REGULATIONS
AND
SYLLABUS
(REGULATIONS 2005)

B.Tech. Degree Programme
(Part Time 7 Semesters)

LEATHER TECHNOLOGY

A.C. COLLEGE OF TECHNOLOGY
ANNA UNIVERSITY
CHENNAI 600 025
REGULATIONS
AND
SYLLABUS
(REGULATIONS 2005)

Deputy Controller of Examinations
A.C. College of Technology Campus,
Anna University, Chennai-600 025.

B.TECH DEGREE PROGRAMME
(PART TIME 7 SEMESTERS)

LEATHER TECHNOLOGY

A.C. COLLEGE OF TECHNOLOGY
ANNA UNIVERSITY
CHENNAI - 600 025
A.C. COLLEGE OF TECHNOLOGY
ANNA UNIVERSITY: CHENNAI – 600 025
(An Autonomous Constituent Institution of Anna University)

REGULATIONS 2005

B.E. / B.Tech. (Part-Time – 7 Semesters) Degree Programmes

Effective from December 2004-2005 and applicable to the students admitted to the A. C. College of Technology.

1. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these regulations, unless the context otherwise requires


(ii) “Branch” means specialization or discipline of B.E./B.Tech. (Part-Time – 7 Semesters) Degree Programme, like Chemical Engineering, Textile Technology, etc.

(iii) “Course” means a theory or practical subject that is normally studied in a semester like, Mathematics, Physics etc.

(iv) “Institution” means the A.C. College of Technology the autonomous constituent Institution of Anna University.

(v) “Head of Institution” means the Dean of the Institution who is responsible for all activities of the Institution and for implementation of relevant rules of this Regulations.

(vi) “University” means Anna University.

2. CONDITIONS FOR ADMISSION

2.1 Candidates seeking admission to the first semester, also known as Bridge semester of the part-time B.E. / B.Tech. degree programme shall be required to have passed the Diploma in Engineering/Technology in the relevant branch
of specialization awarded by the State Board of Technical Education, Tamil Nadu or any other authority accepted by the Syndicate of the University as equivalent thereto.

2.2 Eligibility Candidates seeking admission shall satisfy the following conditions:

(i) Eligibility conditions such as class, marks, number of attempts shall be as prescribed by the Syndicate of the University from time to time.

(ii) Shall have been employed for at least one year after qualifying for the Diploma, the period being counted as on 1st January of the academic year in which admission is sought.

(iii) Notwithstanding the qualifying examination the candidate might have passed (vide clause 2.1) he/she have a minimum level of proficiency in Mathematics, Physics, Chemistry and the relevant branch of study as may be prescribed by the University.

(iv) Shall be employed within a zone of 65km radius from the institution.

(v) Shall satisfy the conditions of physical fitness as prescribed by the syndicate of the University.

3. DURATION OF THE PROGRAMME

The duration of the programme shall be seven consecutive semesters, spread over 3.5 academic years, two semesters constituting an academic year. Each semester shall have a minimum of 75 working days (evenings) excluding the end-semester examination.

4. BRANCHES OF STUDY

A candidate may be offered, at the time of admission, one of the following branches of study:

1. B.Tech. Chemical Engineering-Diploma in Chemical Engineering / Chemical Technology / Chemical Technology (SW) / Petroleum Engineering / Petro...
6.2.2. Practical Subjects:
Every practical exercise/experiment shall be evaluated based on conduct of experiment/exercise and records maintained. There shall be at least one mid-semester test. The criteria for arriving at the internal assessment marks shall be decided by the Head of the institution and shall be announced at the beginning of every semester.

6.2.3. Theory Subjects with Laboratory Component:
If there is a theory subject with laboratory component, there shall be three tests: the first two tests (each 100 marks) will be from theory portions and the third test (maximum mark 100) will be from laboratory component. The sum of marks of first two tests shall be reduced to 10 marks and the third test mark shall be reduced to 10 marks. The sum of these for 20 marks may then be arrived at and rounded to nearest integer.

6.2.4. Project Work:
There shall be three assessments (each 100 marks) during the semester by a review committee. The student shall make presentation on the progress made before the committee. The Head of the institution shall constitute the review committee for each branch of study. The total marks obtained in the three assessments shall be reduced to 20 marks and rounded to the nearest integer.

7. DISCIPLINE
7.1 Every student is required to be disciplined and to have decorous behavior both inside and outside the campus and not to indulge in any activity, which will tend to bring down the prestige of the Institution and university.

7.2. Any act of indiscipline of a student reported to the Head of Institution will be referred to a Discipline and Welfare Committee nominated by the Institution/University from time to time, for taking appropriate action.

7.3 If a student indulges in malpractice during tests/examinations, the student shall be liable for punitive action as prescribed by the Institution/University from time to time.

8. REQUIREMENT FOR COMPLETION OF A SEMESTER:
8.1. A candidate who fulfills the following conditions shall be deemed to have satisfied the requirements for the completion of a semester.
   i) He/She secures not less than 70% overall attendance taking into account the total number of periods attended by the candidate in all the courses put together as against the total number of periods attended during the semester.
   ii) He/She earns a progress certificate from the Head of the Department and the Head of Institution for having satisfactorily completed the programme of study in all the courses pertaining to that semester.
   iii) His/Her conduct is found to be satisfactory as certified by the Head of the Department and the Head of Institution.

8.2. Candidates who do not complete the semester (as per clause 8.1) will not be permitted to write the end-semester examination and are not permitted to go to next semester. They are required to repeat the incomplete semester in the next academic year.

9. REQUIREMENTS FOR APPEARING FOR END-SEMESTER EXAMINATION
A candidate shall normally be permitted to appear for the end-semester examination of the current semester, if he/she has satisfied the semester completion requirements (vide clause 8) and has registered for examination in all the courses of that semester.
10. REQUIREMENT FOR PROCEEDING TO A HIGHER SEMESTER

A candidate shall be permitted to proceed from the current semester to the next semester, irrespective of the arrear courses he/she may have in the earlier semester only if,

i) He/She has satisfied all the semester completion requirements of the current semester and

ii) He/She has registered for the end-semester examination in all the courses of the current semester and also in all arrear courses, if any.

11. PASSING REQUIREMENT AND CLASSIFICATION OF SUCCESSFUL CANDIDATES

11.1. A candidate shall be declared to have passed the examination in a course of study if he/she secures 50% of the total marks (continuous assessment plus end-semester examination marks) prescribed for that course and if he/she has also secured 45% of the marks in the end-semester examination conducted by the Institution. The rule is applicable to theory and practical courses including Project Work.

11.2. A candidate who has been declared as "failed" in a particular course may appear for the end-semester examination in that course as and when the examination in that course is conducted and secure a pass. However, the continuous assessment marks obtained by the candidate in the first attempt shall be retained and considered valid for all subsequent attempts.

11.3. A student can apply for revaluation of his/her end-semester examination answer-paper in a course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Heads of Departments concerned. The Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Heads of the Departments.

11.4. A candidate who qualifies for the award of the degree (vide clause 14) passing the examination in all the courses in all the seven semesters in his/her first appearance within seven consecutive semesters (3.5 academic years) and in addition secures an aggregate of not less than 75% of the total marks (continuous assessment plus end-semester examination marks) for all the courses in the semesters II to VII put together shall be declared to have passed the examination in First Class with Distinction. For this purpose, the withdrawal from examination (vide clause 12) shall not be construed as an appearance. Further any authorized break of study will be excluded from the total duration while finding the period of completion (vide clause 13.3)

11.5. A candidate who qualifies for the award of the degree (vide clause 14) passing the examination in all the courses in the semesters II to VII within a period of eight consecutive semesters after his/her commencement of study in the second semester and in addition secures an aggregate of not less than 60% of the total marks (continuous assessment plus end-semester examination marks) for all the courses in the semesters II to VII put together shall be declared to have passed the examination in First Class. For this purpose the period of completion will be arrived at by excluding any authorized break of study. (vide clause 13.3).

11.6. All other candidates who qualify for the award for the degree (vide clause 14) shall be declared to have passed the examination in Second Class.

11.7. A candidate who absents in the end-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.
12. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

12.1 A candidate, may for valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

12.2 Such withdrawal shall be permitted only once during the entire period of study of the degree programme.

12.3 Withdrawal application is valid only if it is made within the prescribed number of days prior to the commencement of the examination in that course or courses and recommended by the Head of the Department and approved by the Head of the Institution.

12.4 Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.

12.5 The candidate shall reappear in the examination only when the examination in the withdrawn course or courses is conducted subsequently.

13. PROVISION FOR BREAK OF STUDY

13.1 Break of study shall not normally be permitted. However, if a candidate intends to temporarily discontinue the programme in the middle for valid reasons, and to rejoin the programme in a later semester, permission may be granted based on the merits of the case provided he / she applies to the Institution in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Department stating the reasons and the probable date of rejoining the course.

13.2 The candidate rejoining the programme after the authorized break of study shall be covered by the rules and regulations in force at the time of rejoining.

13.3 The duration specified for passing all the courses for the purpose of classification (vide clause 11.4 and 11.5) shall be increased by the period of such authorized break of study.

13.4 The total period for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed the prescribed maximum period (vide clause 14), irrespective of the period of break of study.

13.5 If any student is either detained in a semester for want of requisite attendance, progress and good conduct or suspended from the programme indiscipline, the resulting period of break of study shall not be considered as an authorized break of study for purpose of classification and clause 13.3 is not applicable in this case.

14. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A candidate shall be declared to be eligible for the award of the Degree if he/she has:

i) Undergone the programme for a period of seven semesters.

ii) Passed the examinations in all the courses prescribed in the respective curriculum within a maximum period of 16 Semesters reckoned from the commencement of the first semester to which the candidate was admitted. This maximum period shall be 20 Semesters in the case of women candidates.

iii) No disciplinary action pending against him / her.

iv) The award of the degree must be approved by the Syndicate.

15. REVISION OF REGULATIONS AND CURRICULUM

The Institution may from time to time revise, amend or change the regulations, courses of study, curriculum, syllabi and assessment procedure, if found necessary.
# Degree of Bachelor of Technology
## Regulation 2005 Curriculum
### Semester - I

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTCE 171</td>
<td>Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCE 171</td>
<td>Engineering Graphics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTMA 171</td>
<td>Mathematics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTMA 171</td>
<td>Physics I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTGE 172</td>
<td>Fundamentals of Computing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

### Semester - II

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTTL-201</td>
<td>Skin Biology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Principles of Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Operations and Processes in Leather Manufacture</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Basic Electrical &amp; Electronics Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Mechanical Engg.</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Organic Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

### Semester III

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTTL-201</td>
<td>Physical Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Theory of Preservation and Pretanning Processes</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Practice of Leather Manufacture - I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Principles of Material Testing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTL-201</td>
<td>Computer Applications in Leather Technology</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>
### SEMESTER IV

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTLT-207</td>
<td>Leather Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT-208</td>
<td>Theory and Mechanism of Organic Tannages</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT-209</td>
<td>Practice of Leather Manufacture - II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT-210</td>
<td>Theory and Mechanism of Inorganic Tannages</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Elective - I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

### SEMESTER V

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTLT-301</td>
<td>Practice of Leather Manufacture - III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT-302</td>
<td>Chemistry and Technology of Post tanning, Finishing and Leather Auxiliaries</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT-303</td>
<td>Entrepreneurship in Leather Sector</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT-304</td>
<td>Environmental Science and Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Elective II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

### SEMESTER VI

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTLT-305</td>
<td>Tannery Waste Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT-306</td>
<td>Organisation and Management of Leather Manufacture</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 402</td>
<td>Professional Ethics and Human Values</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Elective – III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Elective – IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

### ELECTIVE LIST

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTLT 001</td>
<td>Science of Leather Supplements and Synthetics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 002</td>
<td>Animal By products Utilisation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 003</td>
<td>Cleaner Production in Tanneries</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 004</td>
<td>Technology of Leather Supplements and Synthetics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 005</td>
<td>Technology of Light Leather Manufacture (Practicals)</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 006</td>
<td>Technology of Heavy Leather Manufacture (Practicals)</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 007</td>
<td>Costing and Value Engineering in Leather</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 008</td>
<td>Industrial Engineering in Leather Sector</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 009</td>
<td>Leather Biotechnology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 010</td>
<td>Safety in Leather Industry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 011</td>
<td>Principles of Plant Design for Leather and process control systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTLT 012</td>
<td>Leather Goods and Garment Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>
AIM
- To develop a sound knowledge of theoretical and modern technological aspects of chemistry
- To enable the student to correlate the theoretical principles with application oriented studies

OBJECTIVES
- Should be conversant with the language of thermodynamics, electrochemistry, spectroscopy, surface chemistry to solve simple problems related to different industrial processes.
- Should be conversant with the theoretical principles and experimental methodology in the use of sophisticated analytical instruments.
- The knowledge gained will be a prerequisite for the application oriented topics to be pursued in the later semesters.

