SYLLABUS

BACHELOR OF TECHNOLOGY PROGRAMME
IN
CHEMICAL ENGINEERING (8 SEMESTERS)
REGULATIONS 2010
SATHYABAMA UNIVERSITY
REGULATIONS – 2010

Effective from the academic year 2010-2011 and applicable to the students admitted to the Degree of Bachelor of Engineering / Technology. (Eight Semesters)

1. Structure of Programme

1.1 Every Programme will have a curriculum with syllabi consisting of theory and practical such as:

   (i) General core courses comprising Mathematics, Basic Sciences, Engineering Sciences.
   (ii) Core course of Engineering / Technology.
   (iii) Elective course for specialization in related fields.

1.2 Each semester curriculum shall normally have a blend of lecture courses not exceeding 7 and practical courses not exceeding 4.

1.3 The medium of instruction, examinations and project report will be in English.

2. Duration of the Programme

A student is normally expected to complete the B.E/B.Tech. Programme in 8 semesters but in any case not more than 12 consecutive semesters from the time of commencement of the course (not more than 10 semesters for those who join 3rd semester under Lateral entry system) The Head of the Department shall ensure that every teacher imparts instruction as per the number of hours specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

3. Requirements for Completion of a Semester

A candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirement for completion of a semester.

3.1 He/She secures not less than 90% of overall attendance in that semester.

3.2 Candidates who do not have the requisite attendance for the semester will not be permitted to write the University Exams.

4. Examinations

The examinations shall normally be conducted between October and December during the odd semesters and between March and May in the even semesters. The maximum marks for each theory and practical course (including the project work and Viva Voce examination in the Eighth Semester) shall be 100 with the following breakup.

   (i) Theory Courses
       Internal Assessment : 20 Marks
       University Exams    : 80 Marks
   (ii) Practical Courses
       Internal Assessment : - -
       University Exams    : 100 Marks
5. **Passing requirements**
   
   (i) A candidate who secures not less than 50% of total marks prescribed for the course (For all courses including Theory, Practicals and Project work) with a minimum of 35 marks out of 80 in the University Theory Examinations, shall be declared to have passed in the Examination.

   (ii) If a candidate fails to secure a Pass in a particular course, it is mandatory that he/she shall reappear for the examination in that course during the next semester when examination is conducted in that course. However the Internal Assessment marks obtained by the candidate in the first attempt shall be retained and considered valid for all subsequent attempts.

6. **Eligibility for the Award of Degree**

   A student shall be declared to be eligible for the award of the B.E/B.Tech. degree provided the student has successfully completed the course requirements and has passed all the prescribed examinations in all the 8 semesters within the maximum period specified in clause 2.

7. **Award of Credits and Grades**

   All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, Letter Grades will be awarded as per the range of total marks (out of 100) obtained by the candidate as given below:

<table>
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<th>RANGE OF MARKS FOR GRADES</th>
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<tr>
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   **CUMULATIVE GRADE POINT AVERAGE CALCULATION**

   The CGPA calculation on a 10 scale basis is used to describe the overall performance of a student in all courses from first semester to the last semester. F and W grades will be excluded for calculating GPA and CGPA.

   \[
   CGPA = \frac{\sum C_i GP_i}{\sum C_i}
   \]

   where \(C_i\) - Credits for the subject

   \(GP_i\) - Grade Point for the subject

   \(\sum\) - Sum of all subjects successfully cleared during all the semesters

8. **Classification of the Degree Awarded**

   1. A candidate who qualifies for the award of the Degree having passed the examination in all the courses of all the semesters in his/her first appearance within a maximum period of 8 consecutive semesters after commencement of study (maximum of 6 semesters for Lateral entry system who join the course in the third semester) securing a CGPA not less than 9.0 shall be declared to have passed the examination in First Class – Exemplary.
2. A candidate who qualifies for the award of the Degree having passed the examination in all the courses of all the semesters in **his/her first appearance** within a maximum period of 8 consecutive semesters after commencement of study (maximum of 6 semesters for Lateral entry system who join the course in the third semester) securing a **CGPA not less than 7.5** shall be declared to have passed the examination in **First Class with Distinction**.

3. A candidate who qualifies for the award of the Degree having passed the examination in all the courses of all the semesters within a maximum period of 8 consecutive semesters after commencement of study (maximum of 6 semesters for Lateral entry system who join the course in the third semester) securing a **CGPA not less than 6.0** shall be declared to have passed the examination in **First Class**.

4. All other candidates who qualify for the award of the Degree having passed the examination in all the courses of all the 8 semesters within a maximum period of 12 consecutive semesters (10 consecutive semesters for Lateral Entry system who join the course in the third semester) after his/her commencement of study securing a **CGPA not less than 5.0** shall be declared to have passed the examination in **Second Class**.

5. A candidate who is absent in semester examination in a course/project work after having registered for the same, shall be considered to have appeared in that examination for the purpose of classification of degree. **For all the above mentioned classification of Degree, the break of study during the programme, will be counted for the purpose of classification of degree.**

6. A candidate can apply for revaluation of his/her semester examination answer paper in a theory course, within 1 week from the declaration of results, on payment of a prescribed fee along with prescribed application to the Controller of Examinations through the Head of Department. The Controller of Examination will arrange for the revaluation and the result will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

**Final Degree is awarded based on the following:**

- **CGPA ≥ 9.0** - First Class - Exemplary
- **CGPA ≥ 7.50 < 9.0** - First Class with Distinction
- **CGPA ≥ 6.00 < 7.50** - First Class
- **CGPA ≥ 5.00 < 6.00** - Second Class

Minimum CGPA requirements for award of Degree is 5.0 CGPA.

9. **Discipline**

Every student is required to observe disciplined and decorous behaviour both inside and outside the University and not to indulge in any activity which will tend to bring down the prestige of the University. If a student indulges in malpractice in any of the University theory / practical examination, he/she shall be liable for punitive action as prescribed by the University from time to time.

10. **Revision of Regulations and Curriculum**

The University may revise, amend or change the regulations, scheme of examinations and syllabi from time to time, if found necessary.
# Semester I

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**Total Credits**: 26

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**Total Credits**: 26

L - Lecture hours; T - Tutorial hours; P - Practical hours; C - Credits
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# ELECTIVES

Note: ONE SUBJECT IS TO BE CHOSEN FROM EACH GROUP COMPULSORY

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DUAL DEGREE IN COMPUTER SCIENCE

Provision for candidates from Non-IT Branches of B.E/B.Tech to undergo Dual Degree Programme leading to B.E in Computer Science.

A. Duration and Curriculum

Candidates selected for a Dual degree programme shall undergo additional courses pertaining to Computer Science. These courses constitute with additional Curriculum as per annexure and consist of both core course and electives. The additional courses are to be undergone concurrently from the 3rd semester of the B.E/B.Tech. (Non-IT) degree programme and extends for one more year beyond the fourth year of the regular B.E/B.Tech. (Non-IT) degree programme to which he/she was first admitted. The additional courses are to be offered from 3rd to 8th Semester after normal working hours so that the regular B.E/B.Tech. (NonIT) remains unaffected.

B. A candidate undergoing dual degree programme should satisfy minimum attendance requirements for the course of additional Curriculum for each semester, as stipulated for the regular B.E/B.Tech. Degree Programme.

C. For the courses of additional Curriculum, a candidate has to write the same examination that is held for the regular B.E. Computer Science.

D. The passing rules for the dual degree programme shall be same as that of the regular B.E/B.Tech. Degree programme.

E. A candidate shall be declared to be eligible for the additional degree of B.E. Computer Science provided that

   (i) The candidate has qualified for the regular B.E. or B.Tech. Degree in the non-IT branch in which he/she was originally admitted.

   (ii) The candidate has successfully completed all the courses prescribed in the additional Curriculum within a maximum period of 12 semesters from the date of first admission.

   (iii) There is no disciplinary action pending against the student.
### THIRD SEMESTER

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### FIFTH SEMESTER

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| 2          | SCSX1018     | Database Systems                       | 3 | 1 | 0 | 4 |
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| 2          | SCSX1022     | J2EE                                   | 3 | 0 | 0 | 3 |
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**TOTAL CREDITS** 15

**TOTAL COURSE CREDITS**: 92
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UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

Definition, scope and importance, need for public awareness, forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, floods, drought, conflicts over water, dams-benefits and problems, mineral resources: use effects on forests and tribal people. water resources: use and over-utilization of surface and ground water, 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 II ECOSYSTEMS AND BIODIVERSITY

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 (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Introduction to biodiversity, definition: genetic, species and ecosystem diversity - biogeographical 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-spots 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 III ENVIRONMENTAL POLLUTION

Definition - causes, 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 IV 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 V 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. 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 / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN:
Max. Marks: 80
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I TRIGONOMETRY

10 hrs.

Review of Complex numbers and De Moivre’s Theorem. Expansions of \( \sin^n\theta \) and \( \cos^n\theta \); \( \sin\theta \) and \( \cos\theta \) in powers of \( \theta \), \( \sin^n\theta \) and \( \cos^n\theta \) in terms of multiples of \( \theta \). Hyperbolic functions – Inverse hyperbolic functions. Separation into real and imaginary parts of complex functions.

UNIT II MATRICES

10 hrs.

Characteristic equation of a square matrix - Eigen values and Eigen vectors of a real matrix- properties of Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof) verification – Finding inverse and power of a matrix. Diagonalisation of a matrix using similarity transformation (concept only) , Orthogonal transformation – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS

10 hrs.

Curvature –centre, radius and circle of curvature in Cartesian co-ordinates only – Involutes and evolutes – envelope of family of curves with one and two parameters – properties of envelopes and evolutes – evolutes as envelope of normal.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

10 hrs.


UNIT V ORDINARY DIFFERENTIAL EQUATION

10 hrs.

Second order linear differential equation with constant coefficients – Particular Integrals for \( e^{ax}, \sin ax, \cos ax, x^n, x^ne^{ax}, e^{ax} \sin bx, e^{ax} \cos bx \). Equations reducible to Linear equations with constant co-efficient using \( x=e^t \). Simultaneous first order linear equations with constant coefficients - Method of Variations of Parameters.

TEXT / REFERENCE BOOKS:


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I CONDUCTING AND SUPERCONDUCTING MATERIALS
10 hrs.

Classical Free electron theory of Metals-Derivation of Electrical and Thermal Conductivity- Deduction of Wiedemann Franz law-Lorentz number. Introduction to Band theory, Difference between Conductors, Semiconductors and Insulators - Superconductivity-Transition temperature - occurrence of superconductivity - BCS Theory(Qualitative), properties of superconductors -Type I &Type II superconductors, High Tc superconductors, AC & DC Josephson effects. Applications of superconductors – basic concepts of SQUID, cryotron, magnetic levitation.

UNIT II MAGNETIC AND DIELECTRIC MATERIALS
10 hrs.

Types based on spin. Hard and soft magnetic materials, domain theory of Ferromagnetism, magnetic bubbles, formation and propagation of magnetic bubbles, applications of magnetic materials - Magnetic storage devices. Dielectric parameters, polarization, polarisability, types of polarization, Internal or local electric field - derivation of Lorentz Equation and Clausius - Mossotti Equation, dielectric loss and breakdown, types of dielectric breakdown, types of dielectric materials, applications.

UNIT III OPTICAL MATERIALS
10 hrs.


UNIT IV MODERN ENGINEERING MATERIALS
10 hrs.


UNIT V CHARACTERIZATION OF MATERIALS
10 hrs.


REFERENCE BOOKS:

‘Applications’ mentioned in the syllabus refer to the basic applications and not to any specific case.

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80
Exam Duration: 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks
Out of 20 marks, maximum of 10% problems may be asked.

Part B: 2 Questions from each unit with internal choice, each carrying 12 marks
Out of 60 marks, maximum of 10% problems may be asked
UNIT I WATER TECHNOLOGY

UNIT II BATTERIES AND FUEL CELLS

UNIT III CORROSION SCIENCE

UNIT IV EXPLOSIVES AND ROCKET PROPELLANTS

UNIT V SURFACE CHEMISTRY

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN:
Max. Marks: 80
Exam Duration: 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
One problem for 5 marks may be asked in Unit 1 - Water Technology
UNIT I INTRODUCTION TO CELL BIOLOGY AND BIO-ORGANIC CHEMISTRY  
Cell structure and function of cell organelles, Eukaryotic and prokaryotic cells, Cell division, Mitosis, Meiosis, Introduction to peptides, Carbohydrates, fats, proteins-structure, classification.

UNIT II INTRODUCTION TO ENZYMES  
Enzyme nomenclature, Classification of Enzymes, Michaelis Menten kinetics, Determination of Km, Lineweaver Burk plot, Eadie-Hofstee plot, Hanes -Woolf plot, Types of Enzyme Inhibition, Competitive inhibition, Uncompetitive inhibition, Non-competitive Inhibition, Enzyme immobilization.

