of Laplace transforms to ordinary differential equations.

UNIT – VI

Multiple integrals - double and triple integrals – change of variables – change of order of integration.

UNIT – VII

Vector Calculus: Gradient- Divergence- Curl and their related properties of sums-products- Laplacian and second order operators. Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals.

UNIT – VIII

Vector integral theorems: Green's theorem- Stoke's and Gauss's Divergence Theorem. Verification of Green's - Stoke's and Gauss's Theorems – Cylindrical, Spherical coordinates-Expressions Grad, div, curl in spherical and cylindrical coordinates.

TEXT BOOKS :

1. A text book of Engineering Mathematics Volume – 1, 2005 T.K.V.Iyengar, B.Krishna Gandhi and others, S.Chand and Company.

2. Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill 2003.

REFERENCES :

1. Engineering Mathematics–I, 2002, P.Nageswara Rao, Y.Narsimhulu, Prabhakara Rao, Deepthi Publishers

2. Engineering Mathematics–I, 2004, Dr.Shahnaz Bathul, Right Publishers.

3. Engineering Mathematics, S.K.V.S. Sri Rama Chary, M.Bhujanga Rao, Shankar, B.S. Publications 2000.

4. Engineering Mathematics-I Rukmangadhachary, Pearson Education.

5. A Text book of Engineering Mathematics, VP Mishra, Galgotia Publications.

6. Engineering Mathematics – I, Sankaraiah, VGS Book Links, Hyderabad.

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I Year B.Tech. Ch.E.

T P C
2+1 0 4

(PY05226) ENGINEERING PHYSICS

UNIT –I

INTERFERENCE Introduction - Superposition of waves - Young's double slit experiment - Coherence - Interference in thin films by reflection - Newton's rings.

DIFFRACTION Introduction - Fressnel and Fraunhofer diffraction - Fraunhofer diffraction at a single slit & at a double slit - Circular aperture - Diffraction grating - Grating spectrum - Resolving power of a grating - Rayleigh's criterion for resolving power.

UNIT II

POLARIZATION Introduction - Representation of polarized and unpolarized light - Polarization by reflection - Malus law - Double refraction - Nicol prism - Circular and Elliptical polarization -Quarter wave plate - Half wave plate.

ULTRASONICS Introduction - Production of Ultrasonic waves - Magnetostriction method - Piezo electric method - Detection of Ultrasonics - Properties of Ultrasonics - Use of Ultrasonics for non-destructive testing - Applications of Ultrasonics.

UNIT III

ACOUSTICS OF BUILDINGS Basic requirement of acoustically good hall - Reverberation and time of reverberation – Sabine's formula for reverberation time - Measurement of absorption coefficient of a material - Factors affecting the architectural acoustics and their remedy.

SUPERCONDUCTIVITY General properties -Meissner effect - Penetration depth - Type I and Type II superconductors - Flux quantization - Josephson Effect - BCS Theory - Applications of superconductors.

UNIT IV

LASERS Introduction - Characteristics of Lasers - Spontaneous and Stimulated Emission of radiation - Einstein's coefficients - Population inversion - Ruby Laser - Helium-Neon Laser - Semiconductor Laser - Applications of Lasers in Industry, Scientific and Medical fields.

UNIT V

FIBER OPTICS Introduction - Principle of optical fiber - Acceptance angle and Acceptance cone - Numerical aperture - Step-Index fiber and transmission of signal in SI fiber - Graded-Index fiber and transmission of signal in GI fiber - Attenuation in optical fibers - Advantages of optical fibers in communication - Application of optical fibers in Medicine and Sensors.

UNIT VI

MAGNETIC PROPERTIES Permeability - Magnetization - Origin of magnetic moment - Classification of magnetic materials - Dia, Para and Ferro magnetism - Hysteresis curve - Soft and Hard magnetic materials - anti-Ferro and Ferri magnetism - Ferrites and their applications.

CRYSTAL STRUCTURES Introduction - Space lattice - Basis - Unit cell - Lattice parameter - Crystal systems - Bravais lattices - Structure and Packing fractions of Simple cubic - Body Centred Cubic - Face Centred Cubic crystals - Structures of Diamond, ZnS, NaCl, CsCl.

UNIT VII

CRYSTAL PLANES & X-RAY DIFFRACTION Directions and Planes in crystals - Miller Indices - Separation between successive [h k l] planes - Diffraction of X-rays by Crystal planes - Bragg's Law - Laue method -Powder method.

UNIT VIII

DEFECTS IN SOLIDS Imperfections in Crystals - Point defects - Schottky and Frenkel defects - Energy for formation of a Vacancy - Equilibrium concentration of Schottky and Frenkel defects -Line defects - Edge and Screw dislocation - Burger's Vectors.

TEXT BOOKS:

1. **Engineering Physics** by R.K.Gaur - S.L. Gupta; Dhanpat Rai and Sons.
2. **Applied Physics** by Dr.M.Chandra Shekar & Dr.P.Appala Naidu; V.G.S. Book links.

REFERENCES :

1. **Engineering Physics** by Dr.M. Arumugam; Anuradha Agencies
2. **Physics Volume 2,** by Halliday, Resnick and Krane; John Wiley & Sons
3. **Engineering Physics** by M.N.Avadhanulu & P.G. Kshirasagar; S.Chand &Company Ltd.
4. **Engineering Physics** by P.V.Naik; Pearson Education
5. **Materials Science and Engineering** by V. Raghavan; Prentice-Hall India
6. **Engineering Physics (Vol.1)** by M.D. Khanna and V. Balaswamy; Vikas Publishing House Pvt. Ltd., New Delhi

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I Year B.Tech. Ch.E.

(CM05036) ANALYTICAL CHEMISTRY

T P C
2+1 0 4

Unit – I :

Principles of analytical methods : Quantitative analysis. Precipitation, types of precipitates, impurities, co-precipitation, post-precipitation, conditions for precipitation, precipitation from homogenous solution. Gravimetric determination of Fe, Ni and Cu, calucutions.

Unit – II

Volumetric analysis : Acid base titration, indicators, Oxidation – reduction titration, Complexation using ligands, complexometric titration with EDTA, metal ion indicators simple calculations, analysis of Na_2CO_3, Fe_2O_3 brass solder etc.

Unit – III

Molecular spectrophotometry : Interaction of radiant energy with matter. Spectral region : Origin of electronic spectra - $\tilde{O}$-$\tilde{O}^*$, n-$\tilde{O}^*$ and - * transitions. Absorption spectra. Lamberts law, Beer's law – Combined law equation deviations from Beer's law. Block diagram of a uv-visible spectrophotometer - quantative analysis direct method for the determination metal ions :Chromium, Manganese, Iron etc in alloys. Simulataneous spectro photometric determination of Chromium and Manganese.

Unit – IV :

Infrared spectroscopy : Interaction of infraradiation with molecules. Sources of Ir radiation, Spectral regions, block diagram of Ir spectrophotometer, function of each component, sample techniques, application of ir spectroscopy to functional group analysis (-OH, -NH$_2$, - CHO, - CO-R, - CONH-)

Unit – V :

Electro analytical methods: Potentials, titration potentiometer, detemation of oxidants and raductants (Fe (II), VO(II), Ce(IV), Cr2 O7 $^{-2}$), PH, glass electrode, buffer solutions, standardization, determination of PH of samples, PH – metric titration of acid – base (HCl vs NaOH) Conductivity, specific conductivity , conductivity meter, conductometric titrations.

Unit – VI :

Voltammetry : Principle of micro electrolysis, polarization, dropping mercury electrode, polarograph, half wave potential, Ilkovic equations, qualitative analysis and quantitative analysis. Standard addition technique. Determination of Lead, Zinc, Cadmium. Amperometric titrations with examples.
Electrolysis : Constant current electrolysis, controlled potential electrolysis. Determination of Copper and Nickel.

Unit – VII :

Separation Methods:(a) Solvent Extraction : Nernst distribution law, distribution coefficient, distribution ratio, % extraction. Batch extraction. Extraction of metal ion from solution, craig extraction.

(b) Chromatography : Principles, planar chromatography, paper chromatography , Rf value. Thinlayer chromatography, identification of spots by spraying agents and other methods.

Unit – VIII :

Gas Chromatography : Principles of Gas chromatography, Block diagram of Gas chromatograph – function of each component , detectors (FID, ECD) stationary phase for column, mobile phase, chromatogram, qualitative analysis, special plots, quantative analysis, retention time, retention volume, capacity factor, area normalization method.

HPLC : Principle of high performance liquid chromatography. Block diagram of HPLC systems, function of each component, stationary phases, eluting solvents, pumps, detectors, quantative applications of HPLC.

TEXT BOOK :

1. Quantative analysis, R.A.Day & A.L.Underwood Printice-Hall of India Pvt.Ltd. 5th edition ,2000.
2. Vogel's Text book of Quantitative chemical analysis, J.Mendham, R.C.Denney, J.D. Barnes, M J.K. Thomas, Person education 6th edition, 2002.

REFERENCES :

1. Instrumental methods of analysis, Willand, Merrit and Dean, CBS publications & Distribution, 1999.
2. Instrumentation methods of analysis, Chatwal & Anand, Himalaya Publications, 2003.

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I Year B.Tech. Ch.E.

T P C
2+1 0 4

(CM05449) PHYSICAL CHEMISTRY

UNIT – I

Distribution Law : Distribution Law – Nernst Distribution Law – Distribution Co-efficient – Explanation and Limitations of Distribution Law – Modification of Distribution Law – Determination of Equilibrium Constant From Distribution Co-Efficient – Applications of Distribution law.

UNIT II :

Phase Rule: Phase Rule – Terms Involved in Phase Rule – Types of Liquids – Derivation of Phase Rule – Phase Diagrams of One Component (Water and Sulphur System), Two Component System (Lead Silver System) and Three Component System. Applications of Phase Rule.

UNIT III:

Chemical Kinetics: Introduction to Chemical Kinetics – Theories of Reaction Rates – Collision Theory – Modified Collision Theory – Absolute Reaction Rate Theory (Transition State Theory) – Reaction Between Ions – Influence of Solvent (Double Sphere Activated Complex and Single Sphere Activated Complex) – Influence of Ionic Strength on the Rate of the Reactions – Chain Reactions – Hydrogen and Bromine, Hydrogen and Oxygen (Steady State Treatment) – Explosion Limits.

UNIT IV:

Colloidal State: Definition of Colloids, Classification of Colloids.
Solids in Liquids (Sols) – Properties, Kinetics, Optical and Electrical, Stability of Colloids. Protective Action, Hardy – Schultze Law, Gold Number.

Liquids in Liquids (Emulsions) – Types of Emulsions, Preparation, Emulsifier.
Liquid in Solids (Gels) – Classification, Preparation and Properties, Inhibition, General applications of Colloids.

UNIT V:

Electro Chemistry: Ohm's Law – Conductance – Specific Conductance – Equivalent Conductance – Molecular Conductance and its Determination – Transport Number and its Determination – Kohlrausch's Law, its Application – Conductometric Titrations – Applications of Conductivity Measurements.

UNIT VI:

Electrochemical Cells: Galvanic cells, spontaneity, reversible, irreversible cells, measurement of EMF, Standard electrodepotential, concentration cells, batteries, Fuel cell, hydrogen oxygen fuel cell, photogalvanic cell, photovoltaic cells.

UNIT VII:

Catalysis: Homogeneous Catalysis – Catalysis by electron and group transfer in solution – Acid-Base Catalysis – Protolytic and Prototropic Mechanizm. Enzyme Catalysis – Specificity – Examples – Influence of Concentration (Michaelis Constant) – Influence of pH – Influence of Temperature.

UNIT VIII:

Photochemistry: Types of chemical reactions, Laws of Photochemistry, Grotthus – Drapper Law, Einstein Law of photochemical equivalence, Quatum yield, Experimental determination of Quantity yield, Reasons for low and high quantity yields, Fluorescence, Phosphorescence, photosensitization photosynthesis, Calculations based on Quantity yield.

TEXT BOOKS :

1. Physical Chemistry - Glasston & Lewis.
2. Advanced Physical Chemistry - Gurudeepraj, Goel Publishing House.

REFERENCE:

1. Physical Chemistry - Ira N.Levine, Tata McGraw Hill, Fifth edition 2002.
2. Physical Chemistry - Atkins.
3. Physical Chemistry - Walter J.Moore.
4. Electro Chemistry - Samuel Glastone.
5. Physical Chemistry - Puri, Sharma and Pathania.
6. Physical Chemistry - Castalin.

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I Year B.Tech. Ch.E.

(CS 05106) C PROGRAMMING AND DATA STRUCTURES

T	P	C
3+1	0	6

UNIT - I

Algorithm, flowchart, program development steps, basic structures of C language, C tokens, data types and sizes, declaration of variables, assigning values, arithmetic, relational and logical operator, increment and decrement operators, conditional operator, bit-wise operators, type conversions, expressions, evaluation, input-output statements, blocks, if and switch statement, while, do-while and for statements, C programs covering all the above aspects.

UNIT - II

One dimensional & Two dimensional arrays, initialization, string variables-declaration, reading, writing, Basics of functions,Parameter pasing,String handling function, user-defined functions, recursive functions, variables and storage classes, scope rules, block structure, header files, C preprocessor, example C programs.

UNIT - III

Pointer and Arrays : Pointers and addresses, Pointers and Arrays, Pointers And function arguments, Address arithmetic, character pointers and functions, pointers to pointers, multi-dimensional arrays, initialization of pointer arrays, command line arguments, pointers to functions.

UNIT - IV

Structures : Definition, initializing, assigning values, passing of structures as arguments, Arrays of structures, pointers to structures, self referential structures. Unions, typedef, bit fields, C program examples.

UNIT - V

Console & File I/O : Standard I/O, Formatted I/O, opening & closing of files, I/O operations on files.

UNIT - VI

Linear DataStructures : Introduction to DataStructures, representing stacks and queues in C using arrays, Infix, Postfix & Prefix programs, circular queues.

UNIT - VII

Linked Lists : Singly linked list, Doubly linked list, Circular List, representing stacks and Queues in C using linked lists

Non-Linear Data Structures : Binary trees: Representation, tree traversals, graph representation, graph traversal, Spanning trees.

UNIT - VIII

Sorting & Searching : Searching Methods- Linear and binary search methods, Sorting methods- Ex: Bubble sort, Selection sort, Insertion sort, heap sort, quick sort.

TEXT BOOKS :

1. C and Data structures – P.Padmanabham, BS Publications

2. C & Data Structures, Ashok N.Kamthane, Pearson Education

REFERENCES :

1. C & Data Structures – Prof. P.S.DeshPande, Prof O.G.Kakde, Wiley Dreamtech Pvt. Ltd., NewDelhi.

2. DataStructures Using C – A.S.Tanenbaum, PHI/Pearson education

3. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/ Pearson Education

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HYDERABAD

I Year B.Tech. Ch.E.

T	P	C
2+2	0	4

(CH05584) INTRODUCTION TO CHEMICAL ENGINEERING

(Qualitative treatment only)

Unit-I:

Introduction, Unit operations, basic laws, units and dimensions,

Unit-II:

Energy, equivalent mass, electrochemical processes, humidity and saturation. Material balance, energy balance

Unit-III:

Flow of fluids: Introduction, nature of fluid, viscosity, velocity profile, flow field, types of fluid motion, laminar and turbulent flow, flow of a fluid past a solid surface, conservation of mass, conservation of energy, pumping of fluids.