UNIT I THERMODYNAMICS

UNIT II SURFACE CHEMISTRY AND CATALYSIS

UNIT III CHEMICAL KINETICS

UNIT IV Electrochemistry

UNIT V SPECTROSCOPY

Total No. of Periods: 45

TEXT BOOKS:

REFERENCE BOOKS:

PTGE 171 ENGINEERING GRAPHICS 3 1 0 100

OBJECTIVE
To develop graphic skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings.

CONCEPTS AND CONVENTIONS (Not for exam) 4
Importance of graphics in design process – visualization, communication, documentation – BIS conventions – Drafting tools – construction of curves like ellipse, parabola, cycloid and involutes.

UNIT I PROJECTION OF POINTS, LINES AND SURFACES 12
General principles of presentation of technical drawings as per BIS – Naming views as per BIS – First angle projection. Orthographic projection of points.
Projections of straight lines located in first quadrant only – determination of true length and true inclination.
Projections of plane surfaces like polygonal lamina and circular lamina, located in first quadrant only.

UNIT II PROJECTION OF SOLIDS 8
Projection of simple solids like prisms, pyramids, cylinder and cone – Drawing views when the axis of the solid is inclined to one reference plane.

UNIT III SECTION OF SOLIDS AND DEVELOPMENT 12
Sectioning of simple solids like prisms, pyramids, cylinder, cone and sphere. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.
Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

UNIT IV PICTORIAL PROJECTIONS 10
Isometric projection – Isometric Scale – Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by vanishing point method.

UNIT V FREE-HAND SKETCHING 10
Free hand sketching techniques – sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning.
Sketching pictorial views from given orthographic views.
Demonstration (Not for Exam)
Demo of computer aided drafting and dimensioning using appropriate software.

Total No. of Periods: 60

TEXT BOOKS:

REFERENCE BOOKS:

Standards:
1. IS 10711 - 2001 Technical Product Documentation - Sizes of drawing sheets
2. IS 9609 - 1983 Lettering on technical drawings
3. IS 10714 - 1983 General Principles of presentation of technical drawings
4. IS 11669 - 1996 General Principles of dimensioning of technical drawings

Special Points applicable to University Examination on Engineering Graphics
1. There will be five questions, of which the question No. 1 will not have choice and can be from any unit of the syllabus. The other four questions will be of "Either – OR" type, from the remaining units.
2. All questions will carry equal marks of 20 each making the total of 100 marks.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit the solution with in A3 size.
4. The university examination in a college, will be conducted in multiple sessions, i.e. one for every 180 candidates or part thereof.

PTMA 171 MATHEMATICS I 3 1 0 100

AIM
The course is aimed at developing the skills of the students in the basic chosen topics of Mathematics that are imperative for effective understanding of engineering subjects. It also lays the foundation for learning further topics of Mathematics in higher semesters in a graded manner. The learners will be enabled to appreciate the important role of mathematical concepts in engineering applications.

OBJECTIVES
On completion of the course the students are expected to
• Be capable of identifying algebraic eigenvalue problems from practical areas and obtain the eigensolutions in certain cases and to have acquired the techniques of diagonalizing a matrix which would render the eigensolution procedure very simple.
• Have grasped the method of three dimensional analytical geometry to study the properties of lines and planes in space along with sphere as an illustrative curved surface element, providing an elegant tool for enhanced understanding of three dimensional materials which is imperative for engineers.
• Understand effectively the geometrical aspects of curvature, involutes and evolutes of plane curves, essential concepts for an engineer, as elegant applications of differential calculus.
- Understand and handle functions of more than one variable, from the points of view of their differentiation, expansions and extreme values, along with differentiation under integral sign which are encountered in engineering studies.

- Have learnt the method of solving systems of differential equations of certain types that they might encounter in their studies of other subjects in the same or higher semesters.

UNIT I MATRICES  
9 + 3
Rank of matrix – consistency of linear system of equations.  
Eigenvalue problem – Eigenvalues and eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem (without proof) –  
Similarity transformation (concept only) – Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 9 + 3

UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS 9 + 3
Curvature – Cartesian and polar co-ordinates – Centre and radius of curvature – Circle of curvature – Involute and evolute – Envelopes – Properties of envelopes and evolutes – Evolute as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES 9 + 3

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 9 + 3
Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients - Homogeneous equations of Euler type – Equations reducible to homogeneous form – Method of variation of parameters.

L + T : 45 + 15 Total No. of Periods : 60

TEXT BOOKS:

REFERENCE BOOKS:

PTPH 171 PHYSICS I 3 0 0 100

AIM
- To enhance theoretical and modern technological aspects in Physics
- To enable the students to correlate the theoretical principles with application oriented studies
OBJECTIVES
At the end of the course the students would be exposed to

- Design of acoustically good buildings
- Structure identification of engineering materials
- Non destructive techniques
- Interferometric techniques in metrology, communication and civil engineering
- Application of quantum physics to optical & electrical phenomena
- Application of lasers in engineering and technology.

UNIT I: ACOUSTICS AND ULTRASONICS

UNIT II: CRYSTALLOGRAPHY & NON-DESTRUCTIVE TESTING

UNIT III: WAVE OPTICS

UNIT IV: QUANTUM PHYSICS
Planck’s quantum theory of black body radiation (Derivations). Compton effect (derivation) and Experimental verification of Compton effect – Schrödinger wave equation. Time independent and time dependent equations. Physical significance of wave function, particle in a box (in one dimension) – electrons in a metal.

UNIT V: LASER AND FIBRE OPTICS

TEXT BOOKS:

REFERENCE BOOKS:

PTGE 172 FUNDAMENTALS OF COMPUTING 3 0 0 100

AIM
• To provide an awareness to Computers and Computing

OBJECTIVES
• To enable the student to learn the major Components of a Computer System
• To know how arithmetic is handled in computers
• To know the correct and efficient ways of solving problems
• To learn to use office automation tools
• To learn to program in C

1. INTRODUCTION 9

2. COMPUTER ARITHMETIC AND SOFTWARE 9

3. PROBLEM SOLVING AND OFFICE AUTOMATION 9

4. INTRODUCTION TO C 9

5. FUNCTIONS AND POINTERS 9

Total No. of Periods : 45

TEXT BOOK:

REFERENCE BOOKS:

PLT 201 SKIN BIOLOGY 3 0 0 100

1. STRUCTURE AND FUNCTIONS OF SKIN 6
Structure and functions of epidermis, dermis, cutaneous and subcutaneous tissues, hair, fat tissue, nerve, erector pili muscle, sweat glands. Organization of skin components in different animals.
2. INTRODUCTION TO BIOMOLECULES
Structure and properties of Mono, Di, Oligo and polysaccharides, complex carbohydrates, Structure and properties of Fatty acids, Glycerolipids, phospholipids, sphingolipids, glycolipids, steroids, Structure, function and properties of amino acids, pKa & pKb values, Titration curves of amino acids, reaction of amino acids – Ninhydrin, Edman’s reagent, Sanger’s reagent, Aldehydes, Iso electric pH, buffer, Henderson Hasselbalch equation.
Structure and properties of RNA and its bases, Structure & properties of DNA and its bases, different forms of DNA and RNA.

3. ENZYMES & PROTEINS
General and Physical Chemistry of enzymes & proteins in animal skin, Enzyme classification and their functions, enzyme kinetics, Protein classifications, Reactions of proteins with acids, bases and salts; Protein purification – Ion exchange chromatography, Molecular sieve chromatography, affinity, dialysis, HPLC, Gel electrophoresis, Structural organization of proteins. Structure and chemical features of collagen, Reactive groups; Cross linking.

4. POLYMORPHISM & AGGREGATION PHENOMENA OF COLLAGEN
Tropocollagen molecules; Sub-units of collagen; Types of collagen; Structure and function. Kinetics of fibril formation; precipitated forms of collagen; Electron microscopy of the collagen fibre; Biosynthesis.

5. THERMAL TRANSITION AND DEGRADATION OF COLLAGEN
Denaturation temperature; Mechanism of denaturation process; Thermal shrinkage; Factors influencing melting transition. Degradation of collagen - collagenases; Physico - chemical properties methodology, mechanism of action.

Total No. of Periods: 45
Drying: Drying characteristics, theory and mechanism of drying, estimation of drying rate, design and performance of industrial dryers for leather.

Humidification: Humidity, charts, methods of humidification and dehumidification; Equipment and their design aspects; Humidity control in leather processing.

4. MECHANICAL SEPARATIONS

Size reduction: Theory and equipment; application in leather chemical processing.


Mixing: Basic theory and application in leather and leather chemical processing.

5. PRINCIPLES OF UNIT PROCESSES

General concepts for unit processes; Development of process flow sheets with reference to leather and leather chemical industries design, control safety pollution abatement; Principles of distillation, esterification, hydrolysis, oxidation, hydrogenation, Polymerization, sulphation and sulfonation, deodorization and coupling.

6. WATER AND INORGANIC CHEMICALS

Treatment of water for domestic and industrial purposes, manufacture of sodium chloride, sodium sulphide, sodium sulphate and bisulphite, soda ash, caustic soda, lime, sulphuric and hydrochloric acids.

7. TANNING AGENTS

Vegetable tannins and Vegetable tannin extracts, Basic Chromium Sulphate, Aluminium, and Zincionium, salts for leather processing.

8. OILS, FATS AND DETERGENTS

Oils and fats, their nature and products derived from oils and fats, Fatty Acids and Alcohols, waxes and fatliquors.

9. SYNTHETIC BINDERS

Binders on acrylics, polyamides, polyesters, polyurethanes, polypropylene.

10. DYES AND INTERMEDIATES & SURFACE COATING AGENTS

Raw materials: Important unit processes; Types of dye intermediates and dyes; pigments, lacquers.

Total No. of Periods: 45

REFERENCE BOOKS:


PTEE 191 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

1. ELECTRICAL CIRCUITS

2. ELECTRICAL MACHINES
Principles of operation and characteristics of D.C. machines. Transformers (single phase and three phase) - Synchronous machines - 3 phase and single phase induction motors - (op. principles).

3. SEMI CONDUCTORS
Classification of solids as conductors and semiconductors - Intrinsic, Extrinsic semiconductors - P type and N type semiconductors - Junction diode - Zener effect - Zener diode - VI characteristics of junction and Zener diodes.

4. TRANSISTORS
Bipolar Junction Transistor - CB, CE, CC - Configurations - Simple treatment of characteristics and biasing. Elementary treatment of FET, MOSFET, JFET, DIAC and TRIAC.