UNIT III INTRODUCTION TO GROWTH KINETICS  
Phases of microbial growth, Microbial growth curve, Cell growth kinetics,-Batch and continuous growth, Kinetics of batch and continuous culture, Sterilization kinetics.

UNIT IV INTRODUCTION TO FERMENTATION TECHNOLOGY  
Fermentation- basic definition, Types of media and media components, Fermentors and their accessories, Types of Fermentors, Airlift fermentor, Tower fermentor, Continuous stirred tank fermentor.

UNIT V INTRODUCTION TO DOWNSTREAM PROCESSING  
Stages in downstream operations, Flotation, Flocculation, Filtration, Centrifugation, Release of intracellular products-Cell disruption, Concentration-Liquid Liquid extraction, Evaporation, Membrane filtration, Lyophilization, Drying, Purification by Chromatography.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80  
Exam Duration: 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks  
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  

B.Tech. (CHEMICAL ENGINEERING)  
REGULATIONS 2010
UNIT I CONSTRUCTION OF PLANE CURVES  

UNIT II PROJECTION OF POINTS AND LINES  
General principles of orthographic projection – first angle projection – layout of views – projections of points, straight lines located in the first quadrant – Determination of true lengths of lines and their inclinations to the planes of projection – Traces

UNIT III PROJECTION OF SOLIDS AND SECTION OF SOLIDS  
Projection of solids like prism, pyramid, cylinder and cone when the axis is inclined to only one plane of projection – Change of position method only - Sectioning of above mentioned solids in simple vertical positions by cutting plane inclined to one reference plane and perpendicular to the other – True shapes of sections

UNIT IV DEVELOPMENT OF SURFACES AND FREE HAND SKETCHING  
Need for development of surfaces – Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones.- Pictorial representation of engineering objects – Representation of three dimensional objects in two dimensional media – Need for multiple views – Developing visualization skills through free hand sketching of three dimensional objects.

UNIT V ISOMETRIC PROJECTIONS & PERSPECTIVE PROJECTIONS  
Principles of isometric projection – Isometric scale – Isometric projections of simple solids and combination of solids - Prisms, pyramids, cylinders, cones and spheres (excluding isometric projections of truncated solids) - Perspective projections - Simple objects like – cube, prisms, pyramids by Vanishing point method & Visual Ray method (excluding perspective projections of truncated solids)

TEXT / REFERENCE BOOKS:
5. IS 9609 (Parts 0 & 1 )-2001: Technical Products Documentation – Lettering
7. IS 11669-1986 & SP 46-2003: Dimensioning of Technical Drawings
8. IS 15021(Parts 1 to 4)-2001: Technical Drawings-Projection Methods

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part A: equal distribution of questions from each unit.

Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
Part B - Split up:
Unit 1: 1 question from construction of hexagon / pentagon / ellipse &
1 question from construction of parabola / hyperbola
Unit 2: 1 question from projection of points & 1 question from projection of lines inclined to both the planes.
Unit 3: 1 question from projection of solids & 1 question from section of solids.
Unit 4: 1 question from development of surfaces & 1 question from orthographic projection.
Unit 5: 1 question from isometric projection & 1 question from perspective projection.
UNIT I  INTRODUCTION  

Algorithms & flowcharts-Overview of C-Features of C-IDE of C Structure of C program-Compilation & execution of C program-Identifiers, variables, expression, keywords, data types, constants, scope and life of variables, local and global variables. Operators: arithmetic, logical, relational, conditional and bitwise operators- Special operators: size of () & comma (,) operator-Precedence and associativity of operators & Type conversion in expressions.

Basic input/output and library functions: Single character input/output i.e. getch(), getchar(), getche() & putchar()-Formatted input/output: printf() and scanf()-Library Functions: concepts, mathematical and character functions.

UNIT II  CONTROL STRUCTURES, FUNCTIONS  

Conditional control-Loop control and Unconditional control structures.

The Need of a function-User defined and library function- Prototype of a function-Calling of a function-Function argument-Passing arguments to function- Return values-Nesting of function- main()-Command line arguments and recursion. Storage class specifier – auto, extern, static, & register.

UNIT III  ARRAYS, STRINGS, STRUCTURE AND UNION  

Single and multidimensional arrays-Array declaration and initialization of arrays-Array as function arguments.

Declaration-Initialization and string handling functions.

Defining structure-Declaration of structure variable-Accessing structure members-Nested structures-Array of structures-Structure assignment-Structure as function argument-Function that returns structure- Union.

UNIT IV  POINTERS AND DMA FUNCTIONS  

The ‘&’ and ‘*’ operators-Pointers expressions-Pointers vs arrays-Pointer to functions-Function returning pointers-Static and dynamic memory allocation in C.

malloc(), calloc(), sizeof(), free() and realloc()-Preprocessor directives.

UNIT V  FILE MANAGEMENT AND GRAPHICS  

Defining, opening & closing a file, text file and binary file- Functions for file handling: fopen, fclose, gets, puts,printf, fscanf, getw, putw, fgets, fread, fwrite-Random access to files: fseek, ftell, rewind-File name as Command Line Argument.


TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80  
Exam Duration : 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks  
20 marks

Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  
60 marks

B.Tech. (CHEMICAL ENGINEERING)  7  REGULATIONS 2010
### PHYSICS LAB - I

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1. Torsional pendulum - Determination of MI of the disc and rigidity modulus of the wire.
2. Quinccke’s method - Determination of magnetic susceptibility of a liquid
3. Semiconductor diode - Determination of width of the forbidden energy gap
4. Ultrasonic interferometer – Determination of Compressibility of liquid
5. Lees disc - Determination of thermal conductivity of a bad conductor.

### CHEMISTRY LAB - I

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1. Determination of total, permanent and temporary hardness of a water sample.
2. Estimation of copper in an ore by iodometric titration.
3. Determination of strength of HCl by conductometric titration.
4. Estimation of the amount of ferrous ion by titrating with chromate ion using potentiometer.
5. Verification of the Freundlich isotherm by using acetic acid adsorption on charcoal.
6. Determination of the rate of corrosion of iron metal by hydrogen evolution method.

### PROGRAMMING IN C LAB

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1. To write a simple menu driven calculator program using switch statement.
2. To write a program to calculate the nCr using functions.
3. To write a program to find the largest and smallest number using arrays.
4. To write a program to generate Fibonacci series.
5. To write a program to find the factorial of a number using recursion.
6. To write a program to print the sum of elements of an array using pointers.
7. To write a program to implement file handling
8. To write a program to perform matrix addition and multiplication.
9. To write a program to check for perfect number.
10. To write a program to implement string manipulation functions without using library functions.
11. To write a program to perform ASCII equivalent keystrokes.
12. To write a program to solve a polynomial equation.
UNIT I

Reading comprehension- Skimming and Scanning - Transcoding -Bar diagram, Tables and Pie chart – Discussing topics of general interest or on current topics and making a presentation in the class - Conjunctions and discourse markers- cloze reading- affixes – definitions- tense- voice – jumbled sentences.

UNIT II

Subject verb agreement - Idioms and phrases, reading passages to answer evaluative, inferential and hypothetical type of questions- Listening - Creative thinking and speaking- Formal letters - application for job- resume preparation- inviting dignitaries to department workshops, symposium and university functions - Letter to the editor.

UNIT III

Reading and summarising reports - Writing a project proposal - Editing - Checking punctuation and grammatical errors- Types of Sentences – preparation of Check List- formulating questions and answers - communicating politely.

UNIT IV

Reported speech- Parts of speech- confusable words - Report on industrial visit - project report - Making effective Power Point presentations - speaking about the future plans-expressing opinions-reading and guessing meanings of unknown words from the context – using appropriate verb forms

UNIT V

Modal auxiliaries – Presentation of problems and solutions – wh- questions- question tags- punctuation- hyponymy- listening and taking notes – study skills – preparing notes

TEXT / REFERENCE BOOKS:
1. Aeda Abidi & Ritu Chowdary, “English For Engineers Made Easy”, Cengage India Learning Limited, New Delhi. 2010

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80
Exam Duration : 3 hrs.
Part A: 10 questions of 2 marks each – no choice 20 marks
Part B: 6 questions from the five units with internal choice, each carrying 10 marks 60 marks
UNIT I  THEORY OF EQUATIONS  
Relation between roots and Co-efficient of equations – Symmetry function of roots – Formation of equations – To increase or decrease the roots of a given equation by a given quantity – Reciprocal equations – Descartes rule of signs – Cardon’s method of solving cubic equations.

UNIT II  THREE DIMENSIONAL ANALYTICAL GEOMETRY  
Direction cosines and ratios – The equation of a plane – Equation to a straight line – Shortest distance between two skew lines – Coplanar lines – Sphere – Tangent line – Plane section of a sphere – Orthogonal spheres.

UNIT III  INTEGRAL CALCULUS  
Double integrals – Change of order of integration – Change of Variables from Cartesian to Polar coordinates – Area - using double integral - Triple integrals - Volume using Triple integrals.

UNIT IV  BETA AND GAMMA FUNCTIONS  
Properties of definite Integrals – Related definite Integrals – Reduction formulae for \( e^{ax}, x^n \sin ax, x^n \cos ax, \sin^mx, \cos^nx \) and \( \sin^m x \cos^n x \). Definitions of Beta and Gamma integrals – Relation between them – Properties – Evaluation of definite integrals in terms of Beta and Gamma function – Simple applications.

UNIT V  VECTOR CALCULUS  
Differentiation of a vector function – Gradient, divergence and curl – Directional derivative – Identities (without proof) - Irrotational and Solenoidal fields, Vector Integration – Line, Surface and Volume Integrals, Integral theorems (without proof), Green’s theorem (in the plane), Gauss divergence theorem and Stoke’s theorem – Simple applications involving rectangles and cuboids.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max Marks : 80  
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks  
20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  
60 marks
APPLIED PHYSICS

(Common for all branches)

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UNIT I  FIBER OPTICS


UNIT II  ACOUSTICS OF BUILDINGS

Introduction – Musical sound & noise - Characteristics of musical sound: pitch, loudness, quality - Weber-Fechner law - Relation between pitch & frequency - Factors on which intensity & loudness depend - Decibel scale - Sound intensity level and sound pressure level - Sound absorption - OWU - Sound absorption coefficient and its measurements - Reverberation - Reverberation time - Standard Reverberation time - Sabine's formula to determine the Reverberation time (Jaeger method) - Factors affecting the acoustics of a building and the remedies - Principles to be followed in the acoustical design of a good auditorium.

UNIT III  FUNDAMENTALS OF DIGITAL ELECTRONICS

Number systems - Binary, decimal, Hexadecimal and Octadecimal - Conversion from one number system to another - Binary addition - Subtraction - BCD-ASCII - Excess 3 code and gray code.

UNIT IV  NANO DEVICES


UNIT V  MEDICAL PHYSICS


TEXT / REFERENCE BOOKS:


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks
20 marks

Out of 20 marks, maximum of 10% problems may be asked

Part B: 2 Questions from each unit with internal choice, each carrying 12 marks
60 marks

‘Applications’ mentioned in the syllabus refer to the basic applications and not to any specific case.
UNIT I FUELS


UNIT II LUBRICANTS AND ADHESIVES


UNIT III PHASE RULE


UNIT IV ALLOYS AND COMPOSITES


Composites: Definition, Constituents: Matrix Phase and Dispersed phase. Types of Composites: Metal matrix composites (MMC), Ceramic matrix composites (CMC), Polymer matrix composites (PMC), Fiber reinforced plastics (FRP), Cermets.

UNIT V INTRODUCTION TO NANOMATERIALS


TEXT / REFERENCE BOOKS:
# Basic Mechanical and Civil Engineering

<table>
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## Basic Mechanical Engineering

### UNIT I Energy Sources and Energy Conversion
- Alternate sources of energy - solar, wind, wave, tidal and geo-thermal.
- Boilers: Classification and principles of modern high pressure steam generators - Layout and working principles of hydraulic (hydel), steam, gas turbine, diesel and nuclear power plants.

### UNIT II Internal Combustion Engines
- Working principle of petrol and diesel engines - Two stroke and four stroke engines - Ignition systems - single jet carburetor-spark plug-cooling systems - lubrication systems - fuel pump and fuel injector.

### UNIT III Manufacturing Processes
- Foundry process and technology: Foundry tools, pattern, moulding process.
- Metal forming processes: Principles of forging, rolling, drawing and extrusion.
- Metal joining process: Principles of welding - fundamentals of arc welding, gas welding and gas cutting - brazing and soldering.
- Metal machining process: Lathe - Specifications - Main components and their functions - Lathe operations.
- Machining Concept - Drilling, Milling, Turning, Grinding and surface Finishing.

## Basic Civil Engineering

### UNIT I Building Materials and Structures
- Construction materials - Physical and Mechanical properties - stone, brick, cement, concrete, bitumen, insulation materials & steel.
- Buildings - various components and their functions. Foundation - functions - classification and suitability.
- Flooring - function - types - cement concrete, tile, marble and granite flooring.
- Masonry - Stone and Brick masonry and construction details.
- Roof - Types - Flat & sloped RCC roof. Introduction to seismic resistant structures.