Unit-IV:

Heat transfer: Conduction, convection (omit correlations for calculation of heat transfer coefficients, heat transfer with change in phase) and radiation.

Flow arrangement in heat exchangers, variation of fluid temperatures in heat exchangers, heat transfer equipment, evaporation.

Unit-V:

Mass transfer: Diffusion, mass transfer operation, absorption, Vapour-Liquid Equilibrium, Relative Volatility, Boiling point diagram.

Unit-VI:

Distillation, reflux, McCabe-Thiele method, plate efficiency.

Unit-VII:

Terminology for gas-liquid mass transfer operations, Equipment for gas-liquid operations, selection of equipment for gas-liquid operations, liquid-liquid extraction, extraction schemes, distribution coefficient, triangular diagram, selection of disperse phase, Single stage equilibrium extraction, multistage extraction process, classification of industrial liquid-liquid contactors, industrial liquid-liquid contactors.

Selection of liquid-liquid extraction contactors.

Unit-VIII:

Humidification and dehumidification, drying, equipment for drying, crystallization, crystal geometry, super-saturation, mechanism of crystallization process, classification of crystallization equipment, crystallization equipment, adsorption, adsorption equipment.

TEXT BOOK:

1. Introduction to chemical engineering by S. K. Ghosal, S. K. Sanyal and S. Dutta, TMH publications, 1993.

REFERENCE:

1. Unit operations in chemical engineering by W.L. Mc Cab and J.C. Smith and Peter Harriott, Mc Graw Hill 5th ed. 1993.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

I Year B-TECH Ch.E.

	T	P	C
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(CS05142) COMPUTER PROGRAMMING AND NUMERICAL METHODS LAB

1. Write a C program the evaluates the following algebraic expressions after reading necessary values from the user:

   a) ax+b/ax-b

   b) 2.5 log x + cos 320 + | x2 -y2 | + √ 2xy

   c) 1/α? ?

2. Write a C program for the following

   a) Printing three given integers in ascending order

   b) Sum of 1 + 2+ 3+ _ _ _ _ _ _ n

   c) 1 + x2/2! + x2/ 4!+ _ _ _ _ _ _ upto ten terms

   d) x +x3/3! + x5/5!+ _ _ _ _ _ _ upto 7th digit accuracy

   e) Read x and compute Y =1 for x > 0

      Y=0 for x = 0

      Y= -1 for x<0

3. Write C program using FOR statement to find the following from a given set of 20 integers.

   i) Total number of even integers.   ii) Total number of odd integers.

   iii) Sum of all even integers.   iv) Sum of all odd integers.

4. Write a C program to obtain the product of two matrices A of size (3X3) and B of size (3X2).   The resultant matrix C is to be printed out along with A and B. Assume suitable values for A & B.

5. Using switch-case statement, write a C program that takes two operands and one operator from the user, performs the operation and then prints the answer. (consider operators +,-,/,* and %).

6. Write C procedures to add, subtract, multiply and divide two complex numbers (x+iy) and   (a+ib). Also write the main program that uses these procedures.

7. A cloth show room has announced the following seasonal discounts on purchase of   items.

Purchase AmountDiscount	(Percentage)Mill ClothHandloom items1-100- 5.0101-2005.07.5201-3007.510.0Above 30010.015.0

8. Write a C program using switch and If statements to complete the net amount to be paid by a customer.

9. Given a number, write C program using while loop to reverse the digits of the number. Example 1234 to be written as 4321.

10. The Fibonacci sequence of numbers is 1,1,2,3,5,8... based on the recurrence relation

    f(n) = f (n-1) + f (n-2) for n>2.

    Write C program using d0-while to calculate and print the first m fibonacci numbers.

11. Write a C program to extract a portion of a character string and print the extracted string. Assume that m characters are extracted starting with the nth character.

12. Write a function that will scan a character string passed as an argument and covert all lower case characters into their upper case equivalents.

13. Implement the following data structures using Arrays

    i) Stacks   ii) Linear Queues iii) Circular queues

14. Simple expression evaluator, that can handle +, -,/ and *.

15. Implement the algorithms for the following Iterative Methods Using C to find one root of the equation f(x)=xsinx+cosx=0

    a) Bisection   b)False Position

    c) Newton-Raphson   d)Successive Approximation

16. Implement the algorithms for the following iterative methods using C to find one root of the equation

    9x1+2x2+4x3=20

    x1+10x2+4x3 = 6

    2x1-4x2+10x3 = -15.

17. Write Computer programs to implement the Lagrange interpolation and Newton-Gregory forward interpolation.

18. Implement in 'C' the linear regression and polynomial regression algorithms.

19. Implement Traezoidal and Simpson methods.

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I Year B.Tech. Ch.E.

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(CM05037) ANALYTICAL CHEMISTRY LAB

List of experiments

Redox Titration :

1. Estimation of Iron by potassium dichromate
2. Estimation of Ferric Iron by dichromate

Iodometry :

3. Estimation of hypo using standard potassium dichromate
4. Estimation of copper by sodium thiosulphate

Complexo metric titrations :

5. Estimation of hardness of water using EDTA
6. Estimation of copper by EDTA

Colorimetry :

7. Estimation of chromium in alloy samples
8. Estimation of Iron in alloys samples

Analysis of minerals :

9. Percentage purity of Pyrolusite
10. Percentage purity of Limestone

Precipitation titration :

11. Estimation of Zinc using potassium Ferro Cyanide

Analysis of water :

12. Estimation of dissolved oxygen in water sample
13. Estimation of Chlorides in Water.

Gravimetry :

14. Estimation of Sulphate.
15. Determination of Nickel Using Dimethyl Glyoxime.
16. Determination of copper by Electrogravimetry.
17. Simultaneous Spectrophotometric determination of Cr and Mn in mixture.

Instrumental Methods of Analysis : Determination of composition of a given mixture by G.C./H.P.L.C./I.R.

TEXT BOOKS

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al., Pearson Education.
2. Chemistry Practical-lab manual by Dr.K.B.Chandra Sekhar and Dr.K.N.Jayaveera.

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I Year B.Tech. Ch.E.

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(HS 05232) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The language Lab focuses computer-aided multi-media instruction and language acquisition to achieve the following targets :

- To expose the students to a variety of self-instructional, learner-friendly modes of language learning.
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such as GRE, TOEFL, GMAT etc.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To train them to use language effectively to face interviews, group discussions, public speaking.
- To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

However, depending upon the available infrastructure and budget, the above targets can also be achieved by procuring the minimum required equipment suggested for the establishment of a Conventional Lab the details of which are given below. The lab should cater to the needs of the students to build up their confidence to help them develop leadership qualities through their communicative competence.

SYLLABUS :

The following course content is prescribed for the English Language Laboratory Practice :

1. Introduction to Phonetics.
2. Introduction to Vowels and Consonants and associated Phonetic symbols.
3. Introduction to Accent, Intonation and Rhythm.
4. Situational Dialogues / Role Play.
5. Public Speaking.
6. Debate
7. Group discussions
8. Facing Interviews
9. Resume preparation
10. e-correspondence

Minimum Requirement :

- Computer aided multi media language lab with 30 systems with LAN facility.
- Conventional Language Lab. with audio and video systems, speakers, head phones and a teacher console to accommodate 30 students.

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I Year B.Tech.Ch.E.

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(ME05230) ENGINEERING WORKSHOP PRACTICE

1. TRADES FOR EXERCISES:

(Any seven trades from the following with minimum of three simple exercises in each trade and also study of Tools used).

1. Carpentry
2. Fitting
3. Tin-Smithy and Development of jobs carried out and soldering.
4. Black Smithy
5. House-wiring
6. Foundry
7. Plumbing.
8. IT Workshop-I
9. IT workshop-II

II TRADES FOR DEMONSTRATION & EXPOSURE:

1. Demonstration of power tools – Pneumatic Tools, Electrical Tools
2. Welding - ARC Welding/Gas Welding/Plasma Welding
3. Machine Shop
4. Metal Cutting - Hacksaw, Power Saw, Gas Cutting, Arc Cutting.
5. Metal Cutting (water plasma)

Suggested Software :

- Cambridge Advanced Learners' Dictionary with exercises
- The Rosetta Stone English Library
- Clarity Pronunciation Power
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd
- Learning to Speak English - 4 CDs
- Microsoft Encarta
- Murphy's English Grammar, Cambridge
- Time series of IQ Test, Brain-teasers, Aptitude Test etc.
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy,Cambridge.

BOOKS SUGGESTED FOR ENGLISH LAB :

1. Developing Communication Skills by Krishna Mohan & Meera Benerji (Macmillan)
2. Speaking English Effectively by Krishna Mohan & NP Singh (Macmillan)
3. Better English Pronunciation by JDO Connor (UBS – Cambridge)
4. Oxford Practice Grammar with Answers, John Eastwood, Oxford
5. Handbook of English Grammar and Usage, Mark Lester and Larry Beason, Tata McGraw-Hill
6. A text book of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)
7. Lingua TOEFL CBT Insider, by Dreamtech
8. TOEFL & GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
9. English Skills for Technical Students, WBSCTE with British Council, OL
10. A Handbook of English for Competitive Examinations, by B Shyamala Rao, Blakie Books, Chennai.

DISTRIBUTION AND WEIGHTAGE OF MARKS :

ENGLISH LANGUAGE LABORATORY PRACTICE

1. The practical examinations for the English Language Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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I Year B.Tech.Ch.E.

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(ME05220) ENGINEERING DRAWING PRACTICE LAB

Unit-I:
Introduction to engineering graphics- construction of ellipse, parabola, and hyperbola-cylindrical curves.

Unit-II:
Orthographic projections of points, lines and planes-axis inclined to one planes and inclined to both the planes.

Unit-III:
Orthographic projections of solids: Cylinder, cone, prism, pyramid and sphere positions and axis inclined to both the planes.

Unit-IV:
Isometric projections of lines, planes and simple solids.

Unit-V:
Conversion of orthographic views in to isometric views and vice-versa.

TEXTBOOKS:
1. Engineering graphics by K.L. Narayana and P. Khannayya.
2. Engineering drawings by N.D. Bhat.

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IInd Year B.Tech. Ch.E. (I Semester)

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(MA05364) MATHEMATICS – II

UNIT – I
Matrices : Elementary row transformations – Rank – Normal form – Echelon form – Consistency – Solution of system of simultaneous linear homogeneous and non-homogeneous equations.

UNIT – II
Eigen values, eigen vectors – properties – Cayley-Hamilton Theorem – Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix. Calculation of powers of matrix – Modal and spectral matrices. Real matrices – Symmetric, skew - symmetric, orthogonal, Linear Transformation - Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and eigen vectors of complex matrices and their properties.

UNIT-III
Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index - signature - Sylvester law.

UNIT –IV
Fourier Series: Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

UNIT-V
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type)equations. Method of separation of variables – Classification of second order linear Partial Differential Equations, solutions of one dimensional heat equation, wave equation and two-dimensional Laplace's equation under initial and boundary conditions.

UNIT –VI
Fourier integral theorem – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT-VII

z-transform – inverse z-transform - properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equation by z-transforms.

UNIT-VIII

Wave lets – The Haar wavelets – A wavelet expansion - Multiresolution analysis with Haar Wavelets - General construction of wavelets and multiresolution analysis - Shannon wavelets.

TEXT BOOKS:

1. A Text book of Engineering Mathematics Volume – II, 2005 T.K.V.Iyengar, B.Krishna Gandhi and others, S.Chand and Company.
2. Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill 2003.

REFERENCES:

1. Engineering Mathematics–II, 2002, P.Nageswara Rao, Y.Narsimhulu, Prabhakara Rao
2. Engineering Mathematics, S.K.V.S. Sri Rama Chary, M.Bhujanga Rao, Shankar, B.S.Publications 2000.
3. Advanced Engineering Mathematics (eighth edition), Erwin Kreyszig, John Wiley & Sons (ASIA) Pvt. Ltd. 2001.
4. Advanced Engineering Peter V.O'Neil Thomson Brooks/Cole.
5. Advanced Engineering Mathematics, Merle C.Potter, J.L.Goldberg, E.F.Abrufadel, Oxford University Press. Third Edition 2005.
6. Engineering Mathematics–II, 2005, Sankaraiah, VGS Book Links, Hyderabad.

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IInd Year B.Tech. Ch.E. (I Semester)

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(EE05192) ELECTRICAL ENGINEERING

UNIT – I

SI Unit's ohm's law, series, and parallel circuits, Kirchhoffs laws, Star-delta transformation (Simple Problems)–Force on a current carrying conductor in magnetic field– electromagnetic induction, Faraday's law, Lenz's law – Self and mutual inductances.

UNIT – II

Generation of an alternating emf – average and rms values of alternating quantity – representation of alternating quantities by phasors – single phase series and parallel circuits (simple problems)– series and parallel resonance – three phase balanced systems – single and three phase power calculations.

UNIT – III

Principle of operation of DC machines – emf equation – types of generators – Magnetization and Load characteristics of DC generators

UNIT-IV

DC Motor: Principle of operation of DC Motor,Types of Motors, Back EMF Equation, Characteristics of DC motor, Torque Equation,DC Motor Starter (Three Point starter),Efficiency Calculation, Swimbrne's Test and speed control.

UNIT –V

Construction and principle of operation of single phase transformer – emf equation O.C. & S.C. tests – efficiency and regulation

UNIT-VI

Principle and operation of three phase induction motors – types of motors,Squirrel cage and slip ring motor – slip torque characteristics.

UNIT-VII

Principle and operation of alternators – O.C. & S.C. tests – regulation by synchronous impedance method.

UNIT – VIII

Electrical Instruments: Basic principles of indicating instruments – moving coil and moving iron instruments (Ammeters and voltmeters).

TEXT BOOKS :

1. Introduction to Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH
2. Basic Electrical Engineering by T.K. Nagasarkar and M.S.Sukhija, Oxford University Press, 2005

REFERENCES:

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath Pearson Education/PHI
2. Essentials of Electrical and Computer Engineering by David V.Kerns,Jr,J.David Jrwin; Pearson Education.

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IInd Year B.Tech. Ch.E. (I Semester)

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(CE05258) FLUID MECHANICS FOR CHEMICAL ENGINEERS

UNIT I

Units and dimensions, dimension analysis, similarity, types of fluids, hydrostatic pressure, pressure distribution in a static fluids, pressure measuring devices, gravity and centrifugal decanters .

UNIT- II:

Introduction to fluids in motion, concepts of stream lines, stream tubes, viscosity, types of fluids, flow in boundary layers, its formation and growth in tubes and on plates, basic equation of fluid flow continuity, momentum and Bernoulli's equation.

UNIT-III:

Flow of incompressible fluids in pipes, relation between skin friction-wall shear, laminar flow in pipes, Hagen-Poiselle equation, turbulent flow in pipes, velocity distribution equation,

UNIT-IV:

Friction factor, friction from changes in velocity or direction, flow of compressible fluids, basic equations, flow through variable area conduits, adiabatic isothermal frictional flow.

UNIT-V:

Flow of compressible fluids: Processes, basic equations of compressible flow, flow through variable area conduits, adiabatic frictional flow, and isothermal frictional flow.

UNIT-VI:

Flow past immersed bodies, Drag, Drag coefficient, friction in flow through beds of solids, motion of particles through fluids, its mechanics, terminal velocity, Fluidization, Mechanism of fluidization, pressure drop in fluidization, application of fluidization.