5. TRANSDUCERS AND COMMUNICATION SYSTEM

Total No. of periods : 45

TEXT BOOKS:

UNIT 1 LAWS OF THERMODYNAMICS
Basic concepts and hints; Zeroth law; First Law of Thermodynamics - Statement and application; Steady flow energy equation; Second law of Thermodynamics - Statement, Limitations; Heat Engine, Refrigerator and Heat Pump. Available energy, Kelvin - Planck statement and Clausius statements; Equivalence entropy; Reversibility; Entropy charts; Third law of Thermodynamics - Statement.
UNIT 2 HEATING AND EXPANSION OF GASES

Expressions for work done, Internal energy and heat transfer for constant pressure, constant volume, isothermal, adiabatic and polytropic processes; Free expansion and Throttling.

UNIT 3 AIR STANDARD EFFICIENCY

Carnot cycle; Stirling Cycle; Joule Cycle; Otto Cycle; Diesel Cycle; Dual combustion Cycle.

UNIT 4 I.C. ENGINES, STEAM AND ITS PROPERTIES AND STEAM TURBINES

Engine nomenclature and classifications; SI Engine; CI Engine; Four Stroke cycle. Two stroke cycle; Performance of I.C Engine; Brake thermal efficiency; Indicated Thermal Efficiency; Specific fuel consumption.
Steam - Properties of steam; Dryness fraction; latent heat; Total heat of wet steam; Dry steam; Superheated steam. Use of steam tables; volume of wet steam, volume of superheated steam; External work of evaporation; Internal energy; Entropy of vapour; Expansion of vapour; Rankine cycle.
Steam turbines - Impulse and Reaction types - Principles of operation.

UNIT 5 SIMPLE MECHANISM, FLY WHEEL, DRIVES AND BALANCING

Kinematic Link, Kinematic Pair, Kinematic Chain; Slider Crank mechanism and inversions; Double slider crank mechanism and inversions.
Flywheel-Turning moment Diagram; Fluctuation of Energy
Belt and rope drives; Velocity ratio; slip; Creep; Ratio of tensions; Length of belt; Power Transmitted; simple and compound gear trains.
Balancing of rotating masses in same plane; Balancing of masses rotating in different planes.

Total No. of Periods : 45
1 CARBOHYDRATES

2 OIL, FATS AND WAXES
Types of oils-Development of Rancidity in an oil –Factors contributing to rancidity –Free acid value-Saponification value and iodine value of an oil- Methodology of determining these values-Problems on computing free acid, Saponification and iodine value-Types of Cholesterol- Risk factor in precipitating heart disease- Waxes-Classifications.

3 HETERO CYCLIC COMPOUNDS
Definition and reactions of Pyrrole, Furan, Thiophene, Pyridine- Reactions of furfural-Synthesis of Isoracizid.

4 PROTEINS
Classification of proteins- Tests for proteins- Determination of molecular weight of proteins.

5 DYES AND DYEING
Classification of dyes based on the mode of application of the dye to the fabric- Structural classification of dyes-Coupling reaction to produce azo dyes-Synthesis of the following azo dyes- Methyl orange, Methyl red and Congo red- Synthesis of Triphenyl methane dyes- Malachite green and para-rosaniline- naphthalamine dye- Preparation of Eosin- Introduction to natural dyes and Reactive dyes

6 PHARMACEUTICAL CHEMISTRY
Synthesis of Antimalarial drugs- isopentaquine and chloroquine- Antibacterial drugs-Synthesis of Sulphanilamide and sulphapyridine.

Total No. of Periods: 45
UNIT III IONIC EQUILIBRIA
- Acids and bases- Arrhenius concept-Lewis concept- Dissociation of weak acid- weak base- Ionic product of water-Buffer solutions- calculation of pH-Henderson’s equation-Hydrolysis of salts-
- Degree of hydrolysis-Determination- acid-base indicators-their applications-solubility product principle-Ionic equilibria involving complex ions

UNIT IV COLLOIDS
- Introduction to colloids- properties of colloids- coagulation of solutions- Origin of charge on colloidal particles- Determination of size of colloidal particles- Donnan Membrane equilibrium- Emulsions- Gels- Applications of colloids

UNIT V PHOTOCHEMISTRY

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

1. PRESERVATION
- Principles involved in long and short term preservation techniques for hides and skins; Preservation defects

2. PRETANNING PROCESSES
- Chemistry and principles of different pretanning processes - Seaking, liming, deliming, bating, pickling, depickling and degreasing

3. CLEANER PROCESSING IN BEAMHOUSE PRACTICES
- Salt-free curing options, sulphide free unhairing systems, ammonia-free deliming, salt free pickling systems, solvent and eco friendly degreasing systems. Strategies to bring down BOD, COD and TDS standards of tannery effluents

4. PRACTICE AND QUALITY CONTROL
- Different methods of pretanning processes as applied to light, heavy and industrial leathers.
- Process control in pretanning operations.

Total No. of Periods : 45

TEXT BOOKS:
leathers. Methods of drying of above leathers. Different types of finished leathers made from bag tanned leathers. Processing of splits for shoe suedes garments suede, grain finished leather and specialty finishes.

Total No. of Periods: 45

REFERENCE BOOKS:
4. PHYSICAL TESTING OF LEATHERS
Statistical testing - sampling position for physical testing of leathers. Different methods employed for physical testing of leathers - principles involved. Static and Dynamic methods. Non-destructive testing of leathers.

5. STANDARDS AND QUALITY CONTROL
Quality control in leather processing. Rectification of defects in hides, skins and leathers, control of yield, colour and finish of leathers, etc. Physical and chemical characteristics (specifications) of various types of leathers.

Total No. of Periods : 45

REFERENCE BOOKS:

PTLT 206 COMPUTER APPLICATIONS FOR LEATHER TECHNOLOGY 2 0 1 1 0 0

1. INTRODUCTION TO COMPUTER HARDWARE
Evaluation of computers, Generation of computers, Basics of computer Architecture, Processor basics, Input/Output systems, RISC versus CISC.

2. OPERATING SYSTEMS
Overview of operating systems, operation system concepts, DOS, UNIX and Windows operating systems.

3. INFORMATION TECHNOLOGY AND SYSTEMS
Types of information systems, Computer Networks – LAN, WAN, MAN and topologies, Internet and Intranet, e-mail and e-commerce, Decision making and support systems, Introduction to computer security.

4. PROGRAMMING LANGUAGES
C++ programs using the following concepts: Object oriented programming concepts, Constructor, Destructor, Friend function, operator overloading, Inheritance, Introduction to Java.

5. DATABASE AND ITS APPLICATIONS
Introduction to Visual Basic, Creating, Saving and Running the Projects, Data types and control structures, Creating and using menus, Visual Basic Events.

6. CAD SYSTEMS FOR LEATHER & LEATHER PRODUCTS
-Pattern grading & cutting for Footwear and garments.
-Design and Development of Leather products.
-Computerized color matching systems – its principles and application.

Total No. of Periods : 45

REFERENCE BOOKS:
3. Reference Manuals for CAD systems for Footwear and Garments.
PTLT 207 LEATHER ENGINEERING

Unit I
General principles and mechanism involved in various tanning machines. Mechanism of cutting and shearing action of helical blade systems. Bush, ball, roller and ring oil bearing, cam springs and their application and function in tannery machinery.

Unit II
Basic design, material selection and construction of pils, drums and paddle.

Unit III
Pneumatic steering mechanism and control as applied to dust control equipment, air compressor, auto spray, etc. Hydraulic steering mechanism in case of shaving, staking, embossing machines, etc.

Unit IV
Salient features and purpose of the various machinery used in beam house, tanning and finishing yards, unhairing, fleshing, scudding, sammying, setting, shaving, staking, buffing, dedusting, glazing, machines, finelox, hydraulic press, curtain coating, roller coating, transfer coating and measuring machine etc.

Unit V
Preventive maintenance and safety in the use of leather machinery

Total No. of Periods : 45

PTLT 208 THEORY AND MECHANISM OF ORGANIC TANNAGES

UNIT 1
Vegetable tannins - definition and classification. Occurrence, Biosynthesis. Chemistry of hydrolysable tannins - gallotannins, oligo tannins - their structural aspects including elagi tannin dimers, trimers, etc. Chemistry of condensed (flavanoid) tannins proanthocyanidins, dimers, trimers and other oligomers. Manufacture of vegetable tannin extracts.

UNIT 2
Tannins as well as non-tannins, polyphenolic constituents present in popular indigenous tanning materials like avaram, konnam, wattle, cutch, babul, myrobolan, etc and their Physico-chemical properties and effect on the physical properties of leathers.

UNIT 3
Mechanism of reaction of vegetable tannins with collagen. Electrolytic equilibria, diffusion equilibria, fixation and absorption equilibria.

UNIT 4
Synthetic tannins - Classification - properties, uses in leather industry and their general methods preparation. Mechanism of reaction with collagen.

UNIT 5
Formaldehyde, glutaraldehyde, oil, sulphonyl chloride and quinone tannages.

Total No. of Periods : 45
TEXT AND REFERENCE BOOKS:
2. Rodd, "Chemistry of carbon compounds", Vol. III-D, Chapter on "Hydrolysable tannins".

PTLT-209 PRACTICE OF LEATHER MANUFACTURE - II
1. Finished Leathers and Composition of finished Tanned leathers/semi finished leathers El leathers - Wet blue - Wet white - properties of these leathers short description of their manufacture.
   Function of different ingredients - Newer approaches in finishing. Problems encountered in finishing and their solutions. 9
2. Finished leathers from goat skins Glace kid - Resin uppers - Glazed uppers lining leathers - shoe suedes - garment suedes - Details of processing techniques. 10

3. Finished leathers from hair sheep and wool sheep skin. El and Wet blue leathers - various types of finished leathers from them - sheep nappa, suede garments, upper-lining, diaphragm leathers, glove leathers, Assortment of leathers. 9

4. Upgradation of leathers & Special effects Retannages - Embossing - Special effects by screen and block printing - Roller coating and other modern equipments Tie and dye leathers; Burnishable leathers and oil pull up leathers. 9

5. Specialty leathers - exotic leathers and furs Morocco, pleated leathers, book binding and chamois leathers; reptiles: crocodiles, lizards, etc; Dressing of fur skins. 9

Total No. of Periods : 45

REFERENCE BOOKS:
3. CLRI Process Bulletins.

PTLT 210 THEORY AND MECHANISM OF INORGANIC TANNAGES

1. INTRODUCTION TO COORDINATION CHEMISTRY, METAL IONS IN TANNING 10
   Werner's theory of coordination, origins of coordinative interactions, role of d and f orbitals, definition of ligands, nucleophilicity of ligands and electronegativity of donor atoms, chelation and masking, ligand field stabilisation energy and introduction of factors controlling molecular stability of transition metal complexes. Historical overview of mineral tanning.

2. AQUEOUS CHEMISTRY OF CHROMIUM 8
   Electronic configuration and its implications, common oxidation states of chromium, redox stabilities of chromium (VI) and
chromium (III) salts, redox potentials and their interconversion, protolysis, kinetic inertness of chromium (III), basicity, oxidation, oxidation and polymerisation, Stasny's series, McClanish precipitation point.

3. FACTORS CONTROLLING CHROME TANNING

Single and double bath chrome tannages and their relative merits and demerits, preparation of Basic chromium sulphate salt, reaction parameters influencing composition of BCS, kinetics of chrome tanning, diffusion and complexation, effects of float volume, pH, basicity, masking, temperature, drum speed, ageing chrome tanned substrates.

4. MECHANISM OF CHROME TANNAGE

Theories of chrome tanning, absorption, coating, electrostatic and hydrogen bond interactions and coordinative forces involved in chrome tanning, indirect evidence for chrome binding sites in protein, hydrothermal stability of chrome-collagen compound, chromium-induced structural changes in collagen.

5. OTHER INORGANIC TANNAGES

Aqueous chemistry of aluminium (III), zirconium (IV), titanium (IV) and iron (III) and its relevance to mineral tanning, chemistry of silicates and phosphates and their tanning mechanisms, mechanism classification of inorganic tannages and their relevance to combination tanning.