### UNIT II General Properties of Materials and Building Valuation
- Stress, strain & modulus of elasticity. Simple maintenance methodologies, Valuation - plinth area method - depreciation rate method.

### UNIT III Transportation and Surveying
- Importance of Transport - Roads - Classification of roads - Traffic signs & signals - Surveying - Classification and principles - Applications of Theodolite and Total Station - Measurements of distances - angle - Computation of areas - Trapezoidal and Simpson's rule.

## Text/Reference Books
5. Natarajan K.V., Basic Civil Engineering
7. Venugopal K, Basic Mechanical engineering, Anuradha Publications, Kumbakonam
8. Palani Kumar, K, Basic Mechanical engineering, AirWalk Publications, Chennai-4

## University Exam Question Paper Pattern
- Max. Marks: 80
- Exam Duration: 3 hrs.

### Basic Mechanical
- Part A: 5 questions of 2 marks each - no Choice 10 marks
- Part B: 3 questions from each of the three units of internal choice, each carrying 10 marks 30 marks

### Basic Civil
- Part A: 5 questions of 2 marks each - no Choice 10 marks
- Part B: 3 questions from each of the three units of internal choice, each carrying 10 marks. 30 marks
BASIC ELECTRICAL ENGINEERING

UNIT I D.C.CIRCUITS  
11 hrs.
Electrical quantities, Ohm’s Law, Resistors - Series and parallel combinations, Kirchoff’s laws, Node and Mesh Analysis - Star delta Transformation

UNIT II MAGNETIC CIRCUITS  
8 hrs.
Definition of MMF, Flux and reluctance - Leakage factor - Reluctances in series and parallel (series and parallel magnetic circuits) - Electromagnetic induction - Fleming’s rule - Lenz’s law - Faraday’s laws - statically and dynamically induced EMF - Self and mutual inductance - Energy stored and energy density - Analogy of electric and magnetic circuits

UNIT III A.C.CIRCUITS  
11 hrs.
Sinusoidal functions - RMS(effective) and Average values- Phasor representation - J operator - sinusoidal excitation applied to purely resistive , inductive and capacitive circuits - RL , RC and RLC series and parallel circuits - power and power factor - Three phase circuits - Star / Mesh connections - with balanced loads - measurement of power by two wattmeter method.

TEXT BOOKS:

REFERENCES:

BASIC ELECTRONICS ENGINEERING

UNIT I SEMICONDUCTOR DEVICES AND LOGIC GATES  
10 hrs.
Discrete devices - PN junction diodes - Zener diodes - Tunnel diodes- Thermistors - Bipolar junction transistors - Field effect transistors (FET and MOSFET) - Uni junction transistors - Silicon controlled rectifiers and Triacs. Universal Gates - Half Adder - Full Adder.

UNIT II RECTIFIERS, AMPLIFIERS AND OSCILLATORS  
10 hrs.
Half and full wave rectifiers- Capacitive and inductive filters- ripple factor- PIV-rectification efficiency. CB, CE and CC Configuration - RC coupled amplifier- positive and negative feedback - Barkhausen criterion for oscillations - RC and LC oscillators.

TEXT BOOK/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80
Exam Duration: 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks  
20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  
60 marks
(Distribution may be 70% Theory and 30% Numerical)
UNIT I INTRODUCTION  
Basic Principles: Crystal structures - BCC - FCC - HCP - Methods to determine crystal structure - Atomic radius - APF - Allotropy - Solid solution - Intermetallic compounds

Phase diagrams: Solidification of metals, phase rules, construction of phase diagram, Isomorphous, eutectic diagram showing partial solid solubility, peritectic system. Non-equilibrium cooling of above types of alloys
Equilibrium solid state reactions.

UNIT II FERROUS AND NON-FERROUS ALLOYS  
Fe – Fe₃C diagram, Cooling Curves of pure Fe, Critical points in Fe – Fe₃C equilibrium diagrams, Phase changes. Simple calculation of amount of phases. Plain carbon steels, Effect of alloying elements on steel, Alloy steel,
IS designation of steels - classification of cast iron, Properties and Uses

Composition and uses of important aluminium based alloys, copper based alloys and Nickel based alloys.

UNIT III HEAT TREATMENT OF STEEL  
Non-equilibrium transformation of austenite - Annealing, Normalizing, spheroidizing, TTT diagram. Continuous cooling transformation diagram - Hardening and tempering, martempering, austempering - Hardenability and its determination - Surface hardening processes. Heat treatment of non-ferrous alloys - Age hardening, precipitation hardening

UNIT IV POWDER METALLURGY  

UNIT V MECHANICAL PROPERTIES AND TESTING  
Elastic and plastic deformation of metals - elastic effects - Deformation by slip Tensile test - Stress - strain curve for mild steel & brittle material, determination of yield, ultimate stresses, and percentage elongation - Impact tests. Ductile - Brittle transition - fatigue and creep Stress cycle for fatigue testing, endurance limit. Fatigue limit, S-N Curve, Creep Curve


TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80  
Exam Duration: 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks  
20 marks

Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  
60 marks

B.Tech. (CHEMICAL ENGINEERING)  
REGULATIONS 2010
1. Air wedge - Determination of thickness of a thin wire
3. Spectrometer- Hollow prism - Determination of refractive index of the given liquid
4. Non uniform bending - Determination of Young’s modulus of the material of the beam by Microscopic method.
5. Copper Voltameter - Determination of electrochemical equivalent of copper.
6. Hall effect - Determination of Hall coefficient.

1. Estimation of Glycine by Sorenson's Formal titration method.
2. Determination of Ferric ion by thiocyanate method using Calorimeter.
3. Determination of Chemical oxygen demand in wastewater by dichromate titration method.
4. Estimation of the strength of acid by pH titration.
5. Determination of molecular weight of a polymer by viscosity measurement method.
6. Determination of calorific value of a substance using Bomb calorimeter

CARPENTRY
Handling of carpentry tools, A practice in marking, sawing planning and chiseling to size. Making simple joints such as half-lap, dove-tail and mortise and tenon joints.

Use of modern materials such as plywood, chip board, novapan, laminated sheet (demonstration only).

FITTING
Use of fitting tools-practice in marking, fitting to size and drilling-making of simple mating and profiles such as V, Square, Dove-tail, Half-round joints.

WELDING
i. Electric Arc Welding
   a) Study on Edge preparation techniques for Arc welding
   b) List of Welding Exercises
   ii. Study on gas welding and gas cutting
   iii. Study on TIG & MIG welding

FOUNDERY
i. Sand testing - Grain fineness - Permeability test.
   ii. Study on Pattern Allowances
   iii. Preparation of green sand moulding
   iv. Metal casting technique (Demonstration only)
ENGLISH MATHEMATICS III
(Commom to all branches except Bioinformatics)

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UNIT I LAPLACE TRANSFORM
10 hrs.
Transforms of simple functions – properties of transforms – Transforms of derivatives and Integrals – Periodic functions – Inverse transforms – Convolution theorems – Initial and final value theorems

UNIT II APPLICATIONS OF LAPLACE TRANSFORM
10 hrs.

UNIT III COMPLEX VARIABLES
10 hrs.

UNIT IV COMPLEX INTEGRATION
10 hrs.

UNIT V THEORY OF SAMPLING AND TEST OF HYPOTHESIS
10 hrs.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION TO FUNDAMENTAL CONCEPTS  
Object oriented fundamentals, Structured verses Object oriented development, elements of object oriented 
programming, fundamentals of OOP – class, object, and abstraction and its importance, encapsulation, polymorphism, 
benefits of OOP, structure of C++ program.

UNIT II CLASSES AND OBJECTS  
Working with classes – classes and objects – class specification, class objects, accessing class members, defining 
member functions, inline functions, accessing member functions within class, data hiding, class member accessibility, 
empty classes, constructors, parameterized constructors, constructor overloading, copy constructors, new, delete 
operators, “this” pointer, friend classes and friend functions.

UNIT III OVERLOADING  
Function overloading, operator overloading, overload able operators, unary operator overloading, operator keyword, 
limitations of increment/ decrement operators, binary operator overloading, arithmetic operators, function templates, 
class templates.

UNIT IV INHERITANCE  
Base class and derived class relationship, derived class declaration, forms of inheritance, inheritance and member 
accessibility, constructors in derived class, destructors in derived class, multiple inheritance, multi level inheritance, 
hybrid inheritance, virtual base classes, virtual functions.

UNIT V EXCEPTION HANDLING AND FILES  
Files and streams, opening and closing of files, file modes, file pointers and manipulation, sequential access to 
a file, binary file, random access to a file, error handling during file manipulation, exception handling, exception handling 
model, exception handling constructs, list of exceptions, catching exceptions, handling exceptions.

REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max Marks : 80 
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

Exam Duration : 3 hrs.
UNIT I BASIC CONCEPTS

The terminologies of thermodynamics, the variables and quantities of thermodynamics, categorization of systems and processes. Energy classifications, point and path properties, energy in transition, heat and work, reversible and irreversible processes, phase rule.

UNIT II LAWS OF THERMODYNAMICS

First law and internal energy, statements of first law for the non flow and flow systems, enthalpy and heat capacity limitations of the first law. Zeroth law of thermodynamics, Statements of the second law of thermodynamics, available and unavailable energies, The entropy function, applications of the second law. Third law of thermodynamics.

UNIT III THERMODYNAMIC EQUATIONS OF STATE

The PVT behaviour of fluids, laws of corresponding states and equation of states approaches to the PVT relationships of non ideal gas, problems; compressibility factors, generalized equations of state, property estimation via generalized equation of state.

UNIT IV THERMODYNAMIC FORMULATIONS

Measurable quantities, basic energy relations, Maxwell relations, thermodynamic formulations to calculate enthalpy, internal energy and entropy as function of pressure and temperature, other formulations involving Cp and Cv, complex thermodynamic formulations, thermodynamic properties of an ideal gas, entropy change in reversible and irreversible process.

UNIT V COMPRESSION OF FLUIDS

Thermodynamic aspects of compression process, classification of compression processes, basic equation for change of state of gases, the work expression for different situations, the effect of clearance volume, multistage compression, convergent divergent flow, Ejectors.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks : 80
Exam Duration : 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks 20 marks

Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
SCHX1003 FLUID MECHANICS

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(All Tables/Data Books / Graph Sheets must be allowed in the Exam).

UNIT I FLUID FLOW PHENOMENA

Nature of fluids: incompressible and compressible, hydrostatic equilibrium, manometers, potential flow, boundary layer, the velocity field, laminar flow, Newtonian and non-Newtonian fluids, Newton's-law of viscosity, turbulence, Reynolds number and transition from laminar to turbulent flow, Eddy viscosity, flow in boundary layers, laminar and turbulent flow in boundary layers, boundary-layer formation in straight tubes.

UNIT II KINEMATICS OF FLUID FLOW

Streamlines and stream tubes, equation of continuity, Bernoulli equation, pump work in Bernoulli equation. Flow of incompressible fluids in conduits and thin layers: friction factor, relationships between skin-friction parameters, average velocity for laminar flow of Newtonian fluids, Hagen-Poiseuille equation, hydraulically smooth pipe, von Karman equation, roughness parameter, friction-factor chart, equivalent diameter, form friction losses in Bernoulli equation, couette flow.

UNIT III FLOW PAST IMMERSED BODIES

Drag, drag coefficients, drag coefficients of typical shapes, Ergun equation, terminal settling velocity, free and hindered settlings, Stokes' law, Newton's law, criterion for settling regime, fluidization, conditions for fluidization, minimum fluidization velocity.

UNIT IV TRANSPORTATION OF FLUIDS AND DIMENSIONAL ANALYSIS

Introduction to: pipe and tubing, joint and fittings, stuffing boxes, mechanical seals, gate valves and globe valves, plug cocks and ball valves, check valves.-Classification and selection of pumps, blowers and compressors. -Pumps: developed head, power requirement, suction lift and cavitation, NPSH, constructional features and working principle of single suction volute centrifugal pump, characteristic curves of a centrifugal pump, Dimensional analysis.

UNIT V METERING OF FLUIDS

Constructional features and working principles of: Venturi meter, orifice meter, Rotameter, Pitot tube, Target meter, Vortex-shedding meter, Turbine meter, Magnetic meter.-Application of Bernoulli equation to venturi meter and orifice meter, flow rate calculations from the readings of venture meter, orifice meter and pitot tube.

TEXT / REFERENCE BOOKS:


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks : 80 Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION
Units and Dimensions, Basic and derived units, use of model units in calculations, Methods of expressing compositions of mixture and solutions. Gas Calculations: Ideal and real gas laws - Gas constant - calculations of pressure, volume and temperature using ideal gas law. Use of partial pressure and pure component volume in gas calculations, applications of real gas relationship in gas calculation.