UNIT-VII:

Transportation and Metering of fluids: Pipe fitting and valves, fluid moving machinery pumps, positive displacement pumps, centrifugal pumps.

UNIT-VIII:

Fans, blowers, and compressors. Measurement of flowing fluids- full bore meter, insertion meters.

TEXT BOOK:

1. Unit Operations in chemical Engineering by W.L.McCabe & T.C.Smith & Peter Harriot McGraw-Hill, Inc 5th ed,1993

REFERENCES:

1. Fluid and Unit Operations – Brown et al. Asian publishing house.
2. Engineering fluid mechanics by K.L.Kumar, Eurasis publishing house, New Delhi 1990
3. Principles of Unit Operations, Foust 2nd ed., John Wiley, 1999

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IInd Year B.Tech. Ch.E. (I Semester)

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(CM05441) ORGANIC CHEMISTRY

Unit – I

Polar effects – Inductive effect, electromeric effect, Resonance, Hyper conjugation.

Mechanism of following Organic Reactions.

Unit – II : Electrophilic reactions :

a) Friedel craft reaction

b) Riemer Timenn Reaction

c) Backmann rearrangements

Unit – III Nucleophilic reactions :

a) Aldol condensation

b) Perkin reaction

c) Benzoin condensation

Unit – IV

1. Free radical reaction

a) Halogenation of Alkane

b) Addition HBR on Alkene in presence of peroxide

2. Alylic halogination

a) Using N-Bromo succinamide (NBS)

b) Thermal halogination of Alkane (CH3 – CH = CH)

Unit – V

Stereo isomerism optical isomerism symmetry and chirality, optical isomerism, lactic acid, Tartaric acid, sequence rule, enantiomers, diastereo isomers, geometrical isomerism, E,z-system of nomenclature, confirmation cyclohexane.

Unit – VI

Polymer (Synthetic & Natural)

A) Synthetic: Classification of polymerization (Addition & Condensation)

a) Preparation, properties and uses of following polymers

(1) Polyethelene (2) PVC (3)Tefflon (4) Nylon (5) Bakelite (6) Polyester

B) Natural : Source, Structure and uses of the following

(1) Rubber (2) Cellulose (3) Silk (4) Wool.

Unit – VII

Heterocyclic compounds and Nomenclature, preparation of properties and uses of

(1) Pyrrole (2) Furan (3) Thiophene (4) Pyridine (5) Quinoline (6) Iso –quinoline.

Unit – VIII

Dyes –colour and constitution:

Classification of Dyes, preparation and uses of

(1) Malachite green (2) Rosaniline (3) Congored (4) Bismark brown (5) Fluoroscien.

TEXT BOOKS :

1. Text book of Organic Chemistry – Fergussion, LN East, Westpress.

2. Text book of Organic Chemistry – Robert Morrison and Robert Boyd.

REFERENCES:

1. Polymer science - Gaurikar and others.

2. Reaction mechanism - Peter Skyes.

3. Text book of Organic Chemistry – P.L.Soni.

4. Organic Chemistry vol- I – I.L .Finar.

5. Reactions and Reagents – O.P. Agrawal

2005-2006

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IInd Year B.Tech. Ch.E. (I Semester)

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(CH05122)CHEMICAL PROCESS CALCULATIONS

Unit-1:

Stoichiometric relation: basis of calculations, methods of expressing compositions of mixtures and solutions, density and specific gravity, Baume and API gravity scales.

Unit-2:

Behavior of ideal gases: Kinetic theory of gases, application of ideal gas law, gaseous mixtures, gases in chemical reactions.

Unit-3:

Vapor pressure: Liquefaction and liquid state, vaporization, boiling point, effect of temperature on vapor pressure, Antoine equation, vapor pressure plots, estimation of critical properties, vapor pressure of immiscible liquids and ideal solutions, Roult's law. Non volatile solutes.

Unit-4:

Humidity and Saturation: Relative and percentage saturation or dew point, wet bulb and dry bulb temperature, use of humidity charts for engineering calculations.

Unit-5:

Material balances: Tie substance, Yield, conversion, processes involving chemical reactions.

Unit-6:

Material balance calculation involving drying, dissolution and crystallization. Processes involving recycles, bypass and purge.

Unit-7:

Thermophysics: Energy, energy balances, heat capacity of gases, liquid and mixture solutions. Kopp's rule, latent heats, heat of fusion and and heat of vaporization, Trouton's rule, Kistyakowsky equation for non polar liquids enthalpy and its evaluation.

Unit-8:

Thermochemistry: Calculation and applications of heat of reaction, combustion, formation and neutralization, Kirchoff's equation, enthalpy concentration change, calculation of theoretical and actual flame temperatures.

TEXTBOOKS

1. Chemical process principles, Part –I, Material and Energy Balance by Hougen O A, Watson K.M. and ragatz R.A. John Wiley and Sons, Newyark, 195 2ⁿᵈ Ed.

REFERENCES :

1. Basic principles and calculation in chemical engineering by D.H. Himmelblau, 5ᵗʰ Ed. PHI, 2001

2. Stoichiometry by B.I. Bhatt and S.M. Vora (3ʳᵈ Ed.) Tata Mc Graw Hill publishing sompany Ltd. New Delhi (1996)

2005-2006

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IInd Year B.Tech. Ch.E. (I Semester)

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4+1 0 4

(ME05224) ENGINEERING MECHANICS

UNIT – I

Introduction to Engg. Mechanics – Basic Concepts

Systems of Forces :

Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces :

Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces.

UNIT – II

Friction : Types of Friction – Limiting Friction – Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

UNIT – III

Transmission of Power : Flat Belt Drives : Types of Flat Belt Drives – Length of Belt, Tensions, Tight side, Slack Side, Initial and Centrifugal – Power Transmitted and Condition for Max. Power.

UNIT – IV

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basis principles), centre of gravity of composite bodies, pappus theorem.

UNIT – V

Area moments of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia : Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – VI

Kinematics : Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics : Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – VII

Work – Energy Method :

Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion.

Impulse momentum method :

UNIT – VIII

Mechanical Vibrations : Definitions, Concepts – Simple Harmonic Motion – Free vibrations, simple and Compound Pendulums and its Applications –

TEXT BOOKS :

1. Engineering Mechanics / Fedinand . L. Singer / Harper – Collins.
2. Engg. Mechanics / S.S. Bharikati & J.G. Rajasekharappa

REFERENCES :

1. Engg. Mechanics / Irving. H. Shames Prentice – Hall.
2. Engg. Mechanics / Timoshenko & Yound.
3. Engg. Mechanics Umesh Regl / Tayal.
4. Engg. Mechanics / R.V. Kulkarni & R.D. Askhevkar
5. Strength of Materials & Applied Mechanics / IB Prasad
6. Text Book in Applied Mechanics / Malhotra, Subramanian, Gahlot and Rathore / New Age.
7. Engg. Mechanics / KL Kumar / Tata McGraw Hill.

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IInd Year B.Tech. Ch.E. (I Semester)

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(CE05259) FLUID MECHANICS FOR CHEMICAL ENGINEERS LAB

1. Identification of laminar and turbulent flows (Reynolds apparatus)
2. Measurement of point velocities (pitot tube)
3. Verification of Bernoulli's equation
4. Calibration of Rotameter
5. Variation of Orifice coefficient with Reynolds Number
6. Determination of Venturi coefficient
7. Friction losses in Fluid flow in pipes
8. Pressure drop in a packed bed for different fluid velocities
9. Pressure drop and void fraction in a fluidized bed
10. Studying the coefficient of contraction for a given open orifice
11. Studying the coefficient of discharge in a V-notch
12. Studying the Characteristics of a centrifugal pump
13. Viscosity determination using Stoke's law.

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IInd Year B.Tech. Ch.E. (II Semester)

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(MA05476)PROBABILITY & STATISTICS

UNIT I
Probability: Sample space and events – Probability – The axioms of probability - Some elementary theorems - Conditional probability – Baye's theorem.

UNIT-II
Random variables – Discrete and continuous – Distribution – Distribution function.

UNIT-III
Distribution - Binomial, Poisson and normal distribution – related properties.

UNIT-IV
Sampling distribution: Populations and samples - Sampling distributions of mean (known and unknown) proportions, sums and differences.

UNIT-V
Estimation: Point estimation – interval estimation - Bayesian estimation.

UNIT-VI
Test of hypothesis – Means and proportions – Hypothesis concerning one and two means – Type I and Type II errors. One tail, two-tail tests.

UNIT-VII
Tests of significance – Student's t-test, F-test, test. Estimation of proportions.

UNIT –VIII
Curve fitting: The method of least squares – Inferences based on the least squares estimations - Curvilinear regression – multiple regressions – correlation for univariate and bivariate distributions.

TEXT BOOKS:
1. Probability and statistics for engineers:Erwin Miller And John E.Freund. Prentice-Hall of India Pvt. Ltd., Sixth edition.
2. Text book of Probability and Statistics by Dr.Shahnaz Bathul, .G.S.Publishers 2003.

REFERENCES:
1. Probability, Statistics and Random Processes Dr.K.Murugesan & P.Gurusamy by Anuradha Agencies.
2. Advanced Engineering Mathematics (8th edition), Erwin Kreyszig, John Wiley and Sons (ASIA) Pvt. Ltd., 2001.
3. Probability and Statistics for Engineers: G.S.S.Bhishma Rao, sci tech., 2nd edition 2005.

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IInd Year B.Tech. Ch.E. (I Semester)

T P C
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(CM05448)PHYSICAL AND ORGANIC CHEMISTRY LAB

PHYSICAL CHEMISTRY LAB
1. Determination of specific rotation of substance by polarimeter.
2. Study of inversion of sucrose by polarimetry.
3. Study of reaction between persulphate and iodide.
4. Conductiometric titration of strong acid versus strong base.
5. Conductimetric titration of weak acid versus strong base.
6. Pontentiometric titration between potassium dichromate and ferrous iron.

ORGANIC CHEMISTRY LAB
1. Criteria of purity of solid and liquid compounds, determination of melting point, and boiling point. Detecting nitrogen sulphur and Halogens in Organic Compounds.
2. Identification of an unknown substance from the following classes of organic compounds, alcohols, phenols, aldehydes, ketones, carbohydrates, acids, anhydrides.

TEXT BOOKS:
1. Vogel's TEXT BOOK of Qualitative Organic Chemistry.
2. Experiments in physical chemistry, 7th edition by David P Shoemaker, Joseph W Nibler Tata Mc Graw – Hill & Mc Graw – Hill, 2003

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IInd Year B.Tech. Ch.E. (II Semester)

(CH05485)PROCESS HEAT TRANSFER

T P C
4+1 0 4

UNIT I

Introduction:
Nature of heat flow, conduction, convection, natural and forced convection, radiation.

Heat transfer by conduction in Solids:
Fourier's law , thermal conductivity, steady state conduction in plane wall & composite walls, compound resistances in series, heat flow through a cylinder, conduction in spheres, thermal contact resistance, plane wall: variable conductivity

Unsteady state heat conduction
Equation for one-dimensional conduction, Semi-infinite solid, finite solid.

Unit- II:

Principles of heat flow in fluids:
Typical heat exchange equipment, countercurrent and parallel current flows, energy balances, rate of heat transfer, overall heat transfer coefficient, electrical analogy, critical radius of insulation, logarithmic mean temperature difference, variable overall coefficient, multi-pass exchangers, individual heat transfer coefficients, resistance form of overall coefficient, fouling factors, classification of individual heat transfer coefficients, magnitudes of heat transfer coefficients, effective coefficients for unsteady-state heat transfer.

Unit- III:

Heat Transfer to Fluids without Phase change:
Regimes of heat transfer in fluids, thermal boundary layer, heat transfer by forced convection in laminar flow, heat transfer by forced convection in turbulent flow, the transfer of heat by turbulent eddies and analogy between transfer of momentum and heat, heat transfer to liquid metals, heating and cooling of fluids in forced convection outside tubes.

Unit- IV:

Natural convection
Natural convection to air from vertical shapes and horizontal planes, effect of natural convection in laminar-flow heat transfer, free convection in enclosed spaces, mixed free & forced convection.

Unit- V:
Heat transfer to fluids with phase change:
Unit VI:
Heat transfer from condensing vapors, heat transfer to boiling liquids.

Heat exchange equipment
General design of heat exchange equipment, heat exchangers, condensers, boilers and calendrias, extended surface equipment, heat transfer in agitated vessels, scraped surface, heat exchangers, heat transfer in packed beds, heat exchangers effectiveness (NTU method)

Unit VII:

Evaporators
Evaporators, performance of tubular evaporators, capacity and economy, vapors recompression

Unit- VIII:

Radiation:
Introduction, properties and definitions, black body radiation, real surfaces and the gray body, absorption of radiation by opaque solids, radiation between surfaces, radiation shielding, radiation to semi transparent materials, combined heat transfer by conduction, convection and radiation.

TEXT BOOKS
1. Unit operations of chemical engineering by Mc.Cabe & Smith McGraw-Hill 5th edition 1993
2. Heat transfer-Schaum's series, McGraw-Hill publications

REFERENCES
1. Process heat transfer, D.Q.Kern McGraw-Hill
2. Heat Transfer by J.P.Holman
3. Y.V.C.Rao, Heat Transfer, University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IInd Year B.Tech. Ch.E. (II Semester)

T P C
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(CH05120)CHEMICAL ENGINEERING THERMODYNAMICS-I

UNIT I

Introduction: The scope of thermodynamics, temperature, defined quantities; volume, pressure, work, energy, heat, Joules Experiments.

Unit-II:

The first law and other basic concepts: The first law of thermodynamics, thermodynamic state and state functions, enthalpy, the steady-state steady-flow process, equilibrium, the phase rule, the reversible process, constant-V and constant-P processes, heat capacity.

Unit-III:

Volumetric properties of pure fluids: The PVT behavior of pure substances, virial equations, the ideal gas, the applications of the virial equations, second virial coefficients from potential functions. Cubic equations of state, generalized correlations for gases, generalized correlations for liquids, molecular theory of fluids.

Unit-IV:

Thermodynamics of flow processes ; principles of conservation of mass and energy for flow systems, analysis of expansion processes ; turbines, throttling ; compression processes –compressors and pumps ; calculation of ideal work and last work.

Unit-V:

The second law of thermodynamics: Statements of the second law, heat engines, thermodynamic temperatures scales, thermodynamic temperature and the ideal-gas scale

Unit-VI:

Entropy, Entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics, entropy from the microscopic view point

Unit-VII:

Refrigeration and liquefaction: The Carnot refrigerator, the vapor compression cycle, the comparison of refrigeration cycles, the choice of refrigerant, absorption refrigeration, the heat pump, liquefaction processes

Unit-VIII:

Thermodynamic properties of fluids: Property relations for homogeneous phases, residual properties, two phase systems, thermodynamic diagrams, tables of thermodynamic properties, generalized property correlation for gases

TEXT BOOKS

1. J.M.Smith and HC Van Ness , introduction to chemical engineering thermodynamics,5ᵗʰ ed, Mc Graw Hill,1996.

REFERENCE

1. YVC.Rao, Chemical engineering thermodynamics, University publications.
2. K.V.Narayanan a text book of chemical engineering thermodynamics, PHI,2001.
3. M.D.Koretsky, Engineering and Chemical thermodynamics, John Wiley & Sons, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IInd Year B.Tech. Ch.E. (II Semester)

T P C
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(CH05127) CHEMICAL TECHNOLOGY

UNIT I

Soda ash, caustic soda and chlorine, Glass: manufacture of special glasses

Unit – II

Industrial gases: carbon dioxide, hydrogen and oxygen – products of water gas, producer gas. Nitrogen industries: synthetic ammonia, urea, nitric acid (ammonium nitrate), ammonium chloride, ammonium phosphate and complex fertilizers

Unit – III

Sulphur and sulphuric acid, manufacture of sulphuric acids, hydrochloric acid and some other chemicals –Aluminum sulphate and alum, barium salts rare earth compounds.