Total No. of Periods: 45

REFERENCE BOOKS:


SEMESTER V

PTLT-301 PRACTICE OF LEATHER MANUFACTURE - II

1. UTILITY, FASHION AND SPECIAL LEATHERS

Different types of raw materials used, properties of these leathers physical and chemical standards required process details to achieve the specification. Other types of leathers such as upholstery, washable, water resistant leathers, chamois glove and fashion leathers. Processing of exotic leathers such as reptiles, crocodiles, lizards etc.

Total No. of Periods: 3

2. PROCESS OPTIMISATION

Salt free curing options, sulphide free, unharieving systems, ammonia free deliming, salt free pickling systems, solvent free, eco-friendly degreasing systems, eco-friendly tanning systems, solvent free finishing systems and integrated strategies to achieve permissible BOG, COD and TDS standards of tannery effluents. Eco labelling practices followed in grading and assessment of finished leathers for various end uses.

Total No. of Periods: 3

3. ADVANCED FINISHING TECHNIQUES

Role of newer equipments like Autospray, Roller Coats, Continuous Embossing Machines, Finiflex, Auto tiggers, Staking machines etc. Methods such as oil pull up, waxy, burnishable, crazy horse, antiques grain, suede, screen painting, roller printing, tie and dye finishing, also pearl finishing, easy care, patent finishing, calicoic finishing, novel finishing techniques etc.

Total No. of Periods: 10

4. SPLIT PROCESSING AND UPGRADEATION

Split Shoe suede, garment suede, grain finished leather and speciality finishes. Processing technologies and finishing techniques specially suited for the purpose. Upgradation of lower ends for better utilisation. Transfer foil, lamination techniques, etc in split finishing.

Total No. of Periods: 10
REFERENCE BOOKS:

PTLT-302 CHEMISTRY AND TECHNOLOGY OF POST TANNING, FINISHING AND LEATHER AUXILIARIES 3 0 0 100

1. DYES AND DYEING OF LEATHER 12
Classification of dyes based on their chemical nature and also according to their application, their properties, blending of dyes, theory and practice of colour matching, theory and mechanism of dyeing, chemistry and application of dyeing auxiliaries such as leveling agents, wetting agents, dispersing agents and dye fixatives. Theory of colours, chromophoric groups and their optical absorption, structural features of dyes, factors affecting hue and colour, intensity, acid, basic and reactive dye classification. Introduction to the chemistry and technology of dye manufacture.

2. FATLIQUORS AND FATLIQUORING 11

3. RETANNING AGENTS 10
Chemical classification of syntans, sulphonation of naphthalene phenols, Naophols, Phenol-formaldehyde condensation reactions and Naphila, characterisation and photo oxidation mechanisms of phenolic terms, chemistry of light fast syntans, chemistry of amino resins and PU. Unit operations in syntan manufacture.

4. PIGMENTS, BINDERS, TOP COATING AGENTS AND OTHER AUXILIARIES 12

Total No. of Periods : 45

REFERENCE BOOKS:

PTLT-303 ENTREPRENEURSHIP IN LEATHER SECTOR 3 0 0 100

1. INDUSTRIAL ENTERPRISE 6
2. VENTURE PLANNING AND DEVELOPMENT 12

3. TECHNO - ECONOMIC FEASIBILITY REPORTS (TEFR) 5
   Components of TEFR - size of projects, Project costing - Selection and means of finance - cash-flow projections - Costing and pricing - Implementation schedules - PERT and related project scheduling charts - TEFR for tannery, shoe plants, leather chemical, leather garments and leather goods units.

4. RESOURCE MANAGEMENT 5
   Material and money flow - Labour management - Principles of production management - TQM concepts - ISO and related certification methods - Purchase management in leather sector - Credit financing and labour issues in leather sector - Productivity bottlenecks in tanneries and shoe plants and debottlenecking strategies - Inventory control measures for leather sector.

5. PRODUCTION PLANNING 5
   Operations research - time-motion studies - Principles of time management - Management information system - Intranet and Internet communication and its relevance in managing enterprises - Factors concerning system productivity in leather sector.

6. MANAGING MARKETS 12

Total No. of Periods : 45

PT LT 304 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 1 0 0

AIM
To impart knowledge on various environmental pollution aspects and issues.

OBJECTIVES
To create an awareness on the various environmental pollution aspects and issues. To give a comprehensive insight into natural resources, ecosystem and biodiversity. To educate the ways and means to protect the environment from various types of pollution. To impart some fundamental knowledge on human welfare measures.

UNIT – I 9

UNIT – II 9
UNIT – III
Solid wastes - quantities and characterizations - industrial - hazardous waste - radio active waste - simple treatments and disposal techniques.

UNIT – IV
Air pollution-types and sources of gaseous pollutants- particulate matter - hazardous air pollutants - global and atmospheric climatic change - acid rain. Industrial exhaust - characterization - various treatment techniques of industrial flue gas

UNIT – V

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:
1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt., Ltd., Ahmedabad India,


PTLT 305 TANNERY WASTE MANAGEMENT 3 0 0 100

1. PERSPECTIVES
Leather industries and environmental implications. Legislations on environmental protection, standards for discharge of liquid effluents, air emissions into environment.

2. TANNERY EFFLUENTS
Sources of generation of liquid and solid wastes in tanneries. Characterisation of liquid wastes and assessment of critical parameters of pollution (solids, BOD, COD, nutrients, metals and phenolics)

3. PRINCIPLES OF TREATMENT OF TANNERY WASTE WATER AND DESIGN OF EFFLUENT TREATMENT PLANTS
Units of operation in controlling solids at primary stages of treatment. Units of operation in controlling dissolved organics at secondary stages of treatment. Units of operation in controlling pollutants at tertiary stage.

4. SOLID WASTE MANAGEMENT
Composition of solid wastes - physical, chemical and biological characteristics. Principles of treatment and disposal of solid wastes.

5. IN-PLANT MANAGEMENT FOR REDUCTION OF POLLUTION
House-keeping, segregation of waste streams. Recovery and reuse of valuable waste materials found in liquid effluents including chromium, sulphides etc.

Total No. of Periods : 45
REFERENCE BOOKS:

1. Thomas, C. Thorstensen. Fundamentals of Pollution Control for the leather industry.

PTLT-306 ORGANISATION & MANAGEMENT OF LEATHER MANUFACTURE

1. TRENDS IN LIVESTOCK POPULATION

Categories of livestock, global distribution, India's share, distribution livestock in India, growth rates, trends and relative importance, projections.

2. AVAILABILITY OF HIDES AND SKINS

Concepts, global availability, India's share in the world, trends in meat production and consumption practices, fallen animal recovery systems, off-take rates, slaughter and mortality rates, availability of hides and skins, projections.

3. MARKETING OF HIDES AND SKINS

Collection and mobilization of hides and skins, Origin and characteristics, Transportation, Grading systems, Pricing, major markets and sourcing of hides and skins, Broad features of marketing.

4. STRUCTURE OF TANNING INDUSTRY IN INDIA

Distribution of tanneries in India, scale of operation, type of ownership, line of specialization, capacity and production, employment pattern, industrial policy, environmental issues, leather complexes.

5. STRUCTURE OF LEATHER PRODUCT INDUSTRIES IN INDIA

Categories of products, distribution of footwear, leather garments, leather goods industries, scale of operation, ownership pattern, capacity and production, industrial policy, employment, exports and domestic market.

6. INDIA'S FOREIGN TRADE AND POLICY

Economic and social importance of leather sector, trade terms, trends in the exports, major importing countries, imports of India, review of trade policy and impact.

7. GLOBAL MARKET FOR LEATHER AND LEATHER PRODUCTS

Shifts in production bases, structure of global market, trends in the global trade, major markets, competitions for India, dynamics of global leather trade.
8. EMERGING DIMENSIONS IN THE GLOBAL TRADE
Non-price Competition, Trade related Environmental and Social issues, Eco-labels and Social certification, E-Commerce, impact of World Trade Organisation.

9. STRATEGIES FOR EXPORT PROMOTION
Identification of critical factors, Role of various organizations, Planning and sustainable development, Trade policy, Developing market network and market intelligence, Resource and product related strategies.

TEXT BOOKS AND REFERENCES:
2. Report on Capacity Utilisation and Scope for modernization of Indian tanning industry, CLRI, 1990
3. Report of the Committee on The Development of Leather and Leather Manufactures for Exports (Seetharamaiah Committee Report), Govt of India 1972
6. Bulletins of India’s Foreign Trade in Leather and Leather Products, CLRI.

PTCH 402 PROFESSIONAL ETHICS AND HUMAN VALUES

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS


UNIT V GLOBAL ISSUES
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral
leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

**TEXT BOOKS:**


**REFERENCE BOOKS:**


**PTCH 401 PROCESS ECONOMICS AND INDUSTRIAL MANAGEMENT**

3 0 0 100

**AIM**
To introduce process economics and industrial management principles to chemical engineers

**OBJECTIVES**
The objective of this course is to teach principles of cost estimation, feasibility analysis, management, organization and quality control that will enable the students to perform as efficient managers.

**PART - A**

**UNIT I PRINCIPLES OF MANAGEMENT AND ORGANISATION**

5

Planning, organization, staffing, coordination, directing, controlling, communicating, organization as a process and a structure, types of organizations.

**UNIT II PRODUCTION AND MANAGEMENT**

10

Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning, routing; scheduling; dispatching; costs and costs control, inventory and inventory control.

**UNIT III QUALITY AND QUALITY CONTROL**

4

Elements of quality control, role of control charts in production and quality control.

**PART B**

**UNIT I ENGINEERING ECONOMICS FOR PROCESS ENGINEERS**

2

**UNIT II INTEREST, INVESTMENT COSTS AND COST ESTIMATION**

8

Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, invested capital and profitability.

**UNIT III PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT**

8

Estimation of project profitability, sensitivity analysis, investment alternatives, replacement policy, forecasting sales, inflation and its impact.

**UNIT IV ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE**

4

UNIT V ECONOMIC BALANCE

Essentials of economic balance - Economic balance approach, economic balance for insulation, evaporation, heat transfer.

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

PTLT- 401 FOOTWEAR MATERIALS AND COMPONENTS

3 0 0 100

1. UPPERS & LINING
   i. Leathers : Different types of upper and lining leathers, manufacturing techniques, defects, grain characteristics, stretch direction, cutability, area measurement, evaluation, strength, wear and comfort properties.

2. SOLING MATERIALS
   Different types of soling material - leather, rubber, PU, PVC, EVA, TPR, resin rubber, their method of manufacturing, assessment and application.

3. ADHESIVES
   Different types of adhesives used in footwear industry - latex, polyurethane, polyurethane - single and double component, hot melt adhesives, method of manufacturing, evaluation techniques and applications.

4. INSOLES
   Kind of insole boards, leathers, cellulose, synthetic fibre, non woven, seat boards, manufacture, performance, evaluation.

5. GRINDERS
   Manufacture, performance and evaluation of toepuff, steel shanks, heels and tapes and bindings.

6. FASTENERS
   Materials, Manufacture, use and properties of elastic, touch and close fasteners, slide fasteners, buckles and trims, and shoe laces.

7. DRESSING MATERIALS
   Shoe polishes, waxes, cream : Different types of dressing materials, crayons etc., formulation technique and application, evaluation.

Total No. of Periods : 45

REFERENCE BOOKS:
UNIT III STATISTICAL PROCESS CONTROL

The seven tools of quality: Statistical Fundamentals – Measures of central tendency, dispersion, population and sample, normal curve, control charts for variables and attributes, process capability, concept of six sigma, new seven management tools.

UNIT IV TQM TOOLS

Benchmarking – Reasons to benchmark, Benchmarking process, quality function deployment (QFD) – House of quality, QFD process, benefits, Taguchi quality loss function, total productive maintenance (TPM) – concept, improvement needs, FMEA – stages of FMEA.