UNIT II MATERIAL BALANCE
Stoichiometric principles, Application of material balance to unit operations like distillation, evaporation, crystallization, drying etc., - Material balance with chemical reaction - Limiting and excess reactants - recycle - bypass and purging - Unsteady state material balance.

UNIT III HUMIDITY AND SATURATION
Calculation of absolute humidity, molal humidity, relative humidity and percentage humidity - Use of humidity in condensation and drying - Humidity chart, dew point.

UNIT IV FUELS AND COMBUSTION
Determination of Composition by Orsat analysis of products of combustion of solid, liquid and gaseous fuels - Calculation of excess air from orsat technique, problems on sulphur and sulphur containing compounds.

UNIT V ENERGY BALANCE
Heat capacity of solids, liquids and gases, mean heat capacity, sensible heat and latent heat, evaluation of enthalpy, Standard heat of reaction, heat of formation, combustion, solution, mixing etc., calculation of standard heat of reaction - Effect of pressure and temperature on heat of reaction - Energy balance for systems with and without chemical reaction. – Unsteady state energy balances.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks : 80 Exam Duration : 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks 20 marks

Part B: 100% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION
Stress and strain – Application to uniform and varying, Composite sections – Elastic constants, Stress – Strain diagram for brittle and ductile materials, Definition of creep, fatigue, Thermal stresses

UNIT II BENDING MOMENT AND SHEAR FORCE
Types of Beams, Supports and Loads – Concept and significance of shear force and bending moment – Shear force and Bending moment diagram for cantilever, simply supported and overhanging beams.

UNIT III BENDING AND SHEAR STRESS DISTRIBUTION, TORSION
Stresses in Beams – Simple bending theory – Composite Beams – Combined bending and Direct stress – Shear stress distribution for Rectangular and I section – Simple Torsion theory – Stresses and deformations in Solid and Hollow circular shafts

UNIT IV SLOPE AND DEFLECTION OF BEAMS
Double integration method – Macaulay’s method – Moment area method – Conjugate method for simply supported and cantilever beams, (only point loads & Uniformly distributed loads.)

UNIT V THIN CYLINDERS AND SPHERES, THICK CYLINDERS
Stresses and deformation in thin cylinders and spherical shells subjected to internal pressure, Thick cylinders – Hoop and radial stress variation, Lame’s equation, Compound cylinders – Shrink fit

TEXT BOOKS:

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 100% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION - CHLORO ALKALI INDUSTRIES 10 hrs.

Introduction - Basic principles of unit operations and unit process to common devices used in manufacturing processes like Reactors, Steam jet ejectors, Pumps, Thickeners, Dryers, Electrostatic precipitators, Condenser, Vacuum evaporator in block diagram - Standard symbols used for such devices, Process flow sheet. manufacturing of soda ash, caustic soda and chlorine - manufacture of bleaching powder, calcium hypochlorite, sodium hypochlorite and sodium chlorite.

UNIT II HEAVY CHEMICALS 10 hrs.

Manufacture of Sulphur, Hydrochloric Acid and Miscellaneous Inorganic Chemical - Mining and production of Sulphur - Manufacture of Sulphur Trioxide and Sulphuric Acid - Manufacture of Hydrochloric acid - Manufacture of alum, Copper Sulphate, Sodium Dichromate, Hydrogen Peroxide, Aluminium Chloride.

UNIT III CEMENT AND GLASS 10 hrs.


UNIT IV INDUSTRIALS GASES AND PAINTS 10 hrs.


UNIT V FERTILIZER INDUSTRIES 10 hrs.


Potassium Industries: Potassium Chloride and Potassium Sulphate

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
### SMEX4007  MECHANICAL ENGINEERING LAB

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1. Valve timing diagram in Diesel engine  
2. Port timing diagram in Diesel engine  
3. Viscosity Index, Flash and Fire point of Lubricant  
4. Volumetric efficiency on two stage reciprocating compressor  
5. Test on air conditioning system  
6. Performance test on Diesel engine  
7. Load test on diesel alternator set  
8. Heat balance on diesel engine  
9. Mechanical load test on petrol engine  
10. Morse test on multi cylinder petrol engine  
11. COP in compression refrigeration cycle  
12. Study Of Steam Power Plant

### SCSX4009  OBJECT ORIENTED PROGRAMMING LAB

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1. Write C++ program to calculate final velocity using the formula: \( v = u + a \times t \), with initial velocity, acceleration and time as input.  
2. Write C++ program to find the area of square, rectangle, circle using function overloading concept.  
3. Write C++ program to change the sign of an operands using unary operator overloading concept.  
4. Write C++ program to add two complex numbers using binary operator overloading concept.  
5. Write C++ program to find mean value of two integers using friend function concept.  
6. Write C++ program to multiple and divide two different data type using inline function concept.  
7. Implement parametrized constructor, default constructor, copy constructor and destructor  
8. Write C++ program to enter the sale value and print the agent’s commission using single inheritance.  
9. Write C++ program to enter salary and output income tax and net salary using multiple inheritance concept.  
10. Write C++ program to enter the unit reading and output the customer’s telephone bill using hierarchical inheritance.  
11. Write C++ program to find the grade of the students based on academic marks and sports using multilevel inheritance.  
12. Write a program having student as an abstract class and create many derived classes such as Engineering, Medical etc from student’s class. Create their objects and process them.  
13. Write C++ program to count the words and characters in given text using virtual function.  
14. Write C++ program to calculate net pay of employee using virtual base class concept.  
15. Write C++ program to calculate division of two number with a try block to detect and throw an exception if the condition “divide by-zero” occurs.  
16. Write C++ program to merge two files into one single file  
17. Write C++ program to swap two values using function templates  
18. Write C++ program to sort the numbers using class templates
UNIT I PARTIAL DIFFERENTIAL EQUATION
Formulation of equations by elimination of arbitrary constants and arbitrary functions-solutions by equations-general, particular and complete integrals-Lagrange’s linear equation-standard type of first order equation-second and higher order equations with constant coefficients-homogenous equations.

UNIT II FOURIER SERIES
Euler’s formula-Dirichlets conditions-convergence statement only-change of interval-odd and even functions-half range series-RMS value-Parseval’s formula-complex form of Fourier series-harmonic analysis.

UNIT III WAVE AND HEAT EQUATION
One dimensional wave equation-Transverse vibration of finite elastic string with fixed ends-boundary and initial value problems-Fourier series solution-Derivation of one dimensional heat equation-steady and unsteady state-boundary and initial value problems-Fourier series solutions. Two dimensional heat equation-steady state heat flow in two dimensions-Laplace equation in Cartesian coordinates - Fourier series solution.

UNIT IV FOURIER TRANSFORM
The infinite Fourier transform-sine and cosine transform-Properties-Inversion theorem-Finite Fourier transform-sine and cosine transform-Convolution theorem-Parseval’s identity.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I PHASE RULE AND SOLUTIONS 10 hrs.

Phase rule - Definition of terms - Derivation of phase rule - One component system - Water and Sulphur - Two component systems - Eutectic and compound formation - Simple three component systems


UNIT II REACTION KINETICS AND CATALYSIS 10 hrs.


UNIT III ADSORPTION AND COLLOIDS 10 hrs.

Physical and Chemical adsorption - Types of Adsorption isotherms(qualitative treatment only) - Surface area of solids, BET method,. Introduction to Colloids (Preparation details not required) Electro Kinetic Phenomena - Donnan membrane equilibrium - Thixotropy and Colloidal Electrolytes.

UNIT IV ELECTRICAL CONDUCTANCE 10 hrs.

Electrolytes - Types - strong electrolytes and weak electrolytes - Arrhenius theory. Debye - Huckell Onsager theory; Ostwald’s dilution law - solubility of electrolytes and solubility product - common ion effect - acids, bases – definitions- dissociation constant, amphoteric electrolyte - pH - Buffer solutions

UNIT V ELECTRODE POTENTIAL 10 hrs.

Electrode potential - hydrogen electrode, reference electrodes, electrochemical series, faraday’s laws of electrolysis. Decomposition potential, over voltage, definitions of current density, current concentration, current efficiency, energy consumption, electrical conductance, specific conductance and its determination -equivalent conductance, oxidation - reduction redox couple; e.m.f and energy relations. Conductometry, Potentiometry.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 30% Problems
2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I PROPERTIES OF SOLUTIONS 10 hrs.
Partial molar properties, ideal and non-ideal solutions, standard states definition and choice, Gibbs-Duhem equation, excess properties of mixtures. fugacity and fugacity coefficient.

UNIT II PHASE EQUILIBRIA 10 hrs.
Criteria for equilibrium between phases in multi component non-reacting systems in terms of chemical potential and fugacity, application of phase rule, vapour-liquid equilibrium, phase diagrams for homogeneous systems and for systems with a miscibility gap, effect of temperature and pressure on azeotrope composition, liquid-liquid equilibrium, ternary liquid-liquid equilibrium.

UNIT III CORRELATION AND PREDICTION OF PHASE EQUILIBRIA 10 hrs.
Activity and Activity coefficient, Excess Gibbs free energy model, thermodynamic consistency of phase equilibria, application of the correlation and prediction of phase equilibria in distillation process, Bubble point and Dew point calculation.

UNIT IV CHEMICAL REACTION EQUILIBRIA 10 hrs.
Definition of standard state, standard free energy change and reaction equilibrium constant, evaluation of reaction equilibrium constant, prediction of free energy data, equilibria in chemical reactions, calculation of equilibrium compositions for homogeneous chemical reactions, thermodynamic analysis of simultaneous reactions.

UNIT V REFRIGERATION 10 hrs.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks : 80 Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I PULP, PAPER AND SUGAR  
10 hrs.

UNIT II FERMENTATION, OILS AND FATS  
10 hrs.
Fermentation processes for the manufacture of ethyl alcohol, citric acid and antibiotics. Refining of Edible oils and Fats. Manufacture of Soaps and Detergents.

UNIT III PETROLEUM AND PETRO CHEMICALS  
10 hrs.
Introduction to petrochemicals - Petroleum refining processes - Cracking, Reforming processes - Processes for the manufacture of petro-products - Ethylene, propylene, xylene, benzene, toluene, butadiene, Synthesis gas - Gasification of coal and coal chemicals.

UNIT IV PLASTICS, RUBBER AND LEATHER  
10 hrs.
Raw materials, Classification of polymers, synthetic polymers – Polyethylene, polypropylene, PVC, Polystyrene, ABS, Teflon, formaldehyde and epoxy resins. Rubber - Natural rubber, synthetic rubber, SBR, polybutadiene, Poly isoprene, poly chloroprene, acrylic and silicone rubber, compounding of rubber. Leather tanning and finishing.

UNIT V SYNTHETIC FIBRE, DYES AND INTERMEDIATES  
10 hrs.
Viscose rayon, cuprammonium and cellulose acetate, nylons, polyesters, acrylics, mono acrylic polypropylene, Dyes and intermediates.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks : 80  
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks  
20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  
60 marks
UNIT I PARTICLE CHARACTERISTICS AND SIZE ANALYSIS

Particulate solids particle shape, size, mixed particle sizes and size analysis - cumulative and differential analysis - various mean diameters - screen analysis, standard screens - types of screen, BSS, Tyler, ISS - calculations of efficiency of screen - various industrial screen - particle separation not involving fluid mechanics - electrostatic precipitation and magnetic separation, jig - ramed tables, storage of solids - flow of solids - conveying of solids.

UNIT II SIZE REDUCTION


UNIT III MECHANICAL SEPARATIONS


UNIT IV FILTRATION

Filtration Equipment - Sand Filters - Filter presses - Leaf Filter - Rotary continuous Filters - Filter Media - Filter Aids - Principles of Cake Filtration - pressure drop through Filter Cake - Compressible and Incompressible Filter Cakes - Specific Cake resistance - Filter Medium Resistance Constant pressure Filtration - Continuous Filtration - Constant Rate Filtration - Clarifying filters - Liquid clarification - Gas cleaning - Principles of clarification - cross flow filtration.

UNIT V AGITATION AND MIXING


TEXT / REFERENCE BOOKS:


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
## UNIT I INTRODUCTION TO SPECTROSCOPICAL METHODS OF ANALYSIS
10 hrs.

Electromagnetic Radiation: Various ranges, Dual Properties, Various energy levels, Interaction of photons with matter, absorbance, & transmittance and their relationship. Permitted energy levels for the electrons of an atom and simple molecules, Classification of instrumental methods based on physical properties.

Quantitative Spectroscopy: Beer-Lambert’s law, Limitations, Deviations (Real, Chemical Instrumental). Nephelometry, Duboscq colorimetry, Estimation of inorganic ions such as Fe, Ni using Beer-Lambert’s Law.