Unit – IV

Cement manufacture, special cements, miscellaneous calcium compounds, magnesium compounds.

Unit – V:

Manufacture of phenols, formaldehyde, vinyl chloride and vinyl acetate, manufacture of phenol- formaldehyde resin and polyvinyl chloride polymer, SBR.

Unit – VI:

Oils: Definition, constitution, extraction and expression of vegetable oils, refining and hydrogenation of oils.

UNIT-VII:

Soaps and detergents: Definitions, continuous process for the production of fatty acids, glycerin and soap, production of detergents.

Unit – VIII:

Pulp and paper industry: methods of pulping, production of sulphate and sulphite pulp, production of paper –wet process

TEXT BOOKS:

1. Shreve's chemical process industries edited by Austin, Mc-graw-Hill,5ᵗʰ ed.1985.
2. Dryden's outlines of chemical technology edited by M.GopalRao and M.Sitting, 2ⁿᵈ ed. 1973.

REFERENCES:

1. Industrial Chemistry by B.K.Sharma
2. Hand book of industrial chemistry Vol 1&II K.H.Davis & F.S. Berner Edited by S.C. Bhatia, CBS publishers
3. Chemical Technology: G.N. Panday, Vol 1& Vol II

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IInd Year B.Tech. Ch.E. (II Semester)

(CE 05239) ENVIRONMENTAL STUDIES

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UNIT - I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

UNIT - II

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - III

Ecosystems : Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - IV

Biodiversity and its conservation : Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a mega-diversity nation . -Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - V

Environmental Pollution : Definition, Cause, effects and control measures of :

a. Air pollution

b. Water pollution

c. Soil pollution

d. Marine pollution

e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

Solid waste Management : Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

UNIT - VI

Social Issues and the Environment : From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. -Wasteland reclamation. -Consumerism and waste products. -Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT - VII

Human Population and the Environment : Population growth, variation among nations. Population explosion - Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. -HIV/AIDS. -Women and Child Welfare. - Role of information Technology in Environment and human health. -Case Studies.

UNIT - VIII

Field work : Visit to a local area to document environmental assets River /forest grassland/hill/mountain -Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds. -Study of simple ecosystems-pond, river, hill slopes, etc.

TEXT BOOK :

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IInd Year B.Tech. Ch.E. (II Semester)

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(CH05359) MATERIAL SCIENCE FOR CHEMICAL ENGINEERS

UNIT-I
INTRODUCTION: A brief review by atomic structure and chemical bonding: ionization potential, electron affinity and electro negativity. Chemical bonding: ionic, covalent, metallic and secondary bonding. Property relation to bond characteristics.

UNIT-II
CRYSTAL GEOMETRY AND STRACTURE DETERMINATION:
Space lattice and limit cell. Braveries lattices, crystal systems with examples. Lattice coordinates, Miller indices, Braveries indices for directions and places: crystalline and non crystalline solids; ionic, covalent and metallic solids; packing efficiency, ligancy and coordination number; structure determination by Brag's X-ray diffraction and powder methods.

UNIT-III
CRYSTAL IMPERFECTION:
Point defects, line defects-edge and screw dislocation, Bergers circuit and Bergers vectors, dislocation reaction, dislocation motion, multiplication of dislocations during deformation , role of dislocation on crystal properties; surface defects, dislocations on crystal properties; surface defects; dislocation density and stress required to move dislocations.

UNIT-IV
Basic thermodynamic functions; phase diagrams and phase transformation: Primary and binary systems-general types with examples; tie line& lower rules, non equilibrium cooling: phase diagrams of Fe-Fe C, Pb-Sn cn-Ni systems.

UNIT-V
Phase transformations in Fe-Fe C steels, Time-Temperature-Transformation (TTT) curves for eutectoid steels and plain carbon steels; effect of alloying elements on properties of steels;types of steels, alloys and other metals used in chemical industry.

UNIT-VI
Elastic, an elastic and plastic deformations in solid materials; rubber like elasticity, viscoelastic behaviour (models),; shear strength of real and perfect crystals work hardening mechanisms cold working, hot working; dynamic recovery, recrystilisation, grain growth, grain size and yield stress Brief description of heat treatment in steels.

UNIT-VII
Fracture in ductile and brittle materials creep: mechanism of creep and methods to reduce creeping in materials, creep rates and relations. Fatigue-mechanisms and methods to improve fatigue resistance in materials. Composite materials: types; tress-strain relations in composite materials, applications.

UNIT-VIII
OXIDATION AND CORROSION:
Mechanisms; types of corrosion; methods to combat corrosion.

TEXT BOOK:
1. Material Science and Engineering; V. Raghavan.; Prentice Hall of India Pvt. Ltd.,

REFERENCES:
1. Science of Engineering Materials Vol. 1 &2; Manas chand; Mcmillan Company of India Ltd.
2. Principles of Materials science and engineering; William F.Smith, MGH Publishing Company
3. Materials science for engineering; William.D Callisters Jr; Wiley & Sons.

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IInd Year B.Tech. Ch.E. (II Semester)

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(CH05128) CHEMICAL TECHNOLOGY LAB

1. Estimation of formaldehyde, urea, glucose and sucrose using chemical methods.

2. Analysis of oils and fats: acid value, saponification value and iodine value

3. Estimation of hydroxyl groups in alcohols and phenols

4. Physico-chemical methods of analysis – use of chromatographic units and spectrophotometers.

5. Preparation of following organic chemicals : nitrobenzene, acetanilide, methyl orange, aspirin.

6. Analysis of water, limestone, soda and typical fertilizers.

7. Proximate analysis

8. Coal gasification

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IInd Year B.Tech. Ch.E. (II Semester)

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(CH05486) PROCESS HEAT TRANSFER LAB

1. Determination of total thermal resistance and thermal conductivity of composite wall.

2. Determination of thermal conductivity of a metal rod.

3. Determination of natural convective heat transfer coefficient for a vertical tube.

4. Determination of critical heat flux point for pool boiling of water.

5. Determination of forced convective heat transfer coefficient for air flowing through a pipe

6. Determination of overall heat transfer coefficient in double pipe heat exchanger.

7. Study of the temperature distribution along the length of a pin-fin under natural and forced convection conditions

8. Estimation of un-steady state film heat transfer coefficient between the medium in which the body is cooled.

9. Determination of Stefan – Boltzmann constant.

10. Determination of emissivity of a given plate at various temperatures.

11. Determination of radiation constant of a given surface.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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IIIrd Year B.Tech. Ch.E. (I Semester)

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(CH05218) ENERGY ENGINEERING

Unit I:

Sources of energy, types of fuels- energy and relative forms. Calorific value- gross and net value, calculation of calorific value from fuel analysis, experimental determination energy resources present and future energy demands with REFERENCE to India.

Unit II:

Coal: origin, occurrence, reserves, petrography, classification, ranking, analysis, testing, storage, coal carbonization and byproduct recovery, liquefaction of coal, gasification of coal, burning of coal and firing mechanism, burning of pulverized coal.

Unit III:

Liquid fuels: petroleum: origin, occurrence, reserves, composition, classification, characteristics, fractionation, reforming, cracking, petroleum products, specification of petroleum products, burning of liquid fuels.

Unit IV:

Natural gas, coke oven gas, producer gas, water gas, LPG, burning of gaseous fuels, hydrogen (from water) as future fuel, fuel cells, flue gas, analysis: orsat apparatus,

Unit V:

Energy auditing: short term, medium term, long term schemes, energy conversion, energy index, energy cost, representation of energy consumption, sanky diagram, energy auditing.

Unit VI:

Steam Plant: Run time cycle, boiler plant, steam cost, steam, distribution and utilization, combined heat and power systems, energy from bio mass and bio gas plants, gas purification, storage, solar energy, wind energy.

Unit VII:

Waste heat recovery, sources of waste heat and potential application, various types of heat recovery systems, regenerators, recuperators, waste heat boilers

Unit VIII

Energy conservation: conservation methods in process industries, theoretical analysis, practical limitations.

TEXT BOOKS

1. Fuels , furnaces and refractories by O.P.Gupta.
2. Fuels and combustion by Sami sarkar 2nd edition orient Longman (1998).

REFERENCES

1. Non-conventional energy resources by G.D.Rai
2. Solar energy by S.P.Sukhathame
3. Conventional energy technology, Fuel and chemical energy by Tata McGraw-Hill book Co.Ltd. (1987)
4. Fuel and energy by harker and Backhurst Academic press London 1981
5. Fuel science- harker and Allen Oliver and Boyd 1972
6. W.R.Murphy, G.Mc.Kay- energy management, 1st edition – Butterwolfer &Co.Ltd.(2001)
7. Energy management by Turner

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IIIrd Year B.Tech. Ch.E. (I Semester)

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(CH05371) MECHANICAL UNIT OPERATIONS

Unit-I:
Properties, handling and mixing of particulate solids: Characterization of solid particles, properties of particulate masses, storage and mixing of solids, types of mixers, mixers for cohesive solids, mixers for free flowing solids.

Unit-II:
Transportation of solid particulate mass, belt, screw, apron conveyers, bucket elevators pneumatic conveying

Unit-III:
Size reduction: Principles of comminution, computer simulation of milling operations, size reduction equipment-crushers, grinders, ultra fine grinders, cutting machines, Equipment operation.

Unit–IV:
Screening, Industrial screening equipments, Filtration, cake filters, centrifugal filters,

Unit-V:
Principles of cake filtration. Clarifying filters, liquid clarification, gas cleaning, principles of clarification. Cross flow filtration,

Unit-VI:
Separations based on motion of particles through fluids, gravity settling processes and centrifugal settling processes, float and sink method, differential settling, coagulation.

Unit –VII:
Agitation and mixing of liquids: Agitation of liquids, circulation velocities, power consumption in agitated vessels. Blending and mixing of liquids, suspension of solid particles, dispersion operations.

Unit-VIII:
Floatation-separation of ores, floatation agents and floatation equipments.

Text book:
1. Unit operations in chemical engineering by W.L. Mc Cab and J.C. Smith and Peter Harriott, Mc Graw Hill 5th ed. 1993.

REFERENCES:
1. Chemical engineers hand book, J.H. Perry, 7th ed. Mc Graw Hill
2. Unit operation by G.B.Brown.
3. Introduction to Chemical Engineering by J.T.Banchero & W.L. Badger.,TMH,1997.

Tables:
Power number verses Reynolds number graphs should be provided

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IIIrd Year B.Tech. Ch.E. (I Semester)

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(CH05121)CHEMICAL ENGINEERING THERMODYNAMICS -II

Unit -I:
Heat effects: Sensible heat effects, Internal energy of ideal gases: Microscopic view,

Latent heats of pure substances, heat effects of industrial reactions, heat effects of mixing processes.

Unit–II:
Standard heat of reaction, Standard heat of formation, Standard heat of combustion, temperature dependence of ?H^0

Unit-III:
Solution thermodynamics: Theory: Fundamental property relation, chemical potential as a criterion for phase equilibrium, partial properties, ideal gas mixtures, fugacity and fugacity coefficient for pure species, fugacity and fugacity coefficient for species in solutions, generalized correlations for Fugacity coefficient, The ideal solutions, excess properties.

Unit –IV:
Solution thermodynamics: applications: the liquid phase properties from VLE data, models for the excess Gibbs energy, property changes of mixing

Unit-V:
VLE at low to moderate pressures: The nature of equilibrium, the phase rule, Duhems theorem, VLE: Qualitative behavior, the gamma /Phi formulation of VLE, Dew point and bubble point calculations, flash calculations, solute (1)/solvent (2) systems

Unit -VI:

Thermodynamic properties and VLE from equations of state: properties of fluids from the virial equations of state, properties of fluids from cubic equations of state, fluid properties from correlations of the Pitzer type, VLE from cubic equations of state

Unit –VII:

Topics in phase equilibria: Equilibrium and stability, liquid-liquid equilibrium (LLE), vapor- liquid–liquid equilibrium (VLLE), solid-liquid equilibrium (SLE), solid vapor equilibrium (SVE), equilibrium absorption of gases on solids

Unit –VIII:

Chemical reaction equilibria: The reaction coordinate, application equilibrium criterion to chemical reactions, the standard Gibb's energy change and the equilibrium constant, effect of temperature on equilibrium constants, relation of equilibrium constants to composition, equilibrium conversion for single reactions, Phase rule and Duhem's theorem for reacting systems.

Text book:

1. Introduction to chemical engineering thermodynamics by J.M. Smith, H.C. Van Ness and M.M. Abbott, 5th ed. Mc Graw Hill 1996.

2. A Text book of chemical engineering thermodynamics by K.V. Narayanan. PHI, 2001.

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IIIrd Year B.Tech. Ch.E. (I Semester)

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(CH05124) CHEMICAL REACTION ENGINEERING – I

Unit–I

Overview of chemical reaction engineering- classification of reactions, variables affecting the rate of reaction definition of reaction rate. Kinetics of homogenous reactions- concentration dependent term of rate equation, searching for a mechanism, predictability of reaction rate from theory.

Unit–II

Interpretation of batch reactor data- constant volume batch reactor:- Analysis of total pressure data obtained in a constant-volume system, the conversion, Integral method of analysis of data– general procedure, irreversible unimolecular type first order reactions, irreversible bimolecular type second order reactions, irreversible trimolecular type third order reactions, empirical reactions of nth order, zero-order reactions, overall order of irreversible reactions from the half-life, fractional life method, irreversible reactions in parallel, homogenous catalyzed reactions, autocatalytic reactions, irreversible reactions in series.

Unit–III

Constant volume batch reactor– first order reversible reactions, second order reversible reactions, reversible reactions in general, reactions of shifting order, Differential method of analysis of data. Varying volume batch reactor–differential method of analysis, integral method of analysis, zero order, first order, second order, n^{th} order reactions, temperature and reaction rate, the search for a rate equation.

Unit–IV

Introduction to reactor design-general discussion, symbols and relation ship between CA and XA.

Ideal reactors for a single reaction, ideal batch reactor, steady state, mixed flow reactor, steady state plug reactors.

Unit–V

Design for single reactions- size comparison of single reactors, multiple reactor system, recycle reactors, auto catalytic reactions.

Unit–VI

Design for parallel reactions- introduction to multiple reactions, qualitative discussion about product distribution, quantitative treatment of product distribution and of reactor size.

Unit–VII

Irreversible first order reactions in series, quantitative discussion about product distribution, quantitative treatment, plug flow or batch reactor, quantitative treatment, mixed flow reactor, first-order followed by zero-order reaction, zero order followed by first order reaction.

Unit–VIII

Temperature and Pressure effects- single reactions- heats of reaction from thermodynamics, heats of reaction and temperature, equilibrium constants from thermodynamics, equilibrium conversion, general graphical design procedure, optimum temperature progression, heat effects, adiabatic operations, non adiabatic operations, comments and extensions. Exothermic reactions in mixed flow reactors- a special problem, multiple reactions.