UNIT V QUALITY SYSTEMS

Need for ISO 9000 and other quality systems, ISO 9000:2000 quality system – elements, implementation of quality system, documentation, quality auditing, QS 9000, ISO 14000 – concept, requirements and benefits.

Total No. of Periods: 45

TEXT BOOKS:


REFERENCE BOOKS:


PTLT 402 PROJECT WORK

Each student is required to submit a Report on the project assigned to him by the Department. The report should be based on the information available in the literature or data.
determined in the laboratory/industry. The object of the project is to make use of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme.

PTLT 001 – SCIENCE OF LEATHER SUPPLEMENTS AND SYNTHETICS 3 0 0 100

1. Chemistry of the most common polymeric materials used in leather industry as supplements 5

2. POLYMERISATION FUNDAMENTALS 15
   Concept of a macromolecule, natural and synthetic polymer, modes of polymerisation, radical, condensation, stereo regular polymerisation, polymerisation kinetics, mechanism, anionic and cationic polymerisation.
   Polymers with linear, branched and cross-linked structures, thermoplastic and thermostet polymers, bulk, solution, suspension and emulsion polymerisation.

3. ANALYSIS AND TESTING OF POLYMERS 15
   Molecular weight and distributions of polymers, different methods of molecular weight determinations, colligative properties, viscometry, light scattering techniques, thermal analysis of polymer, crystallinity and glass transitions and other mechanical properties, spectral analysis such as IR, UV, and NMR of polymers.

4. POLYMERS FOR LEATHER APPLICATION 10
   Polymers for leather processing, syntans, filling agents, base coats, top coats and adhesives.

Total No. of Periods: 45

REFERENCE BOOKS:

PTLT 002 ANIMAL BYPRODUCTS UTILISATION 3 0 0 100

1. INTRODUCTION 9
   Types of animal byproducts - from abattoirs, meat processing plants, poultry, fishing and other sources including fallen animals. Present methods of collection, processing and utilisation in developing countries vis-a-vis developed countries: conservation techniques and concept of two tier technology. Protein meals from animals by-products including fallen animals and their significance in livestock feeds.

2. DIFFERENT METHODS OF RENDERING 9
   Bone products and their utilisation. Keratinous proteins - various sources keratinous based products and their uses.

3. ANIMAL BLOOD, ITS PRODUCTS AND THEIR UTILISATION 9
4. COLLECTION AND CONSERVATION OF ORGANS AND GLANDS FROM SLAUGHTERED ANIMALS: POSSIBLE SCOPE OF THEIR UTILISATION

Anaerobic digestion, its significance for the preparation of animal feed, fuel gas, fertilizer, etc. Quality control including microbiological aspects of products processed from animal by-products.

5. PRESENT INDUSTRIAL STATUS OF VARIOUS BY-PRODUCTS IN THE COUNTRY

Process studies on
a. Glue making from tannery wastes
b. Bone glue and deproteinisation of bone
c. Horn and hoof meal
d. Protein meals by different methods

Total No. of Periods: 45

REFERENCE BOOKS:

PTLT 003 CLEANER PRODUCTION IN TANNERIES 300 100

1. Current level of pollution load in leather processing - Pollution control norms for various parameters - Eco-labeling concepts in leather sector.
   Less salt and salt-less curing techniques - controlled drying techniques - cooling and freezing - chemical alternatives of curing - use of biocides.

2. CLEANER PRETANNING OPERATIONS

Desalting Procedures for TDS reduction, Use of enzymes in beam house for pollution reduction, Soaking enzyme, Unhairing enzyme, Degreasing enzyme, Recycling of soak liquors - sulfide-free and Less- sulfide unhairing methods based on enzymes and other chemical alternatives-time splitting - Recycling of liming floats - Lime-free processing, Ammonium - free deliming agents - Carbon dioxide and other alternatives - salt-less pickling - pickle-less chrome tanning - Recycling of pickle floats.

3. CLEANER TANNING METHODS

High exhaustion chrome tanning - Recycle and reuse methods - chrome recovery and reuse - closed pickle - tan recycling procedures. Less - chrome and chrome-free tanning - organic tannages - full vegetable tanning processes - alternative mineral tanning systems

4. Cleaner wet finishing technologies - use of high performance auxiliaries - Screening of chemicals/auxiliaries based on biodegradability and exhaustion characteristics - process control for optimization of use of chemicals/auxiliaries for pollution reduction - Formaldehyde - free retanning and AOX-free fatliquoring - Natural dyes Dyeing with Objectionable - amine-free dyes.

5. CLEANER FINISHING TECHNOLOGIES

Water based Finishing technologies - Reduction of VOC -
formaldehyde - free protein finishes - Safer pigments free from TOXIC metal ions. Newer finish applications for pollution reduction.

Total No. of Periods : 45

REFERENCE BOOKS:
1. Leather Journals from 1960 onwards.

PTLT 004 TECHNOLOGY OF LEATHER SUPPLEMENTS & SYNTHETICS

1. Technology of the most common polymeric materials used in leather industry as supplements. Polymer and Rubber industries in India. 5
2. Manufacture of industrially important polymers for plastics, fibres and latexomer - Polytetrafluoroethylene, polypropylene, polyvinyl chloride, polyvinyl alcohol, polycrylonitrile, polystyrene, polyurethane, fluoro-carbon polymers, epoxy resins, polyamides, polyesters, alkyl resins, silicone polymers, cellulosics. 15
3. Fabrication of polymeric materials, compounding and mixing, casting, extrusion, fibre spinning, molding, coating, foam fabrication. 6
4. Testing of polymers. Mechanical and thermal testing. 8
5. Manufacture of rubber and elastomers. Natural rubber, processing, vulcanizing synthetic elastomers, butadiene copolymer, neutral rubber, polyisoprene polybutadiene, Polymer and rubber industries in India. 10

Total No. of Periods : 45
II. Upgradation techniques for grain/split leather

Total No. of Periods : 90

PTLT 006 TECHNOLOGY OF HEAVY LEATHER MANUFACTURE (PRACTICAL)

Manufacture of vegetable tanned sole leathers
i. by pit
ii. by rapid tanning methods

Manufacture of chrome and waxed chrome sole leathers
Manufacture of water proof sole leathers, processing hardness and saddlery leathers, lining leathers.

DIFFERENT TYPES OF LEATHERS USING RAW/WET BLUE E.I., COW AND BUFFALO HIDES, CALF SKINS.

Picking band leathers
Sports goods leathers
Upholstery leather
Aniline / semi-aniline calf/side leathers
Zug grain upper leathers
Nappa leathers
Patent leathers
Shrunken grain leathers
Suede upper leathers
Burnishable upper leathers
Kattai and Bunwar leathers

Total No. of Periods : 90

PTLT 007 COSTING AND VALUE ENGINEERING IN LEATHER

1. INTRODUCTION TO VALUE ENGINEERING
   a. Value and value analysis
   b. Identification of its function/need use

2. OBJECTIVES OF VALUE ANALYSIS
   Importance in import substitution

3. VALUE ANALYSIS AT DIFFERENT STAGES
   Techniques of value analysis

4. VALUE ANALYSIS PROCEDURE
   a. the information phase
   b. The analytical phase
   c. Recommendation
   d. Implementation

5. ORGANISATION FOR VALUE ANALYSIS
   a. Organisation structure
   b. Responsibilities of individual departments

PROJECT WORK
   Application of value analysis - A case study

Total No. of Periods : 45
PTLT 008 INDUSTRIAL ENGINEERING IN LEATHER SECTOR
3 0 0 1 C0
1. INTRODUCTION : HISTORY AND DEVELOPMENT OF WORK STUDY 10
   - Nature and Scope of Work Study
   - Productivity and workstudy

2. INTRODUCTION OF TECHNOLOGY MANAGEMENT 12
Productivity Management - Japanese management practices - Meaning and functions of personnel management.
Manpower planning :
Importance, Assessing current human resources - assessing future requirement - matching demand and supply. Objectives - Sequencing - Scheduling - Production - Planning and Control. Materials management
Micro and macro level - systems approach - Materials planning - SQC - Incoming material control Demand analysis and forecasting. Meaning of Demand - Types of Demand - Demand forecasting - forecasting methods

3. FACTORS INFLUENCING PLANT LOCATION-LOCATION 8
Analysis - Location decisions - Single facility and Multi - facility need for layout study - classification of layout.

4. MATERIAL HANDLING IN TANNERIES 8
Objectives and benefits of better handling - relationship between layout and materials - principles of material handling - Basic handling equipment types, handling system design - equipment selection - packaging - storage systems

5. SERVICES AND ENVIRONMENT 7
Illumination, Noise Technology, Ventilation & climate, waste management. Methods and equipments for tannery waste treatment - water pollution from tanneries.

Total No. of Periods : 45

REFERENCE BOOKS:
8. James Apple Material handling system design Ronald Press.
PTLT 009 LEATHER BIOTECHNOLOGY

1. PROTEINS ANDNUCLEIC ACID & ENZYMOLGY
Chemistry of DNA and RNA: Structure, Conformation and function.
Proteins - Chemistry, structure and Function. Separation
Principles in proteins. Classification, assay, characterization,
mechanism of action, enzyme kinetics, immobilized enzymes.

2. GENETIC ENGINEERING (RECOMBINANT DNA TECHNOLOGY)
Principles and methods. Essentials of biotechnology - products
of biotechnology. Restriction of enzymes, vectors, DNA cloning
strategies.

3. BIOTECHNOLOGY FOR HIDES/SKINS IMPROVEMENT
Applications in Animal nutrition and animal production: embryo
transfer, gene transfer, transgenic animals. Cleaner Leather
Processing. Use of enzyme options in beam house operations
- Soaking, unhauling, bating, degreasing, offal treatment. Types
of enzymes - proteases, lipases - properties, assay sytem and
production. Types of fermentation. Preparation of media,
preparation of inoculum, separation and purification of products.

4. WASTE MANAGEMENT AND UTILISATION OF COLLAGENOUS
Tissues FOR BIOMEDICAL AND OTHER APPLICATIONS
General features of the organic and inorganic pollutants of
tannery. Stabilisation and disposal of organic and chemical
wastes and their biological treatment. Treatment of tannery
effluents. Energy recovery. Collagen and its application in food,
cosmetic and medical fields.

Total No. of Periods: 45

REFERENCE BOOKS:
1. Röhm, H.J. and Reed, G. "A Comprehensive Treatise on

   1989.
6. Pavanakrishnan, R and Dhar, S.C., "Enzyme Technology in
   Biotechnology practices", CLR Publication.
   - Hill Inc. 1983.

PTLT 010 SAFETY IN LEATHER INDUSTRIES

1. SAFETY PHILOSOPHY
Legal framework of safety & health in India. International
conventions and trends. Responsibilities and enforcement
mechanism. Need for safety & health (cost/benefit rational,
safety, environment and productivity triangle).

2. HAZARD IDENTIFICATION AND ASSESSMENT
Role of industrial hygiene, Hazard classification (hazard
categories and groups). Hazard identification and assessment
(tools and methods).

3. SAFETY IN USE OF HAZARDOUS SUBSTANCES AT WORK
Chemical and biological hazards in the work place in the leather
industry. Health effects of chemical and biological exposure.
Hazard information systems on hazardous substances (material
safety data sheets, labelling).
Workplace exposure monitoring and evaluation.
Hazard prevention and control measures (storage, handling and disposal) in the leather industry.

1. PRODUCTIVE MACHINE SAFETY IN THE LEATHER INDUSTRY
   8
   Safety hazards of machinery, machine tools and electrical installations; Hazard prevention and safeguarding of machinery (guards, machine controls, ergonomics); Role of preventive maintenance.