## UNIT II MOLECULAR SPECTROSCOPY
10 hrs.

Various electronic transitions in organic and inorganic compounds effected by UV, Visible and infra red radiations, Various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Woodward-Fischer rules for the calculation of absorption maxima (dienes and carbonyl compounds) Effects of auxochromes and effects of conjugation on the absorption maxima, Instrumentation for UV, Visible and IR spectroscopies (source, Optical parts and Detectors), Multi component analysis, Photometric titration (Experimental set-up and various types of titrations), Applications of UV, Visible and IR spectroscopy.

## UNIT III ATOMIC SPECTROSCOPY
10 hrs.


## UNIT IV ELECTROMETRIC METHODS OF ANALYSIS
10 hrs.

Introduction of electrometric methods, difference between redox and acid- base reactions, types of cells, schematic representation of cell, single electrode potential, laboratory reference electrodes (Standard hydrogen, saturated calomel, Ag -AgCl and inert electrodes), ion-selective electrodes.

Potentiometry: Nemst equation, experimental set-up and measurement of pH; Conductometry- Measurement of conductance, experimental set-up and various conductometric titrations.

## UNIT V CHROMATOGRAPHIC METHODS
10 hrs.

Basic principles of chromatography, Classification of chromatographic methods, Column, Thin layer, Paper, Gas, High Performance Liquid Chromatography (Principle, mode of separation and Technique). Separation of organic compounds by column and Thin layer, mixture of Cu, Co and Ni by Paper, separation of amino acids by paper, estimation of organic compounds by GC and, HPLC.

## TEXT / REFERENCE BOOKS:

## UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks : 80

| Part A | 2 Questions from each unit, each carrying 2 marks | 20 marks |
| Part B | 2 Questions from each unit with internal choice, each carrying 12 marks | 60 marks |

Exam Duration : 3 hrs.
1. Determination of Eutectic temperature and composition of a simple Eutectic system.
2. Determination of critical solution temperature of phenol-water system.
3. Determination of molecular weight by Rast's method.
4. Determination of partition coefficient of iodine between two immiscible solvents.
5. Determination of cell constant & to verify Ostwald’s dilution law.
6. Determination of Hardness of water for the given sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of Saponification value of oil.
10. Determination of MnO₂ in the given ore.

1. Flow through Venturimeter
2. Flow through Orifice meter
3. Flow through Pitot tube
4. Characteristics of a Reciprocating pump
5. Characteristics of a Centrifugal pump
6. Characteristics of a Jet pump
7. Characteristics of a Gear pump
8. Pipe friction calculation
9. Flow through packed bed
10. Flow through Fluidization
11. Flow through helical coil
12. Flow through annular pipe/ non circular conduits
13. Flow through Weirs and Notches
SMTX1011
APPLIED NUMERICAL METHODS
(Common to Mech, M & P, Aero, Auto, Civil, Chem, E&I, ECE, EEE, E&C and ETCE)

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UNIT I CURVE FITTING AND RELATION BETWEEN OPERATORS 10 hrs.

UNIT II INTERPOLATION 10 hrs.

UNIT III ALGEBRAIC AND TRANSCENDENTAL EQUATIONS 10 hrs.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 10 hrs.

UNIT V PARTIAL DIFFERENTIAL EQUATIONS 10 hrs.
Numerical solution to Partial Differential Equations - Classification - Elliptic equations - Poisson’s equations - Leibmann’s iteration procedure - Parabolic equation - Bender Schmidt Scheme - Crank Nicholson’s Scheme - Hyperbolic equations.

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

SATHYABAMA UNIVERSITY
FACULTY OF CHEMICAL ENGINEERING
B.Tech. (CHEMICAL ENGINEERING)
REGULATIONS 2010
UNIT I DIFFUSION

UNIT II MASS TRANSFER CO-EFFICIENT AND OPERATIONS
Concept of mass transfer co-efficient – Mass transfer under laminar and turbulent flow past the solids – Boundary layers- Correlation of mass transfer co-efficient – Analogies between momentum, heat and mass transfer – Theories of mass transfer and their application – Interphase and overall mass transfer co-efficient in binary systems. - $j_d$ factor.

Material balances on batch, co-current and counter-current staged operations, Equipments for gas liquid operations.

UNIT III HUMIDIFICATION
Basic concepts – construction of psychometric charts – Methods of humidification and dehumidification operations: Design calculation – Cooling towers principle and operation, equipments.

UNIT IV DRYING

UNIT V CRYSTALLIZATION
Theory of Crystallization - Factors governing nucleation and crystal growth - Growth coefficient, Classification of Crystallization and Applications – Batch and Continuous Industrial Crystallizer- equipments.

TEXT/REFERENCE BOOKS:

UNIVERISTY EXAM QUESTION PAPER PATTERN
Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I BASICS OF REACTOR DESIGN  
Definition of reaction rate, different ways of expressing reaction rate, Molecularity and order of reaction, elementary and non elementary reactions, single and multiple reactions. Temperature dependency of reaction rate, Arrhenius theory, Collision theory, Transition state theory. Mechanism of chemical reactions. Concentration dependent term of rate equation. Interpretation of batch reactor data. Constant and variable volume reactions. Conversion from total pressure data. Methods of determining the order of a reaction, Integral and Differential methods, methods of isolation, initial rates, excess. Autocatalytic reactions, Runaway reactions.

UNIT II REACTOR DESIGN FOR SINGLE REACTIONS  

UNIT III DESIGN OF MULTIPLE REACTORS FOR SINGLE REACTIONS  
Charts comparing the sizes of single PFR and CSTR's for various orders of reaction - calculating conversion from these charts. Multiple reactor systems for single reaction – PFR's in series and parallel; CSTR's in series and parallel. Material balance and design equations for multiple reactions. Graphical method for finding number of CSTR's. Charts for comparison of sizes of multiple CSTR's and PFR and calculating conversions.

UNIT IV DESIGN OF SINGLE AND MULTIPLE REACTORS FOR MULTIPLE REACTIONS  
Multiple reactions – Series, Parallel and Series-Parallel. Qualitative and Quantitative treatment of series and parallel reactions. Definitions of Instantaneous and Overall fractional yields and selectivity. Design of single multiple reactors for multiple reactions.

UNIT V NON-ISOTHERMAL REACTOR DESIGN  
Isothermal and Non isothermal reactor systems. Single reactions – Irreversible and reversible reaction, Temperature and Pressure effects – Information from thermodynamics. Equilibrium flow reactor design, adiabatic temperature and equilibrium conversion, optimum temperature progression.

TEXT/REFERENCE BOOKS:

UNIVERISTY EXAM QUESTION PAPER PATTERN

Max.Marks : 80  
Exam Duration : 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks 20 marks

Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

B.Tech. (CHEMICAL ENGINEERING) 34 REGULATIONS 2010
UNIT I WATER


UNIT II COMPRESSORS AND VACUUM PUMPS


UNIT III REFRIGERATION

Refrigeration Systems and their Characteristics, Evaporative refrigeration, Vapour refrigeration system, steam jet refrigeration, thermoelectric cooling, simple vapour compression refrigeration system - production of cryogenic temperatures

UNIT IV AIR CONDITIONING AND VENTILATION

Classification factors affecting air conditioning systems, comfort air – conditioning system, characteristics of Air water systems - Transport air conditioning, evaporative condensers, cooling towers, heat pumps, Humidification and Dehumidification Equipments – Air Blowing – Exhaust Ventilation

UNIT V STEAM

Steam generation in Chemical Process Plants - Properties of Steam - Boilers and Power Generation Equipments - Steam Engines and Turbines - Steam Handling and Distribution – Steam traps and Steam Economy.


TEXT/REFERENCE BOOKS:

UNIVERISTY EXAM QUESTION PAPER PATTERN

Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
<table>
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<tr>
<th>UNIT I INTRODUCTION TO BASIC HEAT TRANSFER</th>
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<th>UNIT II CONDUCTION AND CONVECTION</th>
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<th>UNIT III HEAT EXCHANGERS</th>
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<th>UNIT IV RADIATION</th>
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<th>UNIT V EVAPORATION</th>
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**TEXT/REFERENCE BOOKS:**

**UNIVERISTY EXAM QUESTION PAPER PATTERN**

Max. Marks : 80
Exam Duration : 3 hrs.

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<th>Part A: 2 Questions from each unit, each carrying 2 marks</th>
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<tr>
<td>Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks</td>
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B.Tech. (CHEMICAL ENGINEERING) 36 REGULATIONS 2010
UNIT I FASTENERS  
10 hrs.
Design and drawing considerations of bolt, nut and screws, welded and riveted joints, flanged joints, nozzles and reinforcements. Pipe fittings.

UNIT II FLOW METERS AND SUPPORTS  
10 hrs.
Fundamental principles, equations, general design and drawing considerations of flow meters, and vessel supports such as bracket, saddle, skirt, etc.

UNIT III PRESSURE VESSELS  
10 hrs.
Fundamental principles, equations, general design and drawing considerations of vessels subjected to internal pressure, vessel subjected to external pressure. High pressure vessels. Storage tanks.

UNIT IV UNIT OPERATION EQUIPMENTS  
10 hrs.
Fundamental principles, equations, general design and drawing considerations of cyclones, centrifuges, thickeners and filtration equipments.

UNIT V MIXING EQUIPMENTS  
10 hrs.
Fundamental principles, equations, general design and drawing considerations of agitated vessel, jacketed and coil-heated vessels.

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks : 80 Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INSTRUMENTATION


UNIT II BASIC CONCEPTS OF PROCESS CONTROL

Response of first order systems Examples of first order systems Process Dynamics of linear open systems Second order and first order systems in series Higher order systems Transfer Function Step, Ramp, Pulse and Sinusoidal inputs, Linearization

UNIT III LINEAR CLOSED LOOP SYSTEMS

Development of a block diagram, Controllers and Final control element Closed loop control systems. Block Diagram for feed back control systems, Servo and Regulator problems. Principles of Pneumatic and Electronic controllers Transportation Lag Transient response of closed loop control systems Control valve PI, P, PID control.

UNIT IV STABILITY ANALYSIS


UNIT V CONTROL VALVES, DYNAMICS AND MICROPROCESSOR

Control valves, Valve sizing Characteristics Control valve construction Valve positioning Power unit Transducers Electric to Pneumatic and pneumatic to electric types Transfer function matrix Dead time compensation Step testing Frequency testing Pulse testing.

Dynamics and control of chemical reactors Heat exchangers and Distillation columns Analog and digital computer applications Microprocessors and computer control of chemical processes. Introduction to advanced control systems

TEXT/REFERENCE BOOKS:


UNIVERISTY EXAM QUESTION PAPER PATTERN

Max. Marks : 80
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 50% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

Exam Duration : 3 hrs.

B.Tech. (CHEMICAL ENGINEERING) 38 REGULATIONS 2010
**MECHANICAL OPERATIONS LAB**

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1. Particle size distribution - differential and cumulative analysis by manual method using standard screens
2. Determination of Screen Effectiveness by Mechanical Method using Standard screens
3. Energy requirement and crushing constants determination using:
   - Jaw Crusher
   - Ball mill
   - Drop weight crusher
4. Determination of filtration constants at constant pressure conditions using:
   - Plate and Frame Press
   - Vacuum Leaf Filter
5. Minimum thickener area calculations performing Batch Sedimentation test
6. Calculation of Angle of nip – Roll Crusher
7. Calculation of Critical Speed of impeller – Agitated Vessels
8. Minimum particle size determination for treating dust laden air – Cyclone Separator

**PROCESS DYNAMICS AND CONTROL LAB**

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1. ON-OFF control of thermal process
2. Simulation of Proportional Controller
3. Flow control loop and Flow Transmitter
4. Level Control loop and Level Transmitter
5. Pressure control loop and Pressure Transmitter
6. Control valve characteristics
7. Verifying the inherent characteristics of control valve
8. Flow co-efficient of control valve
9. Range ability of control valve
10. Verifying the response of Non-Interacting level system
11. Verifying the response of Interacting level system
12. Effect of PI controller on flow control system
13. The effect of a P controller on level process for set point and load changes
14. Effect of P, PI, PID Controller on Pressure Control Loop
15. Optimum Controller Setting using Ziegler Nichols Method
16. Optimum Controller Tuning on Level Process Station
UNIT I INTRODUCTION AND LINEAR PROGRAMMING 10 hrs.
Operations Research (OR) - Nature - Characteristics - Phases. - Role of OR in Decision making - Outline of OR Models
Linear Programming – Formulation of L.P. problems – Solution by graphical method, simplex method, and big M methods
– Applications of O.R. in production management

UNIT II TRANSPORTATION AND ASSIGNMENT MODEL 10 hrs.
Transportation problem – Initial feasible solution - Northwest corner method, Least Cost method, Vogel’s
approximation method – Test for optimality - MODI method

Assignment problems- Hungarian assignment models - Travelling salesman problems

UNIT III RESOURCE SCHEDULING AND NETWORK ANALYSIS 10 hrs.
Problem of Sequencing – Problem with N jobs and 2 machines, 3 jobs and M machines. Project Management
– Basic concepts – Case studies – Network construction and scheduling, Program evaluation and resource leveling
by network techniques, time – Cost trade off.