TEXT BOOK :

1. Chemical Reaction Engineering by Octave Levenspiel, 3rd ed. John Wiely & Sons, 1999.

REFERENCES:

1. Elements of chemical reaction engineering by H.S. Fogler, 2nd ed. PHI, 1992.
2. Chemical engineering kinetics by J.M.Smith, 3rd ed. Mc Graw Hill, 1981.

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IIIrd Year B.Tech. Ch.E. (I Semester)

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(CH05355)MASS TRANSFER OPERATIONS-I

Unit I:

THE MASS TRANSFER OPERATIONS: Classification of the Mass-Transfer Operations, Choice of Separation Method, Methods of Conducting the Mass-Transfer Operations, Design Principles, Unit Systems

Unit II:

MOLECULAR DIFFUSION IN FLUIDS: Molecular Diffusion, binary solutions, Fick's law, Steady State Molecular Diffusion in Fluids at Rest and in Laminar Flow, Stefen's diffusion, estimation of diffusivity of gases and liquids, Momentum and Heat Transfer in Laminar flow

Unit III:

MASS TRANSFER COEFFICIENTS: Mass Transfer Coefficients, Mass Transfer Coefficients in Laminar Flow (Explanation of equations only and no derivation), Mass Transfer Coefficients in Turbulent Flow, eddy diffusion, Film Theory, Penetration theory, Surface-renewal Theory, Combination Film-Surface-renewal theory, Surface-Stretch Theory, Mass Heat and Momentum Transfer Analogies, Turbulent Flow in Circular Pipes.

Unit IV:

INTER PHASE MASS TRANSFER: Concept of Equilibrium, Diffusion between Phases, Material Balances in steady state co-current and counter current stage processes, Stages, Cascades

Unit V:

EQUIPMENT FOR GAS-LIQUID OPERATIONS: Gas Dispersed, Sparged vessels (Bubble Columns), Mechanical agitated equipments,Tray towers, Sieve design for absorption and distillation (Qualitative Treatment), Different types of Tray Efficiencies, Liquid Dispersed Venturi Scrubbers, Wetted-Wall Towers, Packed Towers, Tray tower vs Packed towers.

UNIT VI:

Distillation: Fields of applications, VLE for miscible liquids, immiscible liquids, steam distillation, VLE Phase diagrams, Tie line, mixture rules, flash vaporization and differential distillation for binary and multi component mixtures, batch distillation with reflux for binary mixtures

UNIT VII:

Continuous rectification-binary systems, multistage tray towers –method of Mc Cabe and thiele, enriching section, exhausting section, feed introduction, total reflux, minimum and optimum reflux ratios, use of steam, condensers, partial condensers, cold reflux, multiple feeds , tray efficiencies

UNIT VIII:

Multistage (tray) towers –the method of Ponchon and Savarit, the enriching and stripping sections, feed tray location, total reflux, minimum and optimum reflux ratios, reboilers, use of open steam, condenser and reflux accumulators, continuous-contact equipment (packed towers), the transfer unit

TEXTBOOKS

1. Mass transfer operations by R.E. Tryebal, 3rd ed. Mc Graw Hill, 1980.
2. Separation process C.J King, Tata Mc Graw Hill

REFERENCE:

1. Mass transfer operations by Alapati Suryanarayana.

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IIIrd Year B.Tech. Ch.E. (I Semester)

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(CH05487) PROCESS INSTRUMENTATION

Unit –I:

Elements of instruments, static and dynamic characteristics, basic concepts of response of first order type instruments, mercury in glass thermometer, bimetallic thermometer, pressure spring thermometer, static accuracy and response of thermometry.

Unit-II:

Thermo electricity: Industrial thermocouples, thermo couple wires, thermo couple wells and response of thermo couples.

Unit –III:

Thermal coefficient of resistance, industrial resistance, thermometer bulbs and circuits, radiation receiving elements, radiation photo electric and optical pyrometers.

Unit-IV:

Composition analysis, spectroscopic analysis by absorption, emission, mass and color measurement spectrometers, gas analysis by thermal conductivity, analysis of moisture, gas chromatography, refractometer.

Unit-V:

Pressure vacuum and head: liquid column manometers, measuring elements for gauge pressure and vacuum, indicating elements for pressure gauges, measurement of absolute pressure, measuring pressure in corrosive liquids, static accuracy and response of pressure gauges.

Unit –VI

Head, density and specific gravity, direct measurement of liquid level, pressure measurement in open vessels, level measurements in pressure vessels, measurement of interface level, density measurement, and level of dry materials.

Unit -VII

Head flow meters, area flow meters, open channel meters, viscosity meters, quantity meters, flow of dry materials, viscosity measurements.

Unit -VIII

Recording instruments, indicating and signaling instruments, transmission of instrument readings, controls center, instrumentation diagram, process analysis.

Text Book:

Industrial instrumentation by Donald P.Eckman, Wiley eastern, 1950.

REFERENCE:

1. Principles of industrial instrumentation by Patra Nabis, TMH.
2. Instruments for measurements and control by Holbrock W.C. Van Nostrand East West.

2005-2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD
IIIrd Year B.Tech. Ch.E. (I Semester)

T	P	C
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(CH05126) CHEMICAL REACTION ENGINEERING LAB

1. Determination of the order of a reaction using a batch reactor and analyzing the data by (a) differential method (b) integral method.

2. Determination of the activation energy of a reaction using a batch reactor.

3. To determine the effect of residence time on conversion and to determine the rate constant using a CSTR.

4. To determine the specific reaction rate constant of a reaction of a known order using a batch reactor.

5. To determine the order of the reaction and the rate constant using a tubular reactor.

6. CSTRs in series- comparison of experimental and theoretical values for space times and volumes of reactors.

7. Mass transfer with chemical reaction(solid-liquid system) – determination of ass transfer coefficient.

8. Axial mixing in a packed bed. Determination of RTD and dispersion number for a packed-bed using tracer and Determination of RTD and dispersion number in a tubular reactor using a tracer.

2005-2006

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HYDERABAD
IIIrd Year B.Tech. Ch.E. (I Semester)

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(CH05370) MECHANICAL UNIT OPERATION LAB

1. To determine the time of grinding in a ball mill for producing a product with 80 % passing a given screen.

2. To verify the laws of crushing using any size reduction equipment like crushing rolls or vibrating mills and to find out the working index of the material.

3. To find the effectiveness of hand screening of a given sample by a given screen.

4. To separate a mixture of oil into two fractions using froth flotation technique.

5. To obtain batch sedimentation data and to calculate the minimum thickener area under given conditions.

6. To determine the specific cake resistance and filter medium resistance of a slurry in plate and frame filter press.

7. To separate a mixture of particles by Jigging.

8. Studies on cyclone separator.

9. Studies on pulverizer.

10. Verification of Stroke's law.

11. Grinding studies on hard/ soft materials.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IIIrd Year B.Tech. Ch.E. (II Semester)

(HS05352) MANAGEMENT SCIENCE

T	P	C
4+1	0	4

Unit I   *Introduction to Management:* Concepts of Management and organization- nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

Unit II   *Designing Organisational Structures:* Basic concepts related to Organisation - Departmentation and Decentralisation, Types of mechanistic and organic structures of organisation (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.

Unit III   *Operations Management:* Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement-Statistical Quality Control: X chart, R chart, c chart, p chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

Unit IV   a)   Materials Management: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.

b)   Marketing: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of distribution

Unit V   Human Resources Management (HRM): Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs.PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

Unit VI   *Project Management (PERT/CPM):* Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

Unit VII   *Strategic Management:* Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

Unit VIII   *Contemporary Management Practices:* Basic concepts of MIS, End User Computing, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

TEXT BOOKS:
1. Aryasri: Management Science, TMH, 2004.
2. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.

REFERENCES:
1. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2005
2. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005
3. Thomas N.Duening & John M.Ivancevich Management—Principles and Guidelines, Biztantra,2003.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Memoria & S.V.Gauker, Personnel Management, Himalaya, 25/e, 2005
6. Samuel C.Certo: Modern Management, 9/e, PHI, 2005
7. Schermerhorn, Capling, Poole & Wiesner: Management, Wiley, 2002.
8. Parnell: Strategic Management, Biztantra,2003.
9. Lawrence R Jauch, R.Gupta &William F.Glueck:Business Policy and Strategic Management, Frank Bros.2005.
10. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD
IIIrd Year B.Tech. Ch.E. (II Semester)

	T	P	C
	4+1	0	4

(CH05356) MASS TRANSFER OPERATIONS-II

UNIT I

ABSORPTION AND STRIPPING: Absorption equilibrium, ideal and non ideal solutions selection of a solvent for absorption Determination of number of Plates, Absorption Factors, Kremser Brown equation, absorption and factors

Unit-II

Counter and Co-Current Isothermal Absorption and Striping of Single Component Operating Lines, Minimum Flow Rates, Determination of number of Transfer Units and Height of the Continuous Absorber,

Unit III:

Liquid-liquid operations, fields of usefulness, liquid-liquid equilibrium, equilateral triangular co-ordinates, choice of solvent, stage wise contact, multistage cross-current extraction

Unit IV:

Multi stage counter current extraction with and without reflux, fractional extraction

Unit-V

Differential (continuous contact) extractors, spray towers, packed towers, mechanically agitated counter-current extractors, centrifugal extractors, dilute solutions, super critical fluid extraction.

Unit VI:

Adsorption, types of adsorption, nature of adsorbents, adsorption equilibrium, single gases and vapors, vapor and gas mixtures, liquids, Freundlich equation, adsorption operations, stage wise operation, applications of the Freundlich equation

Unit VII:

Fluidized and teeter beds, adsorption of vapor from a gas fluidized bed, continuous contact, steady state moving bed adsorbers, unsteady state–fixed bed adsorbers, adsorption wave, elution, chromatography, pressure swing adsorption ion-exchange, techniques and applications.

Unit VIII:

Leaching: Fields of applications, preparation of solid for leaching, types of leaching, leaching equilibrium, single stage and multi stage leaching calculations, constant under flow conditions, equipment for leaching operation.

TEXT BOOK:

1. Mass transfer operations by R.E. Tryebal, 3rd ed. Mc Graw Hill, 1980.

REFERENCE:

1. Mass transfer operations by Alapati Suryanarayana.

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HYDERABAD
IIIrd Year B.Tech. Ch.E. (II Semester)

	T	P	C
	4+1	0	4

(CH05125)CHEMICAL REACTION ENGINEERING – II

UNIT I

Basics of non-ideal flow– E, the age distribution of fluid, the RTD, Conversion in Non-ideal flow reactors, Diagonizing reactors ills (qualitative discussion only)

Unit–II

The dispersion model- axial dispersion, correlations for axial dispersion, chemical reaction and dispersion.

Unit–III

The tanks in series model- pulse response experiments and the RTD, chemical conversion.

Unit–IV

The convection model for laminar flow– the convective model and its RTD, chemical conversion in laminar flow reactors

Unit–V

Earliness of mixing, segregation and RTD- self-mixing of a single fluid, mixing of two miscible fluids.

Unit–VI

Catalysis and Catalytic reactors- catalysts, steps in a catalytic reactions, synthesizing a rate law, mechanism and rate limiting step. (From chapter 6 Fogler)

Unit–VII

Heterogeneous reactions- introduction

Solid catalyzed reactions- pore diffusion resistance combined with surface kinetics, porous catalyst particles, heat effects during reaction, performance equations for reactors containing porous catalyst particles.

Unit–VIII

Solid catalyzed reactions- experimental methods for finding rates

Deactivating catalysts- mechanisms of catalyst deactivation, the rate and performance equations.

Fluid-fluid reactions: kinetics- the rate equation

Fluid-particle reactions: kinetics- selection of a model, shrinking core model for spherical particles of unchanging size, rate of reaction for shrinking spherical particles, extensions, determination of rate controlling step.

TEXT BOOK:

1. Chemical reaction engineering by Octave Levenspiel 3rd ed. Wiley Eastern Ltd.

REFERENCES:

1. Elements of chemical reaction engineering by H.S. Fogler, 3rd ed. PHI, 1999.
2. Chemical engineering kinetics by J.M.Smith, 3rd ed. Mc Graw Hill, 1981.

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HYDERABAD

IIIrd Year B.Tech. Ch.E. (II Semester)

	T	P	C
	4+1	0	4

(CH05481) PROCESS DYNAMICS AND CONTROL

UNIT I

Introduction to process dynamics and control.
Physical examples of first order systems

Unit-II:

Response of first order systems
Higher order systems and transportation lag

Unit-III:

Control systems
Controllers and final control elements
Block diagram of a chemical rector control system

Unit-IV:

Closed loop transfer functions
Transient response of simple control systems'

Unit-V:

Stability
Root locus

Unit-VI:

Transient response from root locus
Application of root locus to control systems
Introduction to frequency response
Control systems design by frequency response

Unit-VII:

Advance control strategies
Cascade control, Feed forward control, ratio control, Smith predictor, dead time compensation, internal model control.

Unit -VIII:

Controller tuning and process identification.
Control valves

TEXT BOOK

1. Process systems analysis and control by D.R. Coughanowr, 2nd ed. Mc Graw Hill 1991

REFERENCE

1. Chemical process control by G. Stephanopolous, PHI,1998

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IIIrd Year B.Tech. Ch.E. (II Semester)

	T	P	C
	4+1	0	4

(CH05075) BOICHEMICAL ENGINEERING

Unit-I:

Introduction to microbiology: Biophysics, and cell doctrine, the structure of cells, important cell types, RNA and DNA building blocks, proteins from amino acids.

Unit-II:

Kinetics of enzyme catalyzed reaction: the enzyme substrate complex and enzyme actions simple enzyme kinetics with one and two substrates. Michaelis-Menten equation, estimation of M-M parameters- line waves block plot, enzyme inhibitions-MM –form of equation for enzyme inhibitions.

Unit-III:

Immobilized enzyme technology; enzyme immobilization, immobilization of enzyme in industrial processes, utilization and regeneration of cofactors, biosynthesis, transport across cell membranes, passive and facilitated diffusion ,active transport, introduction of metabolic path ways and end products of metabolism.

Unit-IV:

Microbial growth- Monod growth kinetics, substrate and product inhibition yield coefficients for biomass and products-growth in batch fermenter, continuous culture of microorganisms in stirred tank fermenters.

Unit – V:

Industrial application of enzymes: Carbohydrates, starch conversion, cellulose conversion.

Unit-VI:

Design and analysis of biological reactors: batch reactors, enzyme catalyzed reactions in CSTR, CSTR reactors with recycle and cell growth. The ideal plug flow reactors.

Unit – VII:

Fermentation technology and industrial fermentation production of antibiotics penicillin, citric acid, bakers yeast and ethanol-anaerobic fermentation production of biogas continuous sterilization of air and media, aeration and agitation in bioreactors, scale up concepts.

Unit – VIII:

Down stream processing: solid-liquid separation, cell rupture, recovery, and purification of bio-products.

TEXT BOOK:

1. Biochemical engineering fundamentals by J.E.Bailey and D.F.Ollis,2nd ed.1986,McGraw Hill.

REFERENCE:

1. Bio chemical engineering by James M.Lee – Prentice-Hall-1992.
2. Biochemical engineering by Aiba, Humphrey and Mells, academic press.