5. WORK ECOLOGY AND ERGONOMICS
   9
   Safe workstation design and layout.
   Manual handling of material.
   Lighting (standards, use of natural and artificial illumination).
   Climate control (standards, temperature/humidity, improving general ventilation).
   Noise management (standards, prevention and protection).
   Safety of factory premises and installations (railings, flooring, safe structures).
   Welfare measures.
   Personal protection and hygiene (selection, use, maintenance).

6. EMERGENCY PREVENTION AND PREPAREDNESS
   7
   Planning for emergencies.
   Control of fire and explosion.
   Dealing with medical emergencies.

7. SAFETY & HEALTH MANAGEMENT AND PROMOTION
   3
   Promoting safety & health practices at the workplace (training, safety and warning signs) Role of responsibilities of managers, supervisors and workers.

Total No. of Periods : 45

REFERENCE BOOKS:

PTLT 011 PRINCIPLES OF PLANT DESIGN FOR LEATHER AND PROCESS CONTROL SYSTEMS

1. INTRODUCTION
   4
   Brief description of tannery operations where measurement and control is needed.
   Discussion of parameters to be measured and controlled, viz. flow, temperature, pressure, pH. Discussion on necessity for controls. Advantages and disadvantages of process control, application in tannery.

2. PRINCIPLES, ILLUSTRATIONS AND METHODOLOGY OF THE FOLLOWING WITH REFERENCE TO THEIR APPLICATION IN THE LEATHER PROCESSING
   8
   Process Design
   Process flow sheeting
   Material and energy flows and networks
   Process engineering flow schemes
   Codes, Standards and Fabrication processes
   Utilities/Offsite facilities
   Inplant safety
   Selection of Materials of construction
3. BASIC DESIGN OF PROCESS EQUIPMENTS & LAYOUT PRINCIPLES

Basic Design of process Equipments:
- Stirred reactors (gas liquid and liquid - solid systems).
- Tanning drums and supporting units.
- Forced circulation leather dryer.
- Distillation units.
- Principles of layout for Tanneries and Chemical Process Units.
- Factors to be considered for layout selection.
- Types of layouts and their design basis.

4. INDUSTRIAL INSTRUMENTATION


5. PROCESS CONTROL

Introduction to the concept of automatic control. Types of control.

6. ROLE OF COMPUTERS IN PROCESS CONTROL

Case studies in wet operation, Utility - Requirements

Total No. of Periods : 45

REFERENCE BOOKS:
1. Eckman, D.P. Industrial Instrumentation.
2. Millard H. Lajoy. Industrial Automatic Control

8. 'Tannery design' - CLRI Publication.

PTLT-012 LEATHER GOODS AND GARMENTS TECHNOLOGY

1. MATERIAL


2. CUTTING AND CLICKING

Introduction to hand cutting; Preparation of knives & tools; Clicking machines - mechanical and pneumatic/hydraulic; Pattern interlocking/interweaving for material optimisation.

3. ASSEMBLY & STITCHING

Introduction to various sewing machines-Flat bed; cylinder bed & special type mic's; different feed mechanisms; Basic sewing practice; Various types of Assembly techniques for Leather Goods and Garments.

4. PATTERN DESIGNING

Basic design development - measurements / Sizing chart for men women & children; Adoption of styles to basic blocks; Pattern development for leather goods. Pattern grading for Leather Garments. CAD applications for Leather Goods and Garment design & production.
5. ORGANISATION & MANAGEMENT

Feasibility reports for leather goods and garment production; Machinery requirement/plant layout, Process scheduling and line balancing; Quality control measures in leather products manufacture; Packaging methods & practices; Costing, pricing and marketing procedures - for domestic, international markets.

Total No. of Periods: 45

REFERENCE BOOKS:

REGULATIONS AND SYLLABUS
(REGULATIONS 2005)

B.Tech. Degree Programme
(Part Time 7 Semesters)

TEXTILE TECHNOLOGY

A.C. COLLEGE OF TECHNOLOGY
ANNA UNIVERSITY
CHENNAI 600 025
REGULATIONS
AND
SYLLABUS
(REGULATIONS 2005)

Controller of Examinations
A.C. Tech, Anna University,
Chennai-600 025, India

B.TECH DEGREE PROGRAMME
(PART TIME 7 SEMESTERS)

TEXTILE TECHNOLOGY

Deputy Controller of Examinations
A.C. College of Technology Campus,
Anna University, Chennai-600 025.

A.C. COLLEGE OF TECHNOLOGY
ANNA UNIVERSITY
CHENNAI - 600 025
A.C.COLLEGE OF TECHNOLOGY
ANNA UNIVERSITY: CHENNAI – 600 025
(An Autonomous Constituent Institution of Anna University)

REGULATIONS 2005

B.E. / B.Tech. (Part-Time – 7 Semesters)
Degree Programmes

Effective from December 2004-2005 and applicable to the students admitted to the A. C. College of Technology.

1. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these regulations, unless the context otherwise requires:

(i) "Programme" means the B.E./B.Tech. (Part-Time – 7 Semesters) Degree Programme.
(ii) "Branch" means specialization or discipline of B.E./B.Tech. (Part-Time – 7 Semesters) Degree Programme, like Chemical Engineering, Textile Technology, etc.
(iii) "Course" means a theory or practical subject that is normally studied in a semester like, Mathematics, Physics etc.
(iv) "Institution" means the A.C. College of Technology the autonomous constituent Institution of Anna University.
(v) "Head of Institution" means the Dean of the Institution who is responsible for all activities of the Institution and for implementation of relevant rules of this Regulations.
(vi) "University" means Anna University.

2. CONDITIONS FOR ADMISSION

2.1 Candidates seeking admission to the first semester, also known as Bridge semester of the part-time B.E. / B.Tech degree programme shall be required to have passed the Diploma in Engineering/Technology in the relevant branch
2.2 Eligibility Candidates seeking admission shall satisfy the following conditions:

(i) Eligibility conditions such as class, marks, number of attempts shall be as prescribed by the Syndicate of the University from time to time.

(ii) Shall have been employed for at least one year after qualifying for the Diploma, the period being counted as on 1st January of the academic year in which admission is sought.

(iii) Notwithstanding the qualifying examination the candidate might have passed [vide clause 2.1] he/she have a minimum level of proficiency in Mathematics, Physics, Chemistry and the relevant branch of study as may be prescribed by the University.

(iv) Shall be employed within a zone of 65km radius from the institution.

(v) Shall satisfy the conditions of physical fitness as prescribed by the syndicate of the University.

3. DURATION OF THE PROGRAMME

The duration of the programme shall be seven consecutive semesters, spread over 3.5 academic years, two semesters constituting an academic year. Each semester shall have a minimum of 75 working days (evenings) excluding the end-semester examination.

4. BRANCHES OF STUDY

A candidate may be offered, at the time of admission, one of the following branches of study:

1. B.Tech. Chemical Engineering-Diploma in Chemical Engineering / Chemical Technology / Chemical Technology (SW) / Petroleum Engineering / Petro
6.2.2. Practical Subjects:
Every practical exercise / experiment shall be evaluated based on conduct of experiment / exercise and records maintained. There shall be at least one mid-semester test. The criteria for arriving at the internal assessment marks shall be decided by the Head of the institution and shall be announced at the beginning of every semester.

6.2.3. Theory Subjects with Laboratory Component:
If there is a theory subject with laboratory component, there shall be three tests; the first two tests (each 100 marks) will be from theory portions and the third test (maximum mark 100) will be for laboratory component. The sum of marks of first two tests shall be reduced to 10 marks and the third test mark shall be reduced to 10 marks. The sum of these for 20 marks may then be arrived at and rounded to nearest integer.

6.2.4. Project Work:
There shall be three assessments (each 100 marks) during the semester by a review committee. The student shall make presentation on the progress made before the committee. The Head of the institution shall constitute the review committee for each branch of study. The total marks obtained in the three assessments shall be reduced to 20 marks and rounded to the nearest integer.

7. DISCIPLINE

7.1. Every student is required to be disciplined and to have decorous behavior both inside and outside the campus and not to indulge in any activity, which will tend to bring down the prestige of the Institution and university.

7.2. Any act of indiscipline of a student reported to the Head of Institution will be referred to a Discipline and Welfare Committee nominated by the Institution/University from time to time, for taking appropriate action.

7.3. If a student indulges in malpractice during tests/ examinations, the student shall be liable for punitive action as prescribed by the Institution/University from time to time.

8. REQUIREMENT FOR COMPLETION OF A SEMESTER:

8.1. A candidate who fulfills the following conditions shall be deemed to have satisfied the requirements for the completion of a semester.

   i) He / She secures not less than 70% overall attendance taking into account the total number of periods attended by the candidate in all the courses put together as against the total number of periods in all the courses offered during the semester.

   ii) He / She earns a progress certificate form the Head of the Department and the Head of Institution for having satisfactorily completed the programme of study in all the courses pertaining to that semester.

   iii) His / Her conduct is found to be satisfactory as certified by the Head of the Department and the Head of Institution.

8.2. Candidates who do not complete the semester (as per clause 8.1) will not be permitted to write the end-semester examination and are not permitted to go to next semester. They are required to repeat the incomplete semester in the next academic year.

9. REQUIREMENTS FOR APPEARING FOR END-SEMESTER EXAMINATION

A candidate shall normally be permitted to appear for the end-semester examination of the current semester, if he / she has satisfied the semester completion requirements (vide clause 8) and has registered for examination in all the courses of that semester.
10. REQUIREMENT FOR PROCEEDING TO A HIGHER SEMESTER

A candidate shall be permitted to proceed from the current semester to the next semester, irrespective of the arrear courses he / she may have in the earlier semester only if,

i) He / She has satisfied all the semester completion requirements of the current semester and

ii) He / She has registered for the end semester examination in all the courses of the current semester and also in all arrears course, if any.

11. PASSING REQUIREMENT AND CLASSIFICATION OF SUCCESSFUL CANDIDATES

11.1. A candidate shall be declared to have passed the examination in a course of study if he / she secures 50% of the total marks (continuous assessment plus end-semester examination marks) prescribed for that course and if he / she has also secured 45% of the marks in the end-semester examination conducted by the Institution. The rule is applicable to theory and practical courses including Project Work.

11.2. A candidate who has been declared as “failed” in a particular course may reappear for the end-semester examination in that course as and when the examination in that course is conducted and secure a pass. However, the continuous assessment marks obtained by the candidate in the first attempt shall be retained and considered valid for all subsequent attempts.

11.3. A student can apply for revaluation of his / her end-semester examination answer paper in a course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Heads of Departments concerned. The Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Heads of the Departments.

11.4. A candidate who qualifies for the award of the degree (vide clause 14) passing the examination in all the courses in all the seven semesters in his / her first appearance within seven consecutive semesters (3.5 academic years) and in addition secures an aggregate of not less than 75% of the total marks (continuous assessment plus end-semester examination marks) for all the courses in the semester II to VII put together shall be declared to have passed the examination in First Class with Distinction. For this purpose, the withdrawal from examination (vide clause 12) shall not be construed as an appearance. Further any authorized break of study will be excluded from the total duration while finding the period of completion (vide clause 13.3).

11.5. A candidate who qualifies for the award of the degree (vide clause 14) passing the examination in all the courses in the Semester II to VII within a period of eight consecutive semesters after his / her commencement of study in the second semester and in addition secures an aggregate of not less than 60% of the total marks (continuous assessment plus end-semester examination marks) for all the courses in the semesters II to VII put together shall be declared to have passed the examination in First Class. For this purpose the period of completion will be arrived at by excluding any authorized break of study, (vide clause 13.3).

11.6. All other candidates who qualify for the award for the degree (vide clause 14) shall be declared to have passed the examination in Second Class.

11.7. A candidate who absents in the end-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.
12. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

12.1 A candidate, may for valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of one or more courses or consecutive examinations of more than one course in a semester examination.