UNIT IV INVENTORY CONTROL AND SIMULATION 10 hrs.
Inventory Control – Various Types of inventory models – deterministic inventory models – Production model,
Purchase model – with and without shortage- EOQ – Buffer stock – Shortage quantity, Probabilistic inventory models
– Quantity Discount and Price Breaks Simulation – Use, advantages & limitations, Monte Carlo simulation, application
to queuing, inventory & other problems

UNIT V QUEUEING THEORY, GAME THEORY AND REPLACEMENT MODELS 10 hrs.
Queueing theory – Poisson arrivals and exponential service times, Single channel models only. Game theory-Pay
off matrix, competitive games with pure strategy, minimax criterion, principles of dominance & mixed strategies
Replacement policy for items whose maintenance cost increases with time- Consideration of money value - Replacement
policy- Individual, Group replacement of items that fail completely

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max Marks : 80  
Exam Duration : 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks  
20 marks

Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  
60 marks
UNIT I DISTILLATION
Vapor liquid equilibria, Raoult's law and deviations from ideality, Methods of distillation Batch, Continuous, Flash, steam, vacuum. McCabe Thiele method Ponchon Savarit method, Azeotropic, Extractive and Molecular distillation.

UNIT II ABSORPTION
Equilibrium and operating line concept in absorption calculations, Calculation of NTU, HTU, Number of stages, Packed and plate type absorbers. Absorption with chemical reaction, HETP Operating characteristics of stage wise and differential contactors.

UNIT III LIQUID – LIQUID EXTRACTION AND LEACHING
Equilibrium in ternary systems, Stage wise contact equipments, Calculations for batch and continuous extractors Calculation of number of stages, Equipments.

UNIT IV ADSORPTION
Types of adsorption Nature of adsorption, Theories of adsorption, Adsorption isotherms, Operation of adsorption columns, Batch and continuous operations, Equipments.

UNIT V MISCELLANEOUS SEPARATION PROCESSES
Solid and liquid membranes, Concept of Osmosis, reverse osmosis, Dialysis, Foam Separation, Thermal and Sweep diffusion process, Ion Exchange, Zone Refining.

TEXT/REFERENCE BOOKS:

UNIVERISTY EXAM QUESTION PAPER PATTERN
Max. Marks : 80
Exam Duration : 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks
20 marks

Part B: 70% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks
60 marks
UNIT I NON - IDEAL REACTOR DESIGN  
Non ideal reactors, residence time distribution studies, stimulus response techniques, Pulse and step input, other types of inputs, definition of C, E and F curves and relationship between the curves. Developing RTD equation for CSTR, PFR, CSTR. Macromixing and Micromixing data. Zero parameter model – complete segregation model. One parameter model. Tanks in series and dispersion modes. Equations for no. of tanks in series and conversion using these two models (for first order reactions). Definition of vessel dispersion number and Peclet number.

UNIT II NON-CATALYTIC REACTIONS  

UNIT III CATALYSIS AND CATALYTIC REACTIONS  
Introduction to catalysis, general properties of homogeneous, steps in a catalytic reaction, adsorption, surface reaction and description as rate limiting steps, physisorption and chemisorption, adsorption isotherm, unimolecular and bimolecular surface reactions, applications of adsorption, B.E.T. theory of multilayer adsorption, synthesizing a rate law mechanism and rate limiting step, preparation and evaluation of industrial catalysts.

UNIT IV DESIGN OF HETEROGENEOUS CATALYTIC REACTORS  
Rate equation for heterogeneous catalytic system, film resistance, surface reaction and pore diffusion as the controlling steps, internal effectiveness factor of a porous catalyst pellet, overall effectiveness factor, mass transfer and reaction in a packed bed, experimental methods for finding rates – design and comparison of experimental heterogeneous reactors.

UNIT V CATALYST DEACTIVATION  
Catalytic poisoning, mechanism of catalyst deactivation, the rate equation, regeneration of catalyst. Multiphase reactors – slurry, fluidized and packed bed and some important examples of industrial reactors.

TEXT/REFERENCE BOOKS:

UNIVERISTY EXAM QUESTION PAPER PATTERN
Max. Marks : 80                      Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I REACTORS
   Fundamental principles, equations, general design and drawing considerations of Reactors.

UNIT II DRIERS AND CRYSTALLIZERS
   Fundamental principles, equations, general design and drawing considerations of cooling towers, driers and crystallizers.

UNIT III HEAT EXANGERS AND EVAPORATORS
   Fundamental principles, equations, general design and drawing considerations of heat exchangers, condensers, reboilers and evaporators.

UNIT IV DISTILLATION COLUMNS
   Fundamental principles, equations, general design and drawing considerations of distillation columns - plate and packed.

UNIT V ABSORPTION AND ADSORPTION
   Fundamental principles, equations, general design and drawing considerations of equipments for adsorption and absorption.

TEXT/REFERENCE BOOKS:

UNIVERSTY EXAM QUESTION PAPER PATTERN
Max. Marks : 80
Exam Duration : 3 hrs.

Part A: 2 Questions from each unit, each carrying 2 marks 20 marks

Part B: 80% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
1. To measure the emissivity of the test plate and plot a graph between emissivity and temperature.

2. To determine the thermal conductivity of metal rod. (Brass rod)

3. To determine the thermal conductivity of hylem, wood, and asbestos.

4. To find the thermal conductivity of the given insulated material by using lagged pipe.

5. To determine the temperature distribution for a cylinder due to heat transfer by natural convection.

6. To study and compare temperature distribution, heat transfer rate, overall heat transfer co-efficient in parallel flow heat exchanger.

7. To study and compare temperature distribution, heat transfer rate, overall heat transfer co-efficient in counter flow heat exchanger.

1. Study the drying characteristics of calcium carbonate and find the critical moisture content and equilibrium moisture content of the sample.

2. Determine the diffusivity coefficient for the acetone - air system.

3. Verify Rayleigh’s equation for the given acetone - water system by simple distillation.

4. Conduct a batch leaching test to leach out sodium carbonate from the mixture given and hence find out the percentage of sodium carbonate leached out.

5. Verify Freundlich equation for the adsorption of oxalic acid onto activated carbon.

6. Determine the liquid - liquid equilibrium of the system (Benzene - acetic acid - Water) and hence draw the ternary graph for the system.

7. Determine the HETP of the packed column by Fenske’s method.
UNIT I MANAGEMENT FUNCTIONS & STRUCTURE 10 hrs.

UNIT II MANAGEMENT OF ORGANISATION 10 hrs.

UNIT III ORGANISATIONAL BEHAVIOUR 10 hrs.

UNIT IV GROUP DYNAMICS 10 hrs.

UNIT V PROFESSIONAL ETHICS 10 hrs.

TEXT / REFERENCE BOOKS

UNIVERSITY EXAM QUESTION PAPER Pattern
Max Marks : 80  Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks  20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  60 marks
UNIT I MICROBIOLOGY
Types of Microorganism: Structure and function of microbial cells. Fundamentals of microbial growth, batch and continuous culture.

UNIT II ENZYME AND ENZYME KINETICS

UNIT III FERMENTATION AND KINETICS
Fermentation – Types of mechanisms, Continuous fermentation aeration and agitation, kinetics of fermentation Processes

Immobilization: Cell and enzyme immobilization

UNIT IV DESIGN OF BIOREACTOR
Introduction of Bioreactor design: Continuously stirred aerated tank bioreactors. Mixing power correlation. Determination of volumetric mass transfer rate of oxygen from air bubbles and effect of mechanical mixing and aeration on oxygen transfer rate, heat transfer and power

UNIT V INDUSTRIAL BIOREACTORS
Industrial Bioreactors Utilizing Isolated enzymes and biosensors development and applications.

Design of reactor, Batch and continuous type; analysis for immobilized enzyme reactors. Sterile and non sterile operations; reactors in series with and without recycle.

TEXT/REFERENCE BOOKS:

UNIVERISTY EXAM QUESTION PAPER PATTERN
Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 30% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

B.Tech. (CHEMICAL ENGINEERING) 46
REGULATIONS 2010
UNIT I FUNDAMENTALS OF TRANSPORT PHENOMENA

Newton’s law, Non-Newtonian fluids, pressure and temperature dependence of viscosity theory of viscosity of liquids, Shell Momentum balances, flow of falling film, flow through a circular tube, flow through an annulus, adjacent flow of two immiscible fluids The equation of Continuity, The equation of Motion, use of the Equations of Change to set up steady flow problems

UNIT II TEMPERATURE DISTRIBUTION


UNIT III CONCENTRATION DISTRIBUTION

Definitions of concentrations, velocities and mass fluxes, relations among the molar fluxes, Fick’s law of Diffusion, Temperature and Pressure Dependence of Mass Diffusivity, Theory of ordinary diffusion in gases at a low density, theories of ordinary diffusion in liquids, Shell mass balances, Diffusion through a stagnant gas film, Diffusion with heterogeneous chemical reaction, Diffusion with homogeneous chemical reaction, Diffusion and Chemical reaction inside a porous catalyst and the “Effectiveness Factor”.

UNIT IV FRICTION FACTORS AND MACROSCOPIC MOMENTUM BALANCE

Definition of Friction factors, friction factors for flow in tubes and for flow around spheres, Determination of diameter of a falling sphere, Friction factors for packed columns, the macroscopic mass, Momentum and Mechanical energy balances, use of Macroscopic balances to set up steady flow problems, Pressure rise and friction loss in a sudden expansion, performance of a liquid-liquid ejector, thrust on a pipe bend, Isothermal flow of a liquid through an orifice

UNIT V TRANSPORT IN TURBULENT AND ANALOGIES BETWEEN TRANSPORT PROCESSES


TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 60% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I CONVENTIONAL ENERGY SOURCES  
Energy sources, Coal, Oil, Natural gas, Nuclear fuels, Hydro power, The Formation of Natural, Resources, energy situation, exploration.

UNIT II NEW AND RENEWABLE ENERGY SOURCES  

UNIT III DIRECT ENERGY CONVERSION  

UNIT IV NEW ENERGY CONVERSION SYSTEMS  
Other energy transformations, coal gasification and liquefaction, role of coal in energy crisis, fluidized bed combustion. Synfuels. Hydrogen- methods of application, co- generation.

UNIT V ENERGY CONVERSION AND MANAGEMENT  
Waste heat recovery, heat pump.


TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max Marks : 80  
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks  
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks
UNIT I ENGINEERING ECONOMICS FOR PROCESS ENGINEERS, INTEREST & INVESTMENT COSTS


UNIT II COST ESTIMATION, ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE


UNIT III INVESTMENT ALTERNATIVE AND ECONOMIC BALANCE

Economics of Selecting alternates, annual Cost methods, Present worth method, Equivalent Alternate, Rate of Return and payback Time. Cash flow analysis Economic balance - batch Operations, cyclic Operations and Multiple Equipment Units.

UNIT IV MICRO AND MACRO ECONOMICS

Micro Economics - Elasticity of Demand and Supply, Demand Forecasting Methods. Economic Analysis, Cost Analysis. Time Element, BEP

Macro Economics – Multiplier and Accelerator, National Income Accounting, Business Cycle.

UNIT V MARKETING MANAGEMENT


Distribution Channels -Middlemen -Franchising - (SRP/RM/ VEC)

TEXT / REFERENCE BOOKS


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 40% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I BASICS OF MODELING


UNIT II NUMERICAL METHODS


Matrix computation, linear transformation, eigenvalue and singular value decomposition.

UNIT III MODELING OF REACTORS

Batch reactor, CSTR, series of isothermal, Constant Holdup CSTR, CSTR with variable holdup, non isothermal CSTR, Plug flow Reactor, Packed bed reactor.

UNIT IV MODELING OF HEAT AND MASS TRANSFER OPERATIONS

Modeling of heat exchangers, evaporators, absorption columns, ideal binary distillation column, multicomponent non-ideal distillation column, batch distillation with holdup, Single component vaporizer

UNIT V SIMULATION AND OPTIMIZATION

Dynamic simulation of batch reactor, CSTR, PFR, Distillation column, Evaporator and Absorption column.

Introduction, applications, types of optimization scope and hierarchy of optimization. General procedure for solving optimization problems.

TEXT/REFERENCE BOOKS:


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

B.Tech. (CHEMICAL ENGINEERING) 50 REGULATIONS 2010
UNIT I INDUSTRIAL SAFETY

Industrial safety principles, accidents, site selection and plant layout, design for ventilation, emergency response systems for hazardous goods, basic rules and requirements which govern the chemical industries. Major Industrial accidents – Case Study

UNIT II HAZARDS

Chemical hazards classification, hazards due to fire, explosion and radiation. Potential hazards. Chemical and Physical job-safety analysis, High-pressure and high temperature operations, toxic effects, highly radioactive materials. Safe handling and operation of materials and machineries.

UNIT III HAZARD ANALYSIS


UNIT IV APPRAISAL

Effective steps to implement safety procedures, periodic training and regular maintenance, personal protective equipments-types, fire fighting equipments.