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HYDERABAD

IIIrd Year B.Tech. Ch.E. (II Semester)

T	P	C
4+1	0	4

(CH05456) POLYMER TECHOLOGY

(ELECTIVE - I)

Unit - I

Introduction; definitions: polymer& macro molecule, monomer, functionality, average functionality, co-polymer, polymer blend., plastic and resin.

Classification of polymers: based on source, structure, applications, thermal behavior, mode of polymerization.

Concept of average molecular weight of polymers, molecular weight distribution, poly disparity index.

Determination of average molecular weights: End group analysis, osmometry, light scattering techniques, viscometer, Gel permeation chromatography.

Unit-II

Natural polymers: brief study of i) Natural rubber ii) shellac iii) rosin iv) cellulose v) proteins.

Unit-III

Mechanism and kinetics of : Addition or chain polymerization
a) free radical addition polymerisation
b) Ionic addition polymerizations
c) Coordination polymerization.
   i) Coordination or step growth or condensation polymerization.

Unit-IV

Methods of polymeisation: mass or Bulk polymerization process, solution polymeisation process, suspension polymeisation process and emulsion polymerisation method comparison of merits and demerits of there methods.

Properties of polymers: crystalline and amorphous status, melting and glass transition temperatures and their determination, effect of polymer structure on mechanical, physical, chemical and thermal properties.

Unit-V

Degradation of polymers, Role of the following additives in the polymers:
i) Fillers and reinforcing fillers ii) Plasticizers iii) Lubricants iv)Antioxidants and UV stabilizers v) Blowing agents vi)Coupling agents vii)Flame retardents viii) Inhibitors

Unit-VI

Brief description of manufacture, properties and uses of :
i) Polyethylene (HDPE&LDPE), ii) Poly propylene iii) Polyvinylchloride iv) Polystyrene v) Polytetra flnoroethylene vi) Polymethyl mehacrylate vii) Polyvinylacetate & Polyvinylacohol.

Unit-VII

Brief description of manufacture, properties and uses of : i) Polyesters(Polyethylene terephalate polycarbonate and unsaturated polyesters) ii) Nylon(Nylon 66) iii) Phenol-Formaldehyde resins iv) Epoxy resins v) Polyurethane vi) Silicones

Unit-VIII

Compounding of polymer resins, brief description of : i) Compression and transfer moulding ii) Injection moulding iii) Extras ion iv) Blow moulding v) Calendaring vi) Laminating and pultrusion

TEXT BOOKS:

1. Plastic materials, J.A. Brydson, Newnes-Butterwarths (London) 1989.
2. Text book of polymer science, Bill meyer, F.W.Jr. (3rd ed.) John Wiely&sons 1984

REFERENCES:

1. Introduction to plastics, J.H. Brison and C.C. Gosselin, Newnes, London 1968.
2. Polymeric Materials, C.C.Winding and G.D.Hiatt Mc Graw Hill Book Co. 1961
3. Polymer Science by Gowarikar

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HYDERABAD

IIIrd Year B.Tech. Ch.E. (II Semester)

T	P	C
4+1	0	4

(CH05246) FERTILIZER TECHNOLOGY
(ELECTIVE - I)

Unit -I:
Source of nitrogen and hydrogen, steam reformation of hydrocarbons, coal gasification process, partial oxidation of fuel oils,

Unit-II:
Gas purification, high and low temperature shift conversion, CO removal processes, methanation.

Unit-III:
Manufacture of ammonia, ammonia synthesis by various processes, by product ammonia recovery by direct and indirect methods.

Unit-IV:
Manufacture of nitric acid and production of urea, urea once through, total and partial recycle processes prilling,

Unit-V:
Manufacture of other nitrogenous fertilizer such as ammonium sulfate, calcium ammonium nitrate, ammonium chloride etc granulation techniques.

Unit-VI:
Phosphatic fertilizers, single and triple super phosphate, manufacture and production of ammonium phosphate and nitro phosphates, manufacture of phosphoric acid.

Uint-VII:
Potassium fertilizers, mixed and compound fertilizers, liquid fertilizers.

Unit-VIII:
Indian fertilizer industry, production economics and future plans, fertilizer application techniques for different soils, controlled release fertilizers.

TEXT BOOKS :
1. Chemistry and technology of fertilizers by V.Seucheli, Reinhold 1960/
2. Ammonia by Slack A.V. Marcel Dekker, 1973.

REFERENCES :
1. Out lines of chemical technology by CE. Dryden
2. Manual of fertilizer processing by F.T.Nielsson, Dekker 1987

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IIIrd Year B.Tech. Ch.E. (II Semester)

T	P	C
4+1	0	4

(CH05447) PETROLEUM AND PETRO CHEMICAL TECHNOLOGY
(ELECTIVE - I)

UNIT I
Origin, formation and composition of petroleum: Origin and formation of petroleum, Reserves and deposits of world, Indian Petroleum Industry.

Unit-II:
Petroleum processing data: Evaluation of petroleum, thermal properties of petroleum fractions, important products, properties and test methods.

Unit-III:
Fractionation of petroleum: Dehydration and desalting of crudes, heating of crude-pipe still heaters, distillation of petroleum, blending of gasoline.

Unit-IV:
Treatment techniques: fraction-impurities, treatment of gasoline, treatment of kerosene, treatment of lubes.

Unit-V:
Thermal and catalytic processes: Cracking, catalytic cracking catalytic reforming, Naphtha cracking, coking, Hydrogenation processes, Alkylations processes, Isomerization process.

Unit-VI:
Petrochemical Industry – Feed stocks

Unit-VII:
Chemicals from methane: Introduction, production of Methanol, Formaldehyde, Ethylene glycol, PTFE, Methylamines.

Unit-VIII:
Chemicals from Ethane-Ethylene-Acetylene: Oxidation of ethane, production of Ethylene, Manufacture of Vinyl Chloride monomer, vinyl Acetate manufacture, Ethanol from Ethylene, Acetylene manufacture, Acetaldehyde from Acetylene.

TEXT BOOKS:
1. Petroleum refining Engineering ; WL Nelson Mc Graw Hill company IV edition.
2. Modern Petroleum Refining Processes, 4th ed.,, B.K.bhaskara Rao, Oxford & IBH Publishing, 2002.

REFERENCES:
1. The Petroleum chemicals industry by R.F.Goldstine, e & fn London, 1967
2. Chemical technology of petroleum by W.S.Gruese and D.R. Stevens, Mcgraw' Hill, 1980
3. Fundamentals of petroleum chemical technology by P Below.
4. Petro Chemicals Volume 1 and 2 ; A Chauvel and Lefevrev ; Gulf Publishing company 1989

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HYDERABAD

IIIrd Year B.Tech. Ch.E. (II Semester)

(CH05260) FLUIDIZATION ENGINEERING
Elective-I

	T	P	C
	4+1	0	4

Unit-I:

Introduction: The phenomenon of fluidization; liquid like behaviour of a fluidized bed; Comparison with other contacting methods; Advantages and disadvantages of fluidized beds.

Unit-II:

Industrial applications of fluidized beds: Coal gasification; gasoline from other petroleum fractions; Gasoline from natural and synthesis gases; Heat exchange; Coating of metal objects with plastics; Drying of solids; Synthesis of pthalic anhydride; Acrylonitrile; Polymerization of olefins; FCCU; Fluidized combustion of coal; incineration of solid waste; Activation of carbon; Gasification of waste; Activation of carbon; gasification of waste; bio-fluidization.

Unit-III:

Fluidization and mapping of regimes: Minimum fluidization velocity; Pressure drop vs. velocity diagram; effect of temperature and pressure on fluidization; Geldart classification of particles; terminal velocity of particles; turbulent fluidization; pneumatic transport of solids; fast fluidization; solid circulation systems; Voidage diagram; Mapping of regimes of fluidization.

Unit-IV:

Bubbles in dense bed: Single rising bubbles; Davidson model for gas flow at bubbles.; Evaluation of models for gas flow at bubbles.

Unit-V:

Bubbling Fluidized beds: Experimental findings; Estimation of bed porosities; Physical models: simple two phase model; K-L model.

Unit-VI:

High velocity Fluidization: Turbulent fluidized bed; Fast fluidization pressure drop in turbulent and fast fluidization.

Unit-VII:

Solids Movement, Mixing, Segregation and staging: Vertical movement of solids; Horizontal movement of solids; Staging of fluidized beds.

Unit-VIII:

Gas Dispersion and Gas interchange in Bubbling Beds: Dispersion of gas in beds; Gas interchange between bubble and emulsion; Estimation of gas interchange coefficients.

Particle to gas Mass Transfer: Mass Transfer: Experimental interpolation of mass transfer coefficients; Heat transfer; Experimental heat transfer fromf the bubbling bed model.

TEXT BOOKS

1. Fluidization Engineering by Kunil, Diazo and Octave Levenspiel
2. Fluidization by Max Leva.

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IIIrd Year B.Tech. Ch.E. (II Semester)

(CH05482) PROCESS DYNAMICS AND CONTROL LAB

	T	P	C
	0	3	2

1. Calibration and determination of time lag of various first and second order instruments

2. Experiments with single and two capacity systems with and with out interaction.

3. Self and non-self regulation of processes

4. Surface temperature measurements of self and non-self regulations

5. Measurement of gas temperature

6. Experiments on proportional reset, rate mode of control etc.

7. Telemetry, Pneumatic electric and hydraulic control sections

8. Estimation of damping coefficient for U-tube manometer

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IIIrd Year B.Tech. Ch.E. (II Semester)

T	P	C
0	3	2

(CH05358) MASS TRANSFER OPERATIONS LAB

1. Estimation of diffusivity coefficients

2. Distillation, a) Steam distillation b) Differential distillation

3. Packed towers, HETP evaluation

4. Vapor Liquid Equilibria

5. Hydrodynamics of Spray column

6. Continuous and Batch Drying

7. Evaluation of Mass transfer coefficients
   (a) Surface Evaporation   (b) Wetted wall column

8. (a) Liquid- Liquid Equilibria
   (b) Ternary Liquid Equilibria (binodal curve)

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HYDERABAD

IVth Year B.Tech. Ch.E. (I Semester)

T	P	C
4+1	0	4

(CH05558) TRANSPORT PHENOMENA

Unit-I:
Viscosity and the mechanisms of momentum transfer: Newton's law of viscosity (molecular momentum transport), generalization of Newton's law of viscosity, pressure and temperature dependence of viscosity, molecular theory of the viscosity of gases at low density, molecular theory of the viscosity of liquids.

Unit-II:
Thermal conductivity and the mechanisms of energy transport: Fourier's law of heat conduction (molecular energy transport), temperature and pressure dependence of thermal conductivity, and theory of thermal conductivity of gases at low density.

Unit -III
Diffusivity and the mechanisms of mass transport: Fick's law of binary diffusion (molecular mass transport), temperature and pressure dependence of diffusivities, theory of diffusion in gases at low density.

Unit-IV:
Shell momentum balances and velocity distributions in laminar flow: shell momentum balances and boundary conditions, flow of a falling film, flow through a circular tube, flow through annulus, flow of two adjacent immiscible fluids, creeping flow around a sphere.

Unit-V:
Shell energy balances and temperature distributions in solids and laminar flow: shell energy balances; boundary conditions, heat conduction with an electrical heat source, heat conduction with a nuclear heat source, heat conduction with a viscous heat source, heat conduction with a chemical heat source, heat conduction through composite walls, heat conduction in a cooling fin, forced convection, free convection.

Unit-VI:
Concentration distributions in solids and laminar flow: shell mass balances; boundary conditions, diffusion through a stagnant gas film, diffusion with a heterogeneous chemical reaction, diffusion with a homogeneous chemical reaction, diffusion into a falling liquid film (gas absorption), diffusion into a falling liquid film (solid dissolution), diffusion and chemical reaction inside a porous catalyst.

Unit-VII:

The equations of change for isothermal systems: the equation of continuity, the equation of motion, the equation of mechanical energy, the equation of angular momentum, the equations of change in terms of the substantial derivative, use of the equations of change to solve flow problems. Velocity distributions in turbulent flow: comparisons of laminar and turbulent flows, time-smoothed equations of change for incompressible fluids, the time- smoothed velocity profile near a wall.

Unit- VIII:

The equations of change for non- isothermal systems: the energy equation, special forms of the energy equation, the boussanes equation of motion for forced and free convection, use of the equations of change to solve steady state problems.
The equations of change for multi component systems: the equations of continuity for a multi component mixture.

TEXT BOOK:

1. Transport phenomena by Bird R.B., Stewart W.C., Lightfoot F.N., 2nd ed. John Wiley & Sons Inc,U.S.A,1960.

REFERENCES:

1. Transport phenomena for engineers by L.Theodore, International text book company,U.S.A.1971.

2. Transport processes and unit operations, 3rd, Geankoplis, PHI, 1997.

3. Fundamental of heat, momentum and mass transfer, Welty, Wickson, Wilson, John Wiley.

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HYDERABAD

IVth Year B.Tech. Ch.E. (1 Semester)

T	P	C
4+1	0	4

(CH05357) MASS TRANSFER OPERATIONS – III

Unit I

Diffusion :Diffusion in Solids, Fick's Diffusion, Unsteady State Diffusion, Types of Solid Diffusion, diffusion through polymers, diffusion through crystalline solids, Diffusion through porous solids & non-porous membranes.

Unit II

Crystallization-I: crystal geometry, principles of crystallization equilibria and yields, nucleation, crystal growth.

Unit III :

Crystallization-II : equipment, application of principles of design, MSMPR crystallizer, crystallization from melts

Unit IV :

HUMIDIFICATION OPERARATIONS: Vapor-Pressure Curve, Definitions, Psychometric Charts, Enthalpy of gas-vapor Mixtures, Humidification and Dehumidification, Operating lines and Design of Packed Humidifiers, Dehumidifiers and Cooling towers, Spray Chambers

UNIT V :

DRYING: Equilibrium, Definitions, Drying Conditions- Rate of Batch Drying under constant drying conditions, Mechanisms of batch drying, Drying time Through Circulation Drying, Batch and Continuous Drying Equipment, Material and Energy Balances of Continuous Driers.

UNIT VI :

Introduction to Membrane processes:

Introduction, reverse osmosis, ultrafiltration, gas separation, pervaporation, dialysis, liquid membranes, electrodialysis, application, driving forces, modules

UNIT VII :
Polarization phenomena and membrane fouling,
Introduction, concentration polarization in pressure driven processes, concentration profiles, and characteristics flux behaviour in pressure driven membrane separations. membrane operations, concentration polarization in diffusive membrane separations. membrane fouling

UNIT VIII :
An overview of downstream processing of microbial products cell disruption methods for intracellular products, removal of insolubles, biomass (and particulate, debris) separation techniques, flocculation and sedimentation.

TEXT BOOKS:
1. Mass transfer operation by Treybal, R.E, Mc Graw-Hill, Publishers.
2. Rate-Controlled Separations by PHILLIP C.WANKAT, Springer International-2005

REFERENCES:
1. "Bio separations", Belter PA and Cussler, John Willey publishers – 1985
2. Unit Operation in Chemical Engineering by MaCabe and Smith, Mc Graw-Hill, Publishers-2005
3. "Basic Principles of Membrane Technology", M.H.V. Mulder, Kluwer academic, Dordrecht,The Netherlands, 1991.
4. Membrane Technology in the Chemical Industry", By S.P. Nunes and K.V.Peinemann.
5. "Membrane Processes", by R.Rautenbach and R. Albrecht.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IVth Year B.Tech. Ch.E. (I Semester)

	T	P	C
	4+1	0	4

(CH05119) CHEMICAL ENGINEERING PLANT DESIGN AND ECONOMICS

Unit-I:
Introduction, Process Design development. General design considerations, Cost and asset accounting.