12.2 Such withdrawal shall be permitted only once during the entire period of study of the degree programme.

12.3 Withdrawal application is valid only if it is made within the prescribed number of days prior to the commencement of the examination in that course or courses and recommended by the Head of the Department and approved by the Head of the Institution.

12.4 Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.

12.5 The candidate shall reappear in the examination only when the examination in the withdrawn course or courses is conducted subsequently.

13. PROVISION FOR BREAK OF STUDY

13.1 Break of study shall not normally be permitted. However, if a candidate intends to temporarily discontinue the programme in the middle for valid reasons, and to rejoin the programme in a later semester, permission may be granted based on the merits of the case provided he/she applies to the Institution in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Department stating the reasons and the probable date of rejoining the course.

13.2 The candidate rejoining the programme after the authorized break of study shall be covered by the rules and regulations in force at the time of rejoining.

13.3 The duration specified for passing all the courses for the purpose of classification (vide clause 11.4 and 11.5) shall be increased by the period of such authorized break of study.

13.4 The total period for completion of the programme reckoned from the commencement of the first semester in which the candidate was admitted shall not in any case exceed the prescribed maximum period (vide clause 14), irrespective of the period of break of study.

13.5 If any student is either detained in a semester for want of requisite attendance, progress and good conduct or suspended from the programme for indiscipline, the resulting period of break of study shall not be considered as an authorized break of study for purpose of classification and clause 13.3 is not applicable in this case.

14. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A candidate shall be declared to be eligible for the award of the Degree if he/she has:

i) Undergone the programme for a period of seven semesters.

ii) Passed the examinations in all the courses prescribed in the respective curriculum within a maximum period of 16 Semesters reckoned from the commencement of the first semester to which the candidate was admitted. This maximum period shall be 20 Semesters in the case of women candidates.

iii) No disciplinary action pending against him/her.

iv) The award of the degree must be approved by the syndicate.

15. REVISION OF REGULATIONS AND CURRICULUM

The Institution may from time to time revise, amend or change the regulations, courses of study, curriculum, syllabi and assessment procedure, if found necessary.
### DEGREE OF BACHELOR OF TECHNOLOGY
### REGULATION 2005 CURRICULUM

#### SEMESTER - I

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT CY 171</td>
<td>Chemistry I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT GE 171</td>
<td>Engineering Graphics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT MA 171</td>
<td>Mathematics I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT PH 171</td>
<td>Physics I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT GE 172</td>
<td>Fundamentals of Computing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

#### SEMESTER - II

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT CY 181</td>
<td>Chemistry II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT EE 191</td>
<td>Basic Electrical and Electronics Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT GE 181</td>
<td>Engineering Mechanics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT PH 181</td>
<td>Physics II</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>PT MA 181</td>
<td>Mathematics II</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

#### SEMESTER - III

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT MA 506</td>
<td>Statistics and Linear Programming</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT CH 217</td>
<td>Polymer Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT T 204</td>
<td>Textile Fibre Production</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT T 202</td>
<td>Physical Structure and Properties of Fibres</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PT T 301</td>
<td>Spun Yarn Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>
### SEMESTER - IV

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTT 402</td>
<td>Process Control in Spinning</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 315</td>
<td>Technology of Weaving Preparation and Weaving</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 303</td>
<td>Fabric Structure</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 304</td>
<td>Knitting Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 305</td>
<td>Chemical Processing of Textile Materials I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

### SEMESTER - V

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTT 308</td>
<td>Technology of Fabric Manufacture</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 309</td>
<td>Chemical Processing of Textile Materials II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 310</td>
<td>Quality Assessment of Textiles</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 311</td>
<td>New Spinning Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 306</td>
<td>Garment Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 317</td>
<td>Textile Manufacture Lab</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

### SEMESTER - VI

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTT 312</td>
<td>Mechanics of Textile Machinery</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 401</td>
<td>Computer Application in Textile Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 403</td>
<td>Process Control in Fabric Manufacture</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 403</td>
<td>Elective I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 403</td>
<td>Elective II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 411</td>
<td>Quality Assurance Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

### ELECTIVES

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTT 001</td>
<td>Fibre and Textile Composites</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 002</td>
<td>Textured Yarn Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 003</td>
<td>Silk yarn Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 004</td>
<td>Theory of staple fibre opening</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 005</td>
<td>Mechanics of staple fibre drafting</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 006</td>
<td>Technology of staple fibre yarn twisting</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 007</td>
<td>Long staple fibre spinning process</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 008</td>
<td>Process Control in the production of man made fibre yarns</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 009</td>
<td>Mechanics of Textile Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 010</td>
<td>Bonded fabrics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 011</td>
<td>Technical Textiles</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 012</td>
<td>Colour Science, Measurement and its Applications</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 013</td>
<td>Fabric And Garment Finishing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTT 014</td>
<td>Environmental Management in Textile Industry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Code No.</td>
<td>Course Title</td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>M</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>PTTT015</td>
<td>Synthetic fibre colouration</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT016</td>
<td>Process Control in Textile Chemical Processing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT017</td>
<td>CAD and CAM in textiles</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT018</td>
<td>CAD / CAM For Apparel Products</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT019</td>
<td>Garment Production Machinery And Equipment</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT020</td>
<td>Apparel Marketing and Merchandising</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT021</td>
<td>Apparel Production Control</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT022</td>
<td>Garment Construction</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT023</td>
<td>Pattern Making</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT024</td>
<td>Quality assurance in garment industry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT025</td>
<td>Clothing Science</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT026</td>
<td>Protective Garments</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT027</td>
<td>Product Engineering and Plant Layout</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT028</td>
<td>Work study in textile industry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT029</td>
<td>Energy Management in Textile Industry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT030</td>
<td>Costing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT031</td>
<td>Operational Research</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT032</td>
<td>Production and operation management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTTT033</td>
<td>Personnel Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

PTCY 171 CHEMISTRY 1

AIM
- To develop a sound knowledge of theoretical and modern technological aspects of chemistry
- To enable the student to correlate the theoretical principles with application oriented studies

OBJECTIVES
- Should be conversant with the language of thermodynamics, electrochemistry, spectroscopy, surface chemistry to solve simple problems related to different industrial processes.
- Should be conversant with the theoretical principles and experimental methodology in the use of sophisticated analytical instruments.
- The knowledge gained will be a prerequisite for the application oriented topics to be pursued in the later semesters.

UNIT I THERMODYNAMICS


UNIT II SURFACE CHEMISTRY AND CATALYSIS


UNIT III CHEMICAL KINETICS
9

UNIT IV ELECTRO CHEMISTRY
9

UNIT V SPECTROSCOPY
9

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

PTGE 171 ENGINEERING GRAPHICS
3 1 0 100

OBJECTIVE
To develop graphic skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings.

CONCEPTS AND CONVENTIONS (Not for exam) 4
Importance of graphics in design process – visualization, communication, documentation – BIS conventions – Drafting tools – construction of curves like ellipse, parabola, cycloid and involutes.
UNIT I PROJECTION OF POINTS, LINES AND SURFACES  12
General principles of presentation of technical drawings as per BIS – Naming views as per BIS – First angle projection.
Orthographic projection of points
Projections of straight lines located in first quadrant only – determination of true length and true inclination.
Projections of plane surfaces like polygonal lamina and circular lamina, located in first quadrant only.

UNIT II PROJECTION OF SOLIDS  8
Projection of simple solids like prisms, pyramids, cylinder and cone – Drawing views when the axis of the solid is inclined to one reference plane.

UNIT III SECTION OF SOLIDS AND DEVELOPMENT  12
Sectioning of simple solids like prisms, pyramids, cylinder, cone and sphere. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.
Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

UNIT IV PICTORIAL PROJECTIONS  10
Isometric projection – Isometric Scale – Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones.
Perspective projection of prisms, pyramids and cylinders by vanishing point method.

UNIT V FREE-HAND SKETCHING  10
Free hand sketching techniques – sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning.
Sketching pictorial views from given orthographic views.

Demonstration (Not for Exam)
Demo of computer aided drafting and dimensioning using appropriate software.

Total No. of Periods : 60

TEXT BOOKS:

REFERENCE BOOKS:

Standards:
1. IS 10711 - 2001 Technical Product Documentation - Sizes of drawing sheets
2. IS 9609 - 1983 Lettering on technical drawings
3. IS 10714 - 1983 General Principles of presentation of technical drawings
4. IS 11669 - 1996 General Principles of dimensioning of technical drawings

Special Points applicable to University Examination on Engineering Graphics
1. There will be five questions, of which the question No 1 will not have choice and can be from any unit of the syllabus. The other four questions will be of “Either – OR” type, from the remaining units.
2. All questions will carry equal marks of 20 each making the total of 100 marks.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit the solution with in A3 size.
4. The university examination in a college, will be conducted in multiple sessions, i.e. one for every 190 candidates or part there of.

PTMA 171 MATHEMATICS I 3 1 0 100

AIM
The course is aimed at developing the skills of the students in the basic chosen topics of Mathematics that are imperative for effective understanding of engineering subjects. It also lays the foundation for learning further topics of Mathematics in higher semesters in a graded manner. The learners will be enabled to appreciate the important role of mathematical concepts in engineering applications.

OBJECTIVES
On completion of the course the students are expected to
• Be capable of identifying algebraic eigenvalue problems from practical areas and obtain the eigensolutions in certain cases and to have acquired the technique of diagonalizing a matrix which would render the eigensolution procedure very simple.
• Have grasped the method of three dimensional analytical geometry to study the properties of lines and planes in space along with sphere as an illustrative curved surface element, providing an elegant tool for enhanced understanding of three dimensional materials which is imperative for engineers.
• Understand effectively the geometrical aspects of curvature, involutes and evolutes of plane curves, essential concepts for an engineer, as elegant applications of differential calculus.

• Understand and handle functions of more than one variable, from the points of view of their differentiation, expansions and extreme values, along with differentiation under integral sign which are encountered in engineering studies.
• Have learnt the method of solving systems of differential equations of certain types that they might encounter in their studies of other subjects in the same or higher semesters.

UNIT I MATRICES 9 + 3

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 9 + 3

UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS 9 + 3
Curvature – Cartesian and polar co-ordinates – Centre and radius of curvature – Circle of curvature – Involute and evolute – Envelopes – Properties of envelopes and evolutes – Evolute as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES 9 + 3
UNIT V ORDINARY DIFFERENTIAL EQUATIONS 9 + 3
Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients- Homogeneous equations of Euler type – Equations reducible to homogeneous form – Method of variation of parameters.

L + T : 45 + 15 Total No. of Periods : 60

TEXT BOOKS:

REFERENCE BOOKS:

PTPH 171 PHYSICS 1 3 0 0 100

AIM
• To enhance theoretical and modern technological aspects in Physics
• To enable the students to correlate the theoretical principles with application oriented studies

OBJECTIVES
At the end of the course the students would be exposed to
• Design of acoustically good buildings
• Structure identification of engineering materials
• Non destructive techniques
• Interferometric techniques in metrology, communication and civil engineering
• Application of quantum physics to optical & electrical phenomena
• Application of lasers in engineering and technology.

UNIT I ACOUSTICS AND ULTRASONICS 9
Classification of sound – characteristics of musical sound, Loudness – Weber-Fechner law – Decibel, Phon, Sone - Reverberation – Reverberation time, Derivation of Sabine's formula for reverberation time (Rate of Growth and Rate of Decay) – Absorption coefficient and its determination - Factors affecting acoustics of buildings (Optimum reverberation time, Loudness, Focussing, Echo, Echeion effect, Resonance and Noise) and their remedies.


UNIT II CRYSTALLOGRAPHY & NON-DESTRUCTIVE TESTING 9
Space lattice, unit cell, Bravais space lattices, Lattice planes, Miller indices Calculation of number of atoms per unit cell, Atomic radius, coordination number & packing factor for simple cubic, BCC, FCC, HCP and diamond structures – NDT methods. Liquid penetrant method, Ultrasonic: flaw detector, X-ray radiography & fluoroscopy, Thermography.
UNIT III WAVE OPTICS

UNIT IV QUANTUM PHYSICS
Planck's quantum theory of black body radiation (Derivations). Compton effect (derivation) and Experimental verification of Compton effect. Schrödinger wave equation. Time independent and time dependent equations. Physical significance of wave function, particle in a box (in one dimension) - electrons in a metal.