UNIT V HEALTH HAZARDS AND LEGAL ASPECTS


TEXT/REFERENCE BOOKS:

UNIVERISTY EXAM QUESTION PAPER PATTERN

Max. Marks :80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
1. Determine the rate constant for the saponification of Ethyl acetate with sodium hydroxide in a Plug Flow Reactor
2. Determine the rate constant for the reaction of ethyl acetate with sodium hydroxide of equimolar concentration in a batch reactor
3. Determine the rate constant for the reaction of ethyl acetate with sodium hydroxide of non-equimolar concentration in a batch reactor
4. Study the residence time distribution in a Plug Flow Reactor using Step Input
5. Study the residence time distribution in a Mixed Flow Reactor using Step Input
6. Determine the performance of three Mixed Flow reactors in series
7. Study of residence time distribution in a Mixed Flow Reactor using Pulse Input
8. Determine the rate and enhancement factor using non-catalytic solid liquid reactor
9. Determine the enhancement factor for the dissociation factor of Cinnamic acid in a Photochemical reactor
10. Determine the rate constant for the saponification of Ethyl acetate with sodium hydroxide in a Mixed Flow Reactor
11. Determine the heat of reaction using adiabatic reactor

1. Introduction to software (flow sheeting)
2. Simulation of flash drum
3. Simulation of distillation columns
4. Simulation of absorption columns
5. Simulation of Reactors
7. Simulation of pumps and compressors.
8. Simulation of mixing
9. Process simulation study involving mixing, reactor, distillation, heat exchanger for any of the following:
   (a) Ethylene Glycol from Ethylene oxide
   (b) Atmospheric distillation of crude oil
   (c) Propylene Glycol from Propylene oxide
   (d) Styrene from Ethyl Benzene

The objective of the project work is to make use of the knowledge gained by the student at various stages of the degree course. Students, will also be permitted to undertake industrial/consultancy project Work, outside the department, in industries/Research labs.

There shall be three assessments during the semester by a review committee. The student shall make three presentations on the progress made before the committee at various stages of the Project work. The Head of the Department shall constitute the review committee for each branch of study. The total marks obtained in the three reviews, shall be taken in to account. There will be a viva-voce examination at the end of the Project work, conducted by one internal examiner and one external examiner. The total marks secured will be the sum of marks secured in the Project reviews and Viva Voce Examination.

Each student is required to submit a Project report on the project assigned to him by the department. The report should be based on the information available in the literature or data obtained by the student by way of experiments conducted in the laboratory/industry.
UNIT I OBJECTIVE AND FORMULATION OF OPTIMIZATION

Objective and Introduction, Objective Function and Decision variables, Inequality and Equality Constrains in Models Formulation of the Objective Function, Lower and Upper Bounds, Selecting Functions to Fit Empirical Data, Factorial Experimental Designs, Degrees of Freedom, Economic Objective Functions, Measures of Profitability

UNIT II BASIC CONCEPTS OF OPTIMIZATION

Continuity of Function, NLP Problem Statement, Convexity and Its Applications, Interpretation of the Objective Function in Terms of its Quadratic Approximation, Necessary and Sufficient Conditions for an Extremum of an Unconstrained Function

UNIT III OPTIMIZATION OF UNCONSTRAINED FUNCTIONS

One-Dimensional Search Numerical Methods for Optimizing a Function of One Variable, Scanning and Bracketing Procedures, Newton and Quasi-Newton Methods of Unidimensional Search

UNIT IV UNCONSTRAINED MULTivariable OPTIMIZATION

Linear Programming (LP) and Applications Geometry of Linear Programs, Basic Linear Programming Definitions and Results, Simplex Algorithm, Barrier Methods, Sensitivity Analysis, Linear Mixed Integer Programs, Application of the EXCEL Solver Spreadsheet for Optimization, Formulation. Introduction to Non linear Programming with Constraints and Mixed-Integer Programming

UNIT V APPLICATION OF OPTIMIZATION IN CHEMICAL ENGINEERING


Flow sheet Optimization - Case studies.

TEXT / REFERENCE BOOK:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 80% Problems - 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION TO COMPUTER APPLICATIONS

Understanding of operating systems and networks, Importance of computing in chemical engineering, fundamentals of programming

UNIT II DATABASES

Relational databases. SQL, ODBC. Real-time databases; Devise solutions and implement solutions to database queries using interactive SQL DML commands. Devise and implement efficient database design; Data Base Management and Qualitative Interpretation of Process Data

UNIT III COMPUTER NETWORKS

Internet, XML, OPC; OPC techniques, capabilities and issues. Build, apply and debug Model-based OPC

UNIT IV ARTIFICIAL INTELLIGENCE AND NETWORKS

Artificial Intelligence and Networks in Chemical Engineering, Expert Systems (CONPHYDE, KBS) and Tools (KEE, ART), Artificial Neural Network, Learning and Training, Process Plant Diagnosis, Safety Analysis

UNIT V MODELING AND SIMULATION PACKAGES

Process Modelling, Interfacial properties, Fault Diagnosis and Trouble Shooting; Simulation Packages, ASPEN PLUS, Batch Processing Packages (SUPERPRO), FLUENT

TEXT / REFERENCE BOOKS:


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80  Exam Duration: 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks  20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  60 marks
UNIT I GOVERNING DIFFERENTIAL EQUATIONS

UNIT II DISCRETIZATION METHODS

UNIT III HEAT CONDUCTION, CONVECTION AND DIFFUSION
Steady state one-dimensional conduction – two and three dimensional conduction - Steady state one-dimensional convection and Diffusion – Discretization equations for two dimensional convection and diffusion.

UNIT IV CALCULATION OF FLOW FIELD
Representation of the pressure - Gradient term and continuity equation – Staggered grid – Momentum equations - Pressure and velocity corrections – Pressure – Correction equation. Introduction to Finite Element method - Solution of Steady state heat conduction by FEM – Incompressible flow – Simulation by FEM.

UNIT V TURBULENCE MODELS – ALGEBRAIC MODELS

TEXT / REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks : 80
Exam Duration : 3 hrs.
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I FOOD PROCESSING ENGINEERING–FUNDAMENTALS


UNIT II UNIT OPERATIONS IN FOOD INDUSTRIES

Fluid Flow, Thermal Process Calculations, Refrigeration, Evaporation and Dehydration operations in Food Processing

UNIT III FOOD CANNING TECHNOLOGY


UNIT IV FOOD PRESERVATION METHODS

Preservation by Heat and Cold, Dehydration, Concentration, Drying, Irradiation, Microwave heating, Sterilization and Pasteurization, Fermentation and Pickling, Packaging Methods

UNIT V PRODUCTION AND UTILIZATION OF FOOD PRODUCTS


TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
SCHX1042 | FERTILIZER TECHNOLOGY | L | T | P | Credits | Total Marks
--- | --- | --- | --- | --- | ---
 | | | | | 3 | 0 | 0 | 3 | 100

UNIT I INTRODUCTION TO CHEMICAL FERTILIZERS

Chemical inorganic fertilizer and organic manure. Types of fertilizers plant nutrients, location and function of fertilizer components. Manufacture of Ammonia, Nitric acid, Phosphoric acid.

UNIT II NITROGENOUS FERTILIZERS


UNIT III POTASSIUM FERTILIZERS

Sources of potassium- Location, Methods of production of potassium chloride, Potassium schoenites. Function of potassium in plants. Their methods of production, Characteristic and Specifications

UNIT IV PHOSPHATIC FERTILIZERS

Raw materials, Phosphate rock, Sulfur pyrite, etc., Phosphate fertilizer- ground rock phosphate, Bone meal- Single super phosphate, Triple super phosphate, Thermal phosphate, their methods of production, characteristics and specifications.

UNIT V COMPLEX FERTILIZER AND MISCELLANEOUS FERTILIZERS

Types of complex fertilizers, composition ,Production of ammonium phosphate fertilizers, Ammonium sulfate, Di ammonium phosphate, Nitro phosphate , Mono Ammonium Phosphate and various grade of NPK fertilizers Produced in industries.

Mixed fertilizers and granulated mixtures- Bio fertilizers and nutrients. Secondary nutrients and Micronutrients, Fluid fertilizers.

TEXT/REFERENCE BOOKS:

1. Handbook of Fertilizer Technology, Fertilizer Association of India, New Delhi, 1998

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

Exam Duration : 3 hrs
UNIT I INTRODUCTION TO POLYMERS

Classification of polymers, polymerization process, chemistry and Kinetics of step growth and chain growth polymerization, polymerization techniques: Bulk, solution, suspension emulsion, mold, polycondensation, interfacial condensations, solid and gas phase polymerization.

UNIT II MOLECULAR WEIGHT & SIZE OF POLYMERS

Number average and weight average molecular weight, significance of molecular weight, determination of molecular weight and group analysis, solution viscosity method, osmotic pressure, light scattering method, gel permeation chromatography method etc.

UNIT III POLYMER PROPERTIES & THEIR TESTING

Glass transition temperature and associated properties, thermosetting polymers. Tensile strength & impact strength and their determination, softening point, heat distortion dielectric and power factor etc. Theology of polymeric materials.

UNIT IV SYNTHESIS & PROPERTIES OF COMMERCIAL POLYMERS

Plastic, rubber and fibers of commercial importance, polymer auxiliaries; plasticizers, stabilizers, fillers, lubricant etc. Manufacture, processing and properties of resins and fiber forming polymers such as phenol formaldehyde, urea formaldehyde, epoxy resins, urethane foam and silicon polymers; LDPE, HDPE, polypropylene, polyvinyl chloride, polystyrene, polybutadiene, polyacrylonitrile, polyamide, etc. fiber reinforced plastics

UNIT V ENGINEERING APPLICATIONS OF POLYMERS

Elastomeric composites in tyre technology, polymers in fiber, man made fibers, acetate fiber, acrylic, nylon, olefin, polyester, rayon, synthetic adhesives, Bio-polymers and their applications, plastics and polymers in agriculture industry, Plastics in consumer goods, polymer powders, coating and medical applications of polymers. Polymer Degradation: Thermal, Mechanical and by ultrasonic waves, photo degradation, heat energy radiation, oxidation and hydrolysis.

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I AN OVERVIEW  
General aspects of edible oils, oil seeds and fats technology; World requirement of oils and fats; Indian scenario.

UNIT II OILS AND FATS CONSTITUENTS  
Constituents and Chemistry of oils and fats; Application of oils and fats; Fat substitutes.

UNIT III GENERAL ENGINEERING ASPECTS AND PROCESSING METHODS  
Recovery and Pretreatment of oils and fats; Analysis.

UNIT IV OIL REFINING  
Physical treatment; Chemical Bleaching; Deodorizing; Wintering.

UNIT V HYDROGENATION  
Hydrogenation of oils in general; Equipment; Catalysts; Dry & Wet reduction. The Hardening operation; Hydrogenation products.

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80
Exam Duration : 3 hrs

Part A: 2 Questions from each unit, each carrying 2 marks 20 marks

Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION 10 hrs.
Pharmaceutical Industry, Drug discovery and Development of Drugs, Organic Therapeutic agents uses and Economics. Drug Metabolism, Physico Chemical Principles in Drug Metabolism Kinetic Studies and Action of drugs on Human Bodies

UNIT II UNIT PROCESSES AND APPLICATIONS 10 hrs.
Chemical Conversion Processes - Alkylation, Carboxylation, Condensation, Cyclisation, Dehydration, Esterification, Halogenation, Oxidation, Sulfonation, Complex Chemical Conversions and Fermentation.

UNIT III MANUFACTURING PRINCIPLES 10 hrs.
Compressed Tablets, Wet Granulation, Dry Granulation or Slugging, Direct Compression, Tablet Presses, Formulation, Coating Pills, Parental Solutions, Oral Liquid, Injections, Ointments, Role of Regulatory Authorities (FDA), Standard of Hygiene and Manufacturing Practice (GMP)

UNIT IV PHARMACEUTICAL / MICROBIOLOGICAL AND ANIMAL PRODUCTS 10 hrs.
Vitamins, Cold Remedies, Laxatives, Analgesics, Non Steroidal Contraceptives, External Antiseptics, Antacids, Antibiotics, Biologicals, Hormone – Preservation

UNIT V ANALYSIS & QUALITY CONTROL 10 hrs.
Pharmaceutical Analysis Packaging and Control, Analytical Methods and Tests for various Drugs & Pharmaceuticals

Packaging Techniques & Quality Control of Pharmaceutical Products.

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION  
Classification of crude oil, Atmospheric distillation, Vacuum distillation of residue – Products and distillation practice

UNIT II CRACKING AND REFORMING  
Light end products of Distillation, Hydro cracking, Thermal cracking, FCCU, Visbreaking, Catalytic reforming of Naptha and its products.