Unit-II:
Cash flow for industrial operations, factors effecting investment and production cost, capital investments, estimation of capital investments, cost indices, cost factors in capital investment,

Unit-III:
Organizations for presenting capital investments, estimates by compartmentalization, estimation of total product of cost direction, production costs, fixed charges, plant overhead costs, financing.

Unit – IV
Interest and investment cost, type interest, nominal and effective interest rates, continuous interest, present worth and discount annuities, cost due interest on investment, source of capital.

Unit-V:
Taxes and insurances, type of taxes: federal income taxes, insurance-types of insurance, self insurance.

Unit – VI
Depreciation : types of depreciation, services life, salvage value, present value, methods for determining depreciation, single unit and group depreciation.

Unit-VII:
Profitability: alternative investments and replacements, profitability standards, discounted cash flow, capitalized cost, pay out period ,alternative investments, analysis with small investments, increments and replacements.

Unit- VIII:
Optimum design and design strategy, incremental cost, general procedure for determining optimum condition, comparison of graphical and analytical methods, optimum production rates, semi continuous cyclic operation, fluid dynamics, mass transfer strategy of linearization

TEXT BOOK
1. Plant Design and Economics for Chemical Engineering: by M.S.Peters and K.D.Timmerhaus, Mc Graw Hill,4th Ed.,1991.

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HYDERABAD

IVth Year B.Tech. Ch.E. (I Semester)

T P C
4+1 0 4

(CH05123)CHEMICAL PROCESS EQUIPMENT DESIGN

Uint-I

Introduction; development of flow diagrams from process description, material and energy balance, sizing of equipment, design preliminaries, design codes, MOC selection procedure, fabrication methods and testing methods.

Uint-II

Stresses in thin and thick walled shells, theories of failure, design of storage vessels. Design of pressure vessels

Unit-III

Unit-IV

Types of heat exchangers, design of double pipe heat exchangers, shell and tube heat exchangers, optimum design, heating and cooling of fluids in process vessels through coils and jackets.

Unit-V

Types of evaporators: design of single effect and multiple effect evaporators.

Unit-VI

Types of mass transfer equipment, design of distillation and absorption columns.

Unit-VII

Types of reactors, design of batch, CSTR and PFR reactors

Unit-VIII

Materials handling equipment, optimum pipe diameter, design of centrifuges and filters.

TEXT BOOK:

1. Chemical Engineering: Vol.6, Coulson J.M. and Richardson J.F., Pergamon Press 1983

REFERENCES:

1. Process Equipment Design-Vessel Design: Brownell L.E., Wiley Eastern Ltd. (1986)
2. Process Design of equipments: Vol. 1 & 2, Dawande S.D.
3. Introduction to Chemical Equipment Design-Mechanical Aspects: Bhattacharya B.C., CBS Publishers, 1991
4. Process Heat Transfer: Kern Q., MGH Book Co. Inc.,1982
5. Mass Transfer Operations:Treybal R.E., MGH Book Co.Inc, 1982
6. Chemical Engineering Hand Book, Perry, 5th Ed.,
7. Process Equipment Design; M.V.Joshi

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IVth Year B.Tech. Ch.E. (I Semester)

T P C
4+1 0 4

(CH05488) PROCESS MODELING AND SIMULATION

Unit-I:

Mathematical models for chemical engineering systems, fundamentals, introduction to fundamental laws.

Unit-II:

Examples of mathematical models of chemical engineering systems, constant volume CSTRS, two heated tanks, gas phase pressurized CSTR, non-isothermal CSTR.

Unit-III:

Examples of single component vaporizer, batch reactor, reactor with mass transfer, ideal binary distillation column, batch distillation with holdup.

Unit-IV:

Finite difference equations-Linear equations with constant coefficients-solution two homogenous and non-homogenous equations – application to steady state multistage process.

Unit-V:

Non-linear finite difference equations Riccati-Difference equations, analytical solution of multistage distillation columns, extraction columns etc.,

Unit-VI:

Differential-difference equation, transient multistage processes-tanks in series, CSTRs in series, startup of multistage distillation column.

Unit-VII:

Computer simulation, examples, gravity flow tank, three CSTRs in series, binary distillation column, batch reactor, VLE dew point, bubble point calculations, countercurrent heat exchanger.

Unit-VIII:

Modular approaches and equation solving approach, Analysis mode versus design mode, sequential modular approach, simultaneous modular approach Precedence-ordering of equation sets, Adjacency Matrix, Sparse matrices.

TEXTBOOKS:

1. Process modeling simulation and control for chemical engineers; by W.L.Luyben, 2nd Ed., McGraw Hill,1990.
2. B.V.Babu, Process Plant Simulation; Oxford University press

REFERENCES :

1. Numerical methods in engineering; S.K. Gupta., New Age International(P) Ltd., 1995.
2. Mathematical methods in chemical engineering; Jenson and Jeffreys, Academic press, London, NY-1977
3. Engineering Mathematics ; by B.S.Grewal

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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IVth Year B.Tech. Ch.E. (I Semester)

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(CH05154) CORROSION ENGINEERING
Elective-II

Unit-I:
Introduction: Corrosion principles, Electro- chemical aspects, environmental effects, metallurgical and other aspects.

Unit-II:
Forms of corrosion 1: uniform attack, galvanic, crevice, pitting,

Unit-III:
Forms of corrosion 2 :
inter granular, selective, leaching, erosion and stress corrosion.

Unit-IV:
Corrosion testing procedures.

Unit-V:
Corrosion prevention: Material selection, alteration of environment

Unit VI :
Design, cathodic and anodic protection, coating.

Unit VII:
Modern Theory, Principles, thermodynamics and electrode kinetics,

Unit VIII:
Predicting corrosion behaviour, corrosion prevention and rate measurement.

TEXT BOOK:
1. Corrosion engineering ; M.G.Fontana,3rd Ed., McGraw Hill.

REFERENCE :
1. Handbook of corrosion ; Uhlig,

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IVth Year B.Tech. Ch.E. (I Semester)

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(BT05307) INDUSTRIAL BIOTECHNOLOGY
Elective-II

Unit-I
Fundamentals of biochemical engineering sciences ; Biotechnology – ancient and modern.

Unit-II
Exploitation of microbes – Large scale process, commercial exploitation, micro-gravity biotechnology (space biotechnology);

Unit-III
Animal biotechnology – application of animal cell culture, monoclonal antibodies, transgenic animal and gene therapy;

Unit-IV
Plant biotechnology – plant cell, tissue and organ culture processes – engineering perspectives;

Unit-V
Large scale separation processes- ATPS, gradient elution and affinity interaction;

Unit-VI
Technoeconomics of biotechnology industries;

Unit-VII
Legal, social and ethical aspects of biotechnology;

Unit-VIII
Biotechnology and the third world.

TEXT BOOK :
1. Text book of Biotechnology ; HK Das, Wiely Dremtechs Publications
2. Concepts in Biotechnology by Balasubramayam, 2nd ed., University Press,2004.

REFERENCES :
1. Molecular biotechnology; Glick and Pasternack,
2. Fundamentals of biochemical engineering ; Baily Ollis
3. Introduction to Biotechnology ; Ray V.Herran, Thomsam publications-2005

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IVth Year B.Tech. Ch.E. (I Semester)

(CS05434) OOPS THROUGH JAVA
(ELECTIVE - II)

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Unit I:
Creation of Java, importance of Java to internet, byte code, Java buzzwords, OOP Principles, Encapsulation, Inheritance and Polymorphism,data types, variables, declaring variables, dynamic initialization, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

Unit II:
Classes and Objects:
Concepts of classes and objects, class fundamentals, Declaring objects, assigning object REFERENCE variables, introducing methods, constructors, usage of static with data and
methods, usage of final with data,access control, this key word, garbage collection, overloading methods and constructors, parameter passing – call by value, ecursion,nested classes and inner classes, exploring the String class.

Unit III:
Inheritance: Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

Unit IV :
Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding
CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

Unit V:
Exception Handling and Multithreading: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups.

Unit VI:
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. AWT: Concepts of components, container, panel, window, frame, canvas, Font class, Color class and Graphics.

Unit VII:
AWT Controls: Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers – Flow, Border, Grid, Card and Gridbag. Swing – JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Unit VIII:
Networking and Java Library: Basics of Networking, Inetaddress, TCP/IP sockets, Datagrams, URL, URL connection, String handling, java.util, java.io and java.net packages.

TEXT BOOKS:

1. The Complete REFERENCE Java J2SE 5th Edition, Herbert Schldt, TMH Publishing Company Ltd, NewDelhi.

2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons.

REFERENCES:

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education.

2. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

3. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education. Beginning in Java 2, Iver Horton, Wrox Publications

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IVth Year B.Tech. Ch.E. (I Semester)

(MA05118)CHEMICAL ENGINEERING MATHEMATICS

(ELECTIVE - II)

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UNIT I

Mathematical formulation of the Physical Problems :

(i) Application of the law of conservation of mass-Salt accumulation in a stirred tank- starting an equilibrium still-solvent extraction in two stages-Diffusion with chemical reaction.

(ii) Application of the law of conservation of energy-Radial heat transfer through a cylindrical conductor-Heating a closed Kettle-Flow of heat from a fin.

UNIT II

Analytical (explicit) solution of Ordinary differential equation encountered in chemical engineering problems.

(i) First order differential equations-Method of separation of variables-Equations solved by Integration factors-certain examples involving Mass and Energy balances and Reaction Kinetics.

(ii) Second order differential equations-Non-linear equations-linear equations-Simultaneous Diffusions and Chemical reaction in a Tubular reactor-Continuous hydrolysis of Tallow in a spray column.

UNIT III

(i) Formulation of partial differential equations-Unsteady state heat conduction in one dimension-Mass transfer with axial symmetry-Continuity equations.

(ii). Boundary conditions-function specified-Derivative specified and Mixed conditions.

UNIT IV

(i) Interative solution of algebraic equations.

    (a) Jacobi's method (b) Gauss-Siedal Method.

    (b) Successive order-relaxation (S.O.R) method.

Unit V

(i) The difference operator-Properties of the difference operator-Difference tables and other difference operators.

(ii) Linear finite difference equations-the complimentary solution of the particular solution-Simultaneous linear differential equations.

UNIT VI

Non-linear finite difference equations-analytical solution. Solution of the following type of problems by finite difference method.

    (a) Calculation of the number of plates required for an absorption column.

    (b) Calculation of the number of theoretical plates required for distillation column.

    (c) Number of steps required for a counter-current extraction and leaching operations.

UNIT VII

Application of Statistical Methods.

(i) Propagation of errors of experimental data.

(ii) Parameter estimation of alge braic equations encountered in Heat and Mass Transfer, Kinetics and Thermodynamics by

    (a) The method of averages.

    (b) Linear least squares and

    (c) Weight linear least squares methods.

UNIT VIII

(i) Design of experiments.

    Factors, Fractional factorial methods.

TEXT BOOK :

1. "Mathematical methods in chemical engineering" by Jenson, V.J. and G.V.Jefferys, Academic Press. London and New York, 1977

REFERENCE :

1. "Applied Mathematics in Chemical Engineering" by H.S.Mickley, Thoms, K.,Sherwood and C.E.Reed, 2nd ed., Tata McGraw-Hill, Publications, 1975.

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IVth Year B.Tech. Ch.E. (I Semester)

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(CH05484) PROCESS EQUIPMENT DESIGN AND DRAWING LAB

1. Drawing of flow sheet symbols.

2. Drawing of instrumentation symbols.

3. Drawing of instrumentation diagrams.

4. Mechanical aspects chemical equipment design and drawing of following equipment.

   a) double pipe heat exchanger

   b) shell and tube heat exchanger

   c) evaporator

   d) distillation column

   e) batch reactor.

TEXT BOOK :

1. Process Equipment Design by M. V. Joshi

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IVth Year B.Tech. Ch.E. (I Semester)

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(MT05519) SIMULATION LAB

The following experiments have to be conducted using C/C++/Simulink using MATLAB

1. Gravity Flow tank.

2. Three CSTR's in series – open loop

3. Three CSTR's in series – Closed loop

4. Non isothermal CSTR

5. Binary Distillation column

6. Batch Reactor isothermal; Batch reactor non isothermal – closed loop

7. Isothermal batch reactor – open loop

8. Heat Exchanger

9. Interacting System- two tank liquid level

10. Non interacting system-two liquid level

11. Plug flow reactor

12. Bubble point calculations

13. Dew point calculations

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IVth Year B.Tech. Ch.E. (II Semester)

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(CH05312) INDUSTRIAL POLLUTION CONTROL ENGINEERING

Unit-I

Types of emissions from chemical industries and effects of environment, environment legislation, Type of pollution, sources of wastewater, Effluent guidelines and standards,

Unit-II

Characterization of effluent streams, oxygen demands and their determination (BOD, COD, and TOC), Oxygen sag curve, BOD curve mathematical, controlling of BOD curve, self purification of running streams, sources and characteristics of pollutants in fertilizer, paper and pulp industry, petroleum and petroleum industry.

Unit-III:

General methods of control and removal of sulfur dioxide, oxides of nitrogen and organic vapors from gaseous effluent, treatment of liquid and gaseous effluent in fertilizer industry.

Unit-IV

Air pollution sampling and measurement:
Types of pollutant and sampling and measurement, ambient air sampling: collection of gaseous air pollutants, collection of particulate air pollutants. Stack sampling: sampling system, particulate sampling, and gaseous sampling. Analysis of air pollutants: Sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and Ozones, hydrocarbons, particulate matter.

Unit-V

Air pollution control methods and equipments:
Source collection methods: raw material changes, process changes, and equipment modification. Cleaning of gaseous equipments particulate emission control: collection efficiency, control equipment like gravitational settling chambers, Cyclone separators, fabric filters, ESP and their constructional details and design aspects. Scrubbers: wet scrubbers, spray towers, centrifugal scrubbers, packed beds and plate columns, venturi scrubbers, their design aspects. Control of gaseous emissions: absorption by liquids, absorption equipments, adsorption by solids, equipment and the design aspects.

Unit-VI

Introduction to waste water treatment, biological treatment of wastewater, bacterial and bacterial growth curve, aerobic processes, suspended growth processes, activated aerated lagoons and stabilization ponds,
Attached growth processes, trickling filters, rotary drum filters, anaerobic processes.

Unit-VII:

Methods of primary treatments: screening, sedimentation, flotation, neutralization, and methods of tertiary treatment.
A brief study of carbon absorption, ion exchange, reverse osmosis, ultra filtration, chlorination, ozonation, treatment and disposal.

Unit-VIII

Hazardous waste management:
Nuclear wastes: health and environment effects, sources and disposal methods. chemical wastes: health and environmental effects, treatment and disposal: treatment and disposal by industry, off site treatment and disposal, treatment practices in various countries. Biomedical wastes: types of wastes and their control.

TEXT BOOKS:

1. Swamy AVN "Industrial Pollution Control and Engineering." Galgotia publications, 2005. Hyderabad

2. Rao C. S. Environmental pollution and control engineering – Wiley Eastern Limited, India, 1993.

REFERENCES:

1. Pollution control in process industries by S.P. Mahajan TMH,1985.

2. Waste water treatment by M.Narayana Rao and A.K.Datta,Oxford and IHB publ. New Delhi.

3. Air pollution control by P.Prathap mouli and N.Venkata subbayya. Divya Jyothi Prakashan, Jodhpur.

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IVth Year B.Tech. Ch.E. (II Semester)

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(CH05313) INDUSTRIAL SAFETY & HAZARD MANAGEMENT

Unit I:

Introduction:

Safety program, Engineering ethics, Accident and loss statistics, Acceptable risk, Public perception.

Unit II:

Toxicology:

How toxicants enter biological organisms, How toxicants are eliminated from biological organisms.

Unit III:

Industrial Hygiene:

Government regulations, Identification, Evaluation, Control.

Unit IV:

Fires and Explosions:

The fire triangle, Distinction between fire and explosions; Definitions, Flammability characteristics of liquids and vapors, MOC and inerting, ignition energy, Auto ignition, Auto oxidation, Adiabatic compression, Explosions.

Unit V:

Designs to prevent fires and explosions:

Inerting, Explosion proof equipment and instruments, Ventilations, Sprinkler systems.

Unit VI:

Introduction to Relief's:

Relief concepts, Definitions, Location of relief's, Relief types, Datafor sizing relief's, Relief systems.

Unit VII:

Relief Sizing:

Conventional spring operated relief's in liquids, Conventional spring operated relief's in vapor or gas service, Rupture disc relief's in liquid, vapour or gas service.

Unit VIII:

Hazards Identification:

Process hazards checklists, Hazard surveys, Hazop safety reviews.

TEXT BOOK:

1. D.A.Crowl & J.F.Louvar – Chemical Process Safety (Fundamentals with pplications), Prentice Hall (1990).

REFERENCES:

1. H.H.Fawcett and W.S.Wood –Safety and Accident Prevention in Chemical Operations, 2nd edition, John Wiley and sons, New York 1982

2. Coulson and Richardson's – Chemical engineering – R.K.Sinnot, Vol.6, Butterworth-Heinmann Limited 1996.

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IVth Year B.Tech. Ch.E. (II Semester)

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(CH05161) DESIGN AND ANALYSIS OF EXPERIMENTS
(ELECTIVE - III)

Unit I :
Introduction to the role of experimental design; basic statistical concepts; sampling and sampling distribution;

Unit II :
Testing of hypotheses about differences in means- randomized designs and paired comparison designs; testing of hypotheses about variances

Unit III :
Analysis of variance (ANOVA) –one-way classification ANOVA; analysis of fixed effects model; comparison of individual treatment means; the random effects model; the randomized complete block design

Unit IV
Factorial design of experiments; two-factor factorial design-fixed effects and random effects model;

Unit V   :
General factorial design; analysis of 2^k and 3^k factorial designs

Unit VI :
Conforming in the 2^k factorial design in 2^P block; confounding in the 3^k factorial design in 3^P block;

Unit VII :
fractional replication of the 2^k factorial design and the 3^k factorial design

Unit VIII:
Regression analysis- Simple and multiple linear regression and hypothesis testing; response surface methodology-the method of steepness ascent : response surface designs for first-order and second-order models. Evolutionary operation(EVOP)

TEXT BOOK :
1. "Design and analysis of experiments" by D.C. Montgomery, 2nd edition John Wiley and sons, NewYork (1984).

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IVth Year B.Tech. Ch.E. (II Semester)

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(CH05542) TECHNOLOGY OF PHARMACUTICALS AND FINE CHEMICALS

Unit I:
A brief outline o f grades of chemicals, sources of impurities in chemicals, principles (without going into details of individual chemicals) of limit test for arsenic, lead, iron, chloride and sulfate in Pharmaceuticals.

Unit II:
Outlines of Preparation, properties, uses and testing of the following Pharmaceuticals
- sulfacetamide, paracetamol, , riboflavin, nicotinamide,

Unit III:
Outlines of Preparation, properties, uses and testing of the following fine chemicals
- Methyl orange, fluorescence, procaine hydrochloride, paramino salicylic acid, isonicatinic acid hydrazide.

Unit IV:
Manufacture with flowsheets, properties uses and testing of the following Pharmaceuticals – aspirin, penicillin, calcium gluconate,

Unit V:
Manufacture with flowsheets, properties uses and testing of the following ferric ammonium citrate, pthallic anhydride and phenol flourobenzene process and benzene sulfate process, other processes in outline only.

Unit VI:
Tablet making and coating, granulation equipments

Unit VII:
Preparation of capsules, extraction of crude drugs.

Unit VIII:
Sterilization: introduction, risk factor, methods of sterilization, heat (dry and moist), heating with bactericide, filtration, gaseous sterilization and radiation sterilization, suitable example to be discussed.

TEXT BOOKS :
1. Remington's Pharmaceutical Science, Mac publishing company, 13th ed. 1965.
2. TEXT BOOK of Pharmaceutical Chemistry by Blently and driver. Oxford University press, London, 8th ed. 1960.

REFERENCES :
1. Blently's TEXT BOOK of Pharmaceutical Chemistry by H A Rawlins, B Tindell and Box, 8th ed. OU Press, London, 1977.
2. Industrial Chemicals by Faith, Kayes and Clark, John Wiley & Sons, 3rd Ed. 1965.

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IVth Year B.Tech. Ch.E. (II Semester)

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(HS05233) ENTREPRENEURSHIP
(ELECTIVE - III)

Unit I :

Introduction to Entrepreneurship:

Definition of Entrepreneur Entrepreneurship. Entrepreneur vs. Manager, Entrepreneur vs. Entrepreneur. The entrepreneurial decision process. Role of Entrepreneurship in Economic Development. Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

Unit II :

Creating and Starting the venture: Sources of new ideas, methods of generating ideas, creating problem solving, product planning and development process.

Unit III :

The Business Plan: Nature and scope of Business Plan, Writing Business Plan, Evaluating Business Plans. Using and Implementing business plans. Marketing plan, financial plan and the organizational plan. Launching formalities.

Unit IV :

Financing and Managing the new venture :Sources of capital, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and entrepreneurship, Internet advertising.

Unit V :

New venture Expansion Strategies and Issues: Features and evaluation of Joint ventures, acquisitions, mergers, franchising. Public issues, rights issues, bonus issues and stock splits.

Unit VI:

Institutional support to entrepreneurs: Role of Directorate of Industries, District Industries Centres (DICs), Industrial Development Corporation (IDC), State Financial Corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs), Khadi and Village Industries Commission (KVIC), Technical Consultancy Organisation (TCO), Small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI)

Unit VII:

Production and Marketing Management: Thrust areas of production management, Selection of production Techniques, Plant utilization and maintenance, Designing the work place, Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing.

Unit VIII :

Labour legislation, Salient Provisions under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and Payment of Bonus Act.

TEXT BOOKS:

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 5th Edition.

2. Dollinger: Entrepreneurship, 4/e, Pearson,2004.

REFERENCES :

1. Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2004.

2. Harvard Business Review on Entrepreneurship, HBR Paper Back, 1999.

3. Robert J.Calvin: Entrepreneurial Management, TMH, 2004.

4. Gurmeet Naroola: The entrepreneurial Connection, TMH,2001.

5. Bolton & Thompson: Entrepreneurs —Talent, Temperament, Technique, Butterworth Heinemann, 2001.

6. Agarwal: Indian Economy, Wishwa Prakashan 2005.

7. Dutt & Sundaram: Indian Economy,S.Chand, 2005

8. Srivastava :Industrial Relations & Labour Laws, Vikas, 2005.

9. Aruna Kaulgud: Entrepreneurship Management by Vikas publishing house, 2003.

10. Essential of entrepreneurship and small business management by Thomas W.Zimmerer & Norman M.Searborough, PHI-2005

11. ND Kapoor: Industrial Law, Sultan Chand & Sons, 2005.

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IVth Year B.Tech. Ch.E. (II Semester)

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(CH05438) OPTIMIZATION OF CHEMICAL PROCESS
(ELECTIVE - IV)

Unit-I:

Nature and organization of optimization problems: what optimization is all about, Why optimize, scope and hierarchy of optimization, the essential features of optimization, examples of applications of optimization, the essential features of optimization problems, general procedure for solving optimization problems, obstacles to optimization. Classification of models, how to build a model, fitting functions to empirical data, the method of least squares, factorial experimental designs, fitting a model to data subject to constraints.

Unit-II:

Basic concepts of optimization: Continuity of functions, unimodal versus Multimodel functions. Convex and Concave functions, Convex region, Necessary and sufficient conditions for an extremum of an unconstrained function, interpretation of the objective function in terms of its quadratic approximation.

Unit-III:

optimization of unconstrained functions: one-dimensional search: Numerical methods for optimizing a function of one variable, scanning and bracketing procedures, Newton's, Quasi-Newton's and Secant methods of uni-dimensional search, region elimination methods, polynomial approximation methods, how the one- dimensional search is applied in a multi-dimensional problem, evaluation of uni-dimensional search methods.

Unit-IV:

unconstrained multivariable optimization: Direct methods, random search, grid search, uni-variate search, simplex method, conjugate search directions, Powell's method, indirect methods- first order, gradient method, conjugate method, indirect method- second order: Newton's method forcing the Hessain matrix to be positive definite, movement in the search direction,

termination, summary of Newton's method, relation between conjugate gradient methods and Quasi-Newton method.

Unit – V:

Linear programming and applications: Basic concepts in linear programming, Degenerate LP's – graphical solution, natural occurrence of linear constraints, the simplex method of solving linear programming problems, standard LP form, obtaining a first feasible solution, the revised simplex method, sensitivity analysis, duality in linear programming, the Karmarkar algorithm, LP applications.

Unit-VI:

Optimization of Unit operations-1 recovery of waste heat, shell & tube heat exchangers, evaporator design, liquid-liquid extraction process, optimal design of staged distillation column.

Unit-VII:

Optimization of Unit operations-2

Optimal pipe diameter, optimal residence time for maximum yield in an ideal isothermal batch reactor, chemostat, optimization of thermal cracker using liner programming.

Unit-VIII:

Genetic Algorithms: (Qualitative treatment) Working principles, differences between GAs and traditional methods, similarities between GAs and traditional methods, GAs for constrained optimization, other GA operators, real coded GAs, Advanced GAs

TEXT BOOK:

1. Optimization of chemical processes by T.F.Edgar and Himmelblau DM.Mc-Graw. Hill.2001.

2. Optimization for Engineering Design, Kalyan Moy Deb, PHI-2000

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IVth Year B.Tech. Ch.E. (II Semester)

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(ME05436) OPERATIONS RESEARCH
(ELECTIVE - IV)

UNIT – I

Development – Definition – Characteristics and Phases – Types of models – operation Research models – applications.

ALLOCATION: Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

UNIT – II

TRANSPORTATION PROBLEM – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy. **Assignment problem** – Formulation – Optimal solution - Variants of Assignment Problem– Traveling Salesman problem.

SEQUENCING – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

UNIT – III

REPLACEMENT: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement.

UNIT – IV

THEORY OF GAMES: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – dominance principle – m X 2 & 2 X n games -graphical method.

UNIT – V

WAITING LINES: Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

UNIT – VI

INVENTORY: Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

UNIT – VII

DYNAMIC PROGRAMMING:

Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

UNIT – VIII

SIMULATION: Definition – Types of simulation models – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages – Simulation Languages.

TEXT BOOK :

1. Operations Research / S.D.Sharma-Kedarnath.

REFERENCES :

1. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
2. Operations Research: Methods and Problems / Maurice Saseini, Arthur Yaspan and Lawrence Friedman
3. Operations Research / R.Pannerselvam,PHI Publications.
4. Operations Research / Wagner/ PHI Publications.
5. Operation Research /J.K.Sharma/MacMilan.
6. Introduction to O.R/Hiller & Libermann (TMH).
7. O.R/Wayne L.Winston/Thomson Brooks/cole
8. Introduction to O.R /Taha/PHI

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IVth Year B.Tech. Ch.E. (II Semester)

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(CS05159) DATA BASE MANAGEMENT SYSTEMS
(ELECTIVE - IV)

Unit – I:

Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor – History of Data base Systems.

Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

Unit – II:

Relational Model: Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra and Calculus: Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

Unit – III:

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOTR – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL 0 Triggers and Active Data bases.

Unit – IV:

Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – forth Normal Form.

Unit – V:

Overview of Transaction Management: ACID Properties – Transactions and Schedules – Concurrent Execution of transaction – Lock Based Concurrency Control – Performance Locking – Transaction Support in SQL – Introduction to Crash recovery.

Unit – VI:

Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions – Dealing with Dead Locks – Specialized Locking Techniques – Concurrency without Locking.

Crash recovery: Introduction to ARIES – the Log – Other Recovery related Structures – the Write-Ahead Log Protocol – Check pointing – re3covering from a System Crash – Media recovery – Other approaches and Interaction with Concurrency control.

Unit – VII:

Overview of Storage and Indexing: Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning.

Unit – VIII:

Storing data: Disks and Files: - The Memory Hierarchy – Redundant Arrays of Independent – Disks – Disk Space Management – Buffer Manager – Files of records – Page Formats – record formats.

Tree Structured Indexing: Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

Hash Based Indexing: Static Hashing – Extendable hashing – Linear Hashing – Exendble vs. Liner hashing.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, Mc. Graw Hill, III edition.
2. Data base System Concepts, Silberschatz, Korth, Mc.Graw hill, IV edition.

REFERENCES:

1. Data base Systems design, Implementation, and Management, Rob & Coronel 5th Edition.
2. Data base Management System, Navrate Pearson/PHI
3. Data base Management System Mathew Leon, Leon Vikas/Alex Leon.
4. Data base Management System, P.Radha Krishna, Hi-tech Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IVth Year B.Tech. Ch.E. (II Semester)

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(CS05048) ARTIFICIAL INTELLIGENCE
(ELECTIVE – IV)

UNIT-I

Introduction : AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT-II

Searching: Searching for solutions, uniformed search strategies – Breadth first search, depth first search, Depth limited search, Iterative deepening depth first search bi-direction search - comparison. Search with partial information (Heuristic search) Greedy best first search, A* search, Memory bounded heuristic search, Heuristic functions.

UNIT-III

Local search Algorithms, Hill climbing, simulated, annealing search, local beam search, genetical algorithms.

Constrain satisfaction problems: Backtracking search for CSPs local search for constraint satisfaction problems.

UNIT-IV

Game Playing: Adversial search, Games, minimax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, cutting of search.

UNIT-V

Knowledge Represenation & Reasons logical Agents, Knowledge – Based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in propos ional logic, Resolution, Forward & Backward. Chaining.

UNIT-VI

First order logic. Inference in first order logic, propositional Vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution.

UNIT-VII

Planning – Classical planning problem, Language of planning problems, Expressiveness and extension, planning with state – space search, Forward states spare search, Backward states space search, Heuristics for stats space search. Planning search, planning with state space search, partial order planning Graphs.

UNIT-VIII

Learning – Forms of learning, Induction learning, Learning Decision Tree, Statistical learning methods, learning with complex data, learning with Hidden variables – The EM Algorithm, Instance Based learning, Neural Networks.

TEXT BOOKS:

1. Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norving, Pearson Education.

2. Artificial Intelligence, 3rd Edition, Patrick Hendry Winston., Pearson Edition,

REFERENCE:

1. Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).