UNIT V LASER AND FIBRE OPTICS

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

PTOE 172 FUNDAMENTALS OF COMPUTING

AIM
To provide an awareness to Computers and Computing

OBJECTIVES
To enable the student to learn the major components of a Computer System
To learn how arithmetic is handled in computers
To know the correct and efficient ways of solving problems
To learn to use office automation tools
To learn to program in C

1. INTRODUCTION

2. COMPUTER ARITHMETIC AND SOFTWARE
3. PROBLEM SOLVING AND OFFICE AUTOMATION


4. INTRODUCTION TO C


5. FUNCTIONS AND POINTERS


Total No. of Periods : 45

TEXT BOOK:

REFERENCE BOOKS:

SEMMESTER II

PTCY 181 CHEMISTRY II

AIM
- To develop a sound knowledge of theoretical and modern technological aspect of chemistry
- To enable the student to correlate the theoretical principles with application oriented studies

OBJECTIVES
- Should be conversant with the language of water treatment, fuels, environmental pollution, lubricants and corrosion, chemistry of engineering materials to solve problems related to different industrial processes
- Should be conversant with the theoretical principles and experimental methodology in the quantitative and qualitative analysis
- The knowledge gained will be a prerequisite for the application oriented topics to be pursued in the later semester.

UNIT I WATER TREATMENT


UNIT II FULES

Introduction – classification of fuels – higher or gross calorific value – lower or net calorific value – explosive range – calorific intensity – spontaneous ignition temperature – requirements of a

UNIT III ENVIRONMENTAL POLLUTION

UNIT IV LUBRICANTS AND CORROSION


UNIT V CHEMISTRY OF ENGINEERING MATERIALS

Total No. of Periods: 45

REFERENCE BOOKS:

PTEE 191 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

1. ELECTRICAL CIRCUITS

2. ELECTRICAL MACHINES
Principles of operation and characteristics of DC machines. Transformers (single phase and three phase) – Synchronous machines – 3 phase and single phase Induction motors – (op. principles).

3. SEMICONDUCTORS
Classification of solids as conductors and semiconductors – Intrinsic, Extrinsic semiconductors – P type and N type semiconductors – Junction diode – Zener diode – Zener diode – VI characteristics of junction and Zener diodes.
4. TRANSISTORS
Bipolar Junction Transistor – CB, CE, CC – Configurations – Simple treatment of characteristics and biasing. Elementary treatment of FET, MOSFET, JFET, DIAC and TRIAC.

5. TRANSDUCERS AND COMMUNICATION SYSTEM

Total No. of periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

4. DYNAMICS OF PARTICLES

5. FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS

L: 45 T: 15 Total No. of periods : 60

TEXT BOOK:

REFERENCE BOOKS:

UNIT I CONDUCTING MATERIALS
Classical free electron theory of metals - electrical conductivity - Wiedemann Franz law (derivation) – Lorenz number - drawbacks of classical theory- Fermi distribution function - Density of energy states - effect of temperature on Fermi energy. Superconducting Phenomena, Properties of superconductors- Meissner effect and Isolope effect. Type I and Type II superconductors, High Tc superconductors- Magnetic levitation and SQUIDS

UNIT II SEMICONDUCTING MATERIALS
Origin of band gap in solids (qualitative treatment only) – Concept of effective mass of electron and hole – carrier concentration in an intrinsic semiconductor (derivation) – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination - carrier concentration in n-type and p-type semiconductors (derivation) - variation of Fermi level with temperature and impurity concentration – Compound semiconductors - Hall effect – Determination of Hall coefficient

UNIT III MAGNETIC AND DIELECTRIC MATERIALS
Origin of magnetic moment- Bohr magneton - Weiss theory of paramagnetism. Determination of paramagnetic susceptibility of
UNIT IV NEW ENGINEERING MATERIALS

9


UNIT V MEDICAL PHYSICS

9

Ultrasound picture of human body- Block diagram of basic pulse Echo system - A-scan, B-scan and M-scan - Physiological effect of ultrasound therapy - Phonocardiograph (PCG) - source of radioactivity for nuclear medicine - statistical aspect - Basic instrumentation (Geiger-Müller counter, Photo multiplier Tube & Scintillation detector (Renogram) and its clinical applications (Thyroid and Kidney function) - Nuclear medicine imaging devices - Gamma Camera - Positron camera

Total No. of periods : 45

TEXT BOOKS:


REFERENCE BOOKS:

5. Partial Differential Equations

Formation – Solution of first order equations – Standard types
and equations reducible to standard types – Lagrange’s linear
equation – Integral surface passing through a given curve. Solution
of linear equations of higher order with constant coefficients.

L: 45  T: 15 Total No. of periods : 60

TEXT BOOKS:

REFERENCE BOOKS:
1. Narayanan, S., Manicavachagom Pillai, T.K., Ramaiah, G.,
“Advanced Mathematics for Engineering Students”, S Viewanathan

SEMMESTER III

PTMA 505 STATISTICS AND LINEAR PROGRAMMING 3 1 0 100

AIM
Probability and Statistics appear explicitly or implicitly in many
disciplines including computer and information sciences,
economics, biology, operations research and all branches of
engineering. Linear Programming is a mathematical technique
designed to assist an organization in allocating its limited
resources. This course aims at providing necessary tools for
solving engineering and management problems.

OBJECTIVES
At the end of the course, the students would

- Have a fundamental knowledge of the basic probability concepts.
- Have a well-founded knowledge of standard distributions, which
can describe real life phenomena.
- Be introduced to the notion of sampling distribution and would
have acquired a knowledge of statistical techniques useful in
making rational decision in management problems.
- Be able to identify and mathematically formulate allocation
problems involving linear objective functions and linear constraints
and be able to obtain the optimal solution.
- Have acquired an ability to solve certain class of allocation
problems, which can be modeled as a Transportation or
Assignment problems.

UNIT I PROBABILITY AND RANDOM VARIABLE

Axioms of probability-Conditional Probability-Total Probability-
Baye’s Theorem-Random variables-Discrete and Continuous.

UNIT II STANDARD DISTRIBUTIONS

Binomial, Poisson, Geometric, Uniform, Normal, Exponential and
Gamma distributions-Expectations-Variance-Moments-Moment
generating function and their properties.
UNIT III TESTING HYPOTHESIS
Statistical hypothesis-General concepts-Tests of hypothesis for mean, difference of mean, variance, ratio of variance, independence of attributes and goodness of fit using Normal, t, Chi-Square and F distributions

UNIT IV DESIGN OF EXPERIMENTS
Analysis of variance-One-way classification-Completely randomized design-Two-way classification-Randomized block design-Latin square design

UNIT V LINEAR PROGRAMMING
Formulation of linear programming problem - Graphical solution - Simplex algorithm - Transportation and assignment models

L + T : 45 +15 = 60
Total No. of periods : 60

TEXTBOOKS:

REFERENCE BOOKS:

PTCH 217 POLYMER CHEMISTRY

1. BASIC CONCEPTS OF POLYMER SCIENCE
Monomer-Polymer-Functionality - average functionality calculation - Degree of polymerization. Classifications of polymers based on source and applications. Raw materials - source and their preparations.

2. POLYMERIZATION METHODS
Addition (ionic, radical and co-ordination (Ziegler Natta) and condensation polymerizations, Co-polymerisation - Mechanism, kinetics and degree of polymerization - Carother equation. Polymerization techniques- Bulk, solution, emulsion, Gas Phase and suspension.

3. CHARACTERIZATION OF POLYMERS
Different average molecular weights (viscosity, number, weight and Z-averages)-Determination of weight average (by light scattering), number average (by Gelf permutation chromatography and Osmometry) and viscosity average (by Ubbelhode viscometer) molecular weights of polymers- theoretical and experimental details. Thermal characterization: Principle and working of differential scanning calorimetric and thermo gravimetric analysis. Structure-property relationships in polymers- tacticity - polymer morphology-crystallinity-phase transitions (first and second order), factors affecting first order and second order transitions- solubility of polymers - mechanical, optical, thermal, electrical, chemical and weather resistant characteristics.

4. POLYMERS
Synthesis, properties, applications of Poly (ethylene), poly (propylene), poly (styrene), poly (carbonate), poly (vinyl chloride), poly (acrylonitrile) - Poly (urethane), polyester and polyamides - preparation, properties and applications with typical examples. Carbon fibres - source - generation, properties and applications. Conducting and super absorbing polymers - typical examples. Preparation, properties and uses.
5. POLYMER PROCESSING ADDITIVES AND METHODS

Nucleating agents for spherulite formation, Crystal defects, UV stabilizers, anti-microbial, antistatic - blowing agents, coupling agents, flame retardants, heat stabilizers, mold release agents, viscosity control additives - Extrusion Film extrusion - Extrusion coating - powder coating - spin coating.

Total No. of periods: 45

REFERENCE BOOKS:


PTT 204 TEXTILE FIBRE PRODUCTION

1. GENERAL INTRODUCTION

Definition - fibre, filament, staple fibre, broad classification of fibres, global production trends; requirements for fibre forming polymers; properties of major textile fibres - density, moisture regain, Tg and Tm; applications of different fibres; fundamentals of polymers and man made fibres; structural principles of polymeric fibres; fluid flow during spinning; introduction to spinning - melt, wet, dry, dry jet wet, liquid crystal, gel spinning of polymeric fibres.

2. NATURAL FIBRES

Cotton-cultivation, varieties, practices, grading and baling; silk - pre and post cocoon operations, varieties of silk and their properties; wool shearing, grading, varieties of wool and their properties; bast fibres - jute cultivation, fibre extraction and properties.

3. SPINNING MACHINERIES AND COMPONENTS

General features of melt spinning line with and without gadgets; extruder-single and multi screw extruder, basic operations and zones of extruder, mechanism of melting, melt flow; design features of extruder, three dimensional dynamic mixer, continuous vertical polymer filter, melt manifold, static mixer, spin pack, quenching system and quenching chamber, factors influencing quenching, types of air quench media, take up, high speed winder; solution spinning - dope, candle filter, gadgets, coagulation bath, dryer and winder.

4. PRODUCTION OF FILAMENT YARNS

PET - polymer production, DMT and TPA route, production process batch, semi continuous, continuous, transfer line injection online compounding, catalysts used and its role, DEG - effect in polymer and fibre properties, control of DEG formation Nylon 6 raw material, caprolactum specifications, types of catalyst, process - batch, continuous, integrated continuous process; Nylon 68: raw materials and their specification, production process - batch, continuous, polymerization using dry Nylon66 salt and direct polymerization; PP MFI, fibre production methods, the traditional
long air quench melt spinning, water quench melt spinning, tape yarns from slit film, spinning parameters and role in fibre formation; Rayon fibres: chemistry of viscose, manufacture of viscose rayon, spinning, spinning bath composition, modified high wet modulus yarns, Polynosic, super high wet modulus rayon; Lyocell manufacturing: Acrylic: acrylic; mod acrylic; need for co monomers, dope preparation, influence of coagulation variables on fibre structure, dry spinning, spinning cell, fibre cross section formation, spin stretch during dry spinning, finish application and winding

5. POST SPINNING OPERATIONS
Spin finishes: need and composition of spin finish, spin finish application technique, spin finish for staple fibre production and filament types; drawing, need for drawing, drawing unit, high speed spinning, spin draw process, draw warping, heat setting need for heat setting, stability and measurement of degree of set; crimping and texturisation, introduction and need, principles, types, merits & demerits of low to top converters and low to staple converters

Total No. of periods