UNIT III PRIMARY FINISHING TREATMENTS  

UNIT IV SECONDARY FINISHING PROCESSES  
Treatment of Gasoline production, Alkylation - Sulphuric acid process and Hydrofluoric acid process, Isomerisation process, Polymer gasoline.

UNIT V HEAVY ENDS TREATMENT  
Production of Lube Oil stock, Wax and Asphalt

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80  
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks  
20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks  
60 marks
UNIT I SUPRAMOLECULAR CHEMISTRY 10 hrs.
Supramolecular Chemistry. Definition and examples of the main intermolecular forces used in supramolecular chemistry. Self-assembly processes in organic systems. Main supramolecular structures.

UNIT II NANOMATERIALS 10 hrs.
Physical Chemistry of Nanomaterials. Students will be exposed to the very basics of nanomaterials; A series of nanomaterials that exhibit unique properties will be introduced.

UNIT III FABRICATION 10 hrs.
Methods of Synthesis of Nanomaterials. Equipment and processes needed to fabricate nanodevices and structures such as bio-chips, power devices, and opto-electronic structures. Bottom-up (building from molecular level) and top-down (breakdown of microcrystalline materials) approaches.

UNIT IV NANO-BIOTECHNOLOGY 10 hrs.
Biologically-Inspired Nanotechnology Basic biological concepts and principles that may lead to the development of technologies for nanoengineering systems. molecular nanoscale engineered devices, nanoscale biotechnologies, nano products .

UNIT V CHARACTERIZATION OF NANOMATERIALS 10 hrs.
Instrumentation for Nanoscale Characterization- Instrumentation SEM, TEM, XRD, FTIR for characterization of properties .Limits of each technique.

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I  INTRODUCTION  10 hrs.
Definition-Need-Scope for Entrepreneurial Development in India-Role of Government on Entrepreneurship-Successful cases in Entrepreneurs. Women Entrepreneurs in India.

UNIT II  ENTREPRENEURIAL GROWTH FACTORS  10 hrs.
Characteristics - Competencies-Qualities of an Entrepreneur-Micro and Macro Factors influencing growth of Entrepreneurship-Identifying potential entrepreneurs-Differences between entrepreneur and intrapreneur & manager.

UNIT III  CLASSIFICATION AND DEVELOPMENT OF INDUSTRIES  10 hrs.
Small Scale Industries-Definition-classification-problems-remedies-Developing Ancillary units-Institutions involved in developing Entrepreneurs: DIC, TIIC, SIDCO, SISI and NSIC.

UNIT IV  PROJECT PRESENTATION AND FINANCIAL ASSISTANCE  10 hrs.
Market research- New Product Development-Product life cycle concept-Feasibility Analysis- Key Elements of developing project report for getting financial assistance-Institutions involved in getting Financial assistance: IFCI, IDBI, SIDBI, SFC’s and commercial banks.

UNIT V  LEGAL & TECHNICAL ASPECTS FOR ESTABLISHING INDUSTRIES  10 hrs.
Brief idea on Factories Act 1948 (Health, Wealth, Safety measures)-Environmental pollution prevention control Acts - Procedures for getting subsidies & licenses from both Centre & State Government.

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80  Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION
Environment definition - The biosphere - the hydrologic cycle – the nutrient cycles, pollution of air, water and soil. Air pollution laws and air quality standard. Water pollution quality standards and law. MIMAS. Air pollution effect on human, plant and animal, acid rain.

UNIT II WATER POLLUTION AND ANALYSIS
Origin of waste water, types of waste pollutants and their effects, waste water sampling and analysis, determination of organic and inorganic matters, physical characteristics, bacteriological measurements.

UNIT III WATER TREATMENT
Characteristics of natural water, water conditioning, softening of water, demineralization of water. Treatment of water for municipal water supplies. Industrial water treatment, the aerobic process, the anaerobic process. Water pollution effect on man, plant and animal.

UNIT IV NOISE POLLUTION
Introduction, sources of noise pollution, Characteristics of sound, noise units, types of noise, effects and control of noise pollution. Radioactive pollution (RAP), sources of RAP-classification of its radiation effects on humans, plants and animals.

UNIT V POLLUTION CONTROL AND DISPOSAL METHODS

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

B.Tech. (CHEMICAL ENGINEERING) 64 REGULATIONS 2010
UNIT I THERMAL SEPARATION

UNIT II SORPTION TECHNIQUES
Types and choice of adsorbents, Normal Adsorption techniques, chromatographic techniques, Equipment and commercial processes, Recent advances and economics, Molecular Sieves.

UNIT III MEMBRANE SEPARATION PROCESSES
Types and choice of membranes, their merits, commercial, pilot plant and laboratory membrane permeators, Dialysis, Reverse Osmosis, Ultrafiltration, and Economics of Membrane operations.

UNIT IV IONIC SEPARATION
Controlling factors, Applications, Equipments for Electrophoresis, Dielectrophoresis, Electro Dialysis and Ion - Exchange, Commercial processes.

Other Techniques: Adductive Crystallization: Molecular addition compounds, Clathrate compounds and Adducts, Equipments, Applications, Economics and Commercial processes.

UNIT V FOAM SEPARATION

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION TO CATALYSIS

General properties of homogenous and heterogeneous catalysis, Life cycle of catalyst, Steps in a catalytic reaction, Physisorption and chemisorption, active site, catalyst characterization, catalyst activity and selectivity.

UNIT II GEOMETRIC AND ELECTRONIC FACTORS IN CATALYSIS

Adsorption and reaction kinetics in catalytic (heterogeneous) system, Electron band theory, valence bond theory, Dowdens rule for bond formation, semiconductor theory, charge transfer theory

UNIT III CATALYST PREPARATION

Preparation and evaluation of industrial catalysts, catalyst formation, wet methods, precipitation and precipitation deposition, unsupported and supported metal catalyst, sintering, reverse micro emulsion method

UNIT IV KINETICS OF HETEROGENEOUS REACTIONS

Reaction engineering applied to catalytic homogeneous and heterogeneous chemical reactions, Kinetics of adsorption and surface reaction, evaluation of kinetic parameters.

UNIT V CATALYST POISONING

Catalyst poisoning and deterioration, (sintering) origination of catalyst, types of poison, catalyst deactivation, pour mouth poisoning, poisoning by chemical binding, catalyst cleaning and regeneration, reversible and irreversible poisoning

TEXT/REFERENCE BOOKS:


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION  
Introduction to multi component separation system –Technological schemes of complex oil, gas condensate processing plant-application of multi component separation system in petrochemical system-Low temperature absorption system-gas, oil and water separation system by using three phase separator

UNIT II MULTI COMPONENT DISTILLATION  
Introduction to Multi component distillation. Key components, Estimation of minimum theoretical stages (Fenke’s equation), Determination of minimum reflux ratio (Under wood’s method), Approximate calculation for multi component-multistage distillation estimation of actual reflux ratio and theoretical stages (Kirks-Bridge equation) distribution of no, key components at actual refuse

UNIT III ABSORPTION  
Absorption of multi component–calculation of number of trays by Kremser’s equation, Working of Horizontal multistage plate absorber- vertical plate and packed bed absorber, direct flow multi stage absorption and step direct flow counter flow absorption.

UNIT IV EXTRACTION  
Extraction of multi component system-Choice of solvent, single stage extraction-Multistage extraction-cocurrent and counter current-batch, simulation of continuous counter current cascade extraction, Stage Efficiency, Types of extractors.

UNIT V CONSTRUCTION OF SEPARATORS  
Construction of Separators, Dividers, and Settlers-vertical and horizontal separators ,gill and grid orifice separators ,centrifugal -one socket and multi socket separators, separators with grid and glass fiber coagulator, gravitation oil gas separator

TEXT/REFERENCE:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80 
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

B.Tech. (CHEMICAL ENGINEERING) 67
REGULATIONS 2010
UNIT I INTRODUCTION

Definition of Corrosion, corrosion damage, effect of material safety and reliability, classification of corrosion, expression of corrosion rate, electrochemical corrosion reaction, redox reaction, effect of oxygen, oxidizers. Effect of temperatures and concentration of chemicals on corrosion rate, Corrosion direct & two stage attack, electrochemical attack, environment conditioning.

UNIT II TYPES OF CORROSION

Effect of galvanic coupling, metallurgical aspects, metallic properties, ringworm corrosion, Principle of modern corrosion theory, Forms of corrosion – Uniform attack, galvanic corrosion, crevice corrosion, pitting intergranular corrosion and hydrogen damage, higher corrosion resistance through proper selection of material, isolation of corrosion prone materials from destructive environment.

UNIT III CORROSION PRODUCTIVE MEASURES

Technologies of anodisation, enameling, rubber lining, glass lining, refractory lining, painting and other surface protective measures.

UNIT IV APPLICATION OF CORROSION ENGINEERING

Corrosion engineering in special applications such as material transport, pumping, filtration, condensation, boiling, riveting, welding, and high temperature environments.

UNIT V CORROSION TESTING AND MEASUREMENTS

Corrosion testing, monitoring and inspection, laboratory corrosion test, accelerated chemical tests for studying different forms of corrosion, electrochemical methods of corrosion rate measurements by DC and AC methods, corrosion monitoring methods, chemical and electrochemical removal of corrosion products, cost factor in competitive corrosion prevention / inhibition techniques.

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80
Exam Duration : 3 hrs

Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION AND APPLICATIONS


UNIT II GROSS BEHAVIOR OF FLUIDIZED BEDS


UNIT III ANALYSIS OF BUBBLE AND EMULSION PHASE

Davidson’s model, Frequency measurements, bubbles in ordinary bubbling bed model for bubble phase. emulsion phase: Experimental findings. Turn over rate of solids. Bubbling bed model for emulsion phase Interchange coefficients.

UNIT IV FLOW PATTERN OF GAS AND HEAT & MASS TRANSFER IN FLUIDIZED BEDS


UNIT V HEAT TRANSFER BETWEEN FLUIDIZED BEDS AND SURFACES- ENTRAINMENT & ELUTRIATION

Heat transfer between fluidized beds and surfaces: Experiment finding theories of bed heat transfer comparison of theories. Model for entrainment and application of the entrainment model to elutriation.

TEXT/REFERENCE BOOK:

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

B.Tech. (CHEMICAL ENGINEERING) 69 REGULATIONS 2010
UNIT I INTRODUCTION

10 hrs.

The Electrical Double layer-It's role in Electrochemical processes, Electrocapillary curve, Helmholtz layer fields at the interface.

UNIT II BATTERIES

10 hrs.

Batteries - Primary Batteries and Secondary Batteries, Leclanché dry cell, Alkaline Manganese cell, Mercury cell Reverse electrolytic cells like Mg–CuCl₂, Mg-PbO, Zn-PbO, Secondary cells like lead acid, Ni-Cd, Ni-Fe, AgO-Zn, AgO-Cd, Sodium-Sulfur, Li-S, Fuel Cells.

UNIT III ELECTRODES

10 hrs.

Electrodes-Metals Graphite, Lead Oxide, Titanium Substrate insoluble electrodes, Iron Oxide, Semiconductor type electrodes.

Metal finishing, Electro Deposition, Electro refining, Electro reforming, Electro polishing, Anodizing, Selective Solar Coatings.

UNIT IV ION–ION INTERACTIONS

10 hrs.


UNIT V ELECTROCHEMICAL SYSTEMS

10 hrs.


TEXT/REFERENCE BOOKS:


UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80 Exam Duration : 3 hrs

Part A: 2 Questions from each unit, each carrying 2 marks 20 marks

Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks
UNIT I INTRODUCTION 10 hrs.
Principles of nuclear reactions – nuclear fission and fusion reactions, chain reaction uncontrolled chain reaction and a nuclear bomb, fundamentals of nuclear power generation, controlled chain reaction, control rods, energy from fission and fusion, raw materials and fuels, Isotopes, fuel burn up

UNIT II RADIOACTIVE SUBSTANCES 10 hrs.
Radioactivity and radioactive substances. Neutron energies, thermal neutrons, Nuclear cross sections, Fission reactor types, reactor control, fuel arrangements in a thermal reactor. Processing of nuclear fuels, Separation and purification of isotopes, Heavy water

UNIT III NUCLEAR REACTORS 10 hrs.
Pressurized water reactor, PWR power plant, Boiling water reactor, BWR power plant, Gas cooled reactor, high temperature gas cooled reactor.

UNIT IV REACTOR ACCESSORIES 10 hrs.
Concept of breeding, Fast breeder reactors, Liquid metal fast breeder reactor and accessories.

UNIT V NUCLEAR POLLUTION AND ACCIDENTS 10 hrs.
Nuclear radiation and Thermal pollution by nuclear power plants, Radio-active pollution of environment by nuclear power plants, nuclear accidents and radio-active waste disposal.

TEXT/REFERENCE BOOKS:

UNIVERSITY EXAM QUESTION PAPER PATTERN
Max. Marks: 80
Exam Duration : 3 hrs
Part A: 2 Questions from each unit, each carrying 2 marks 20 marks
Part B: 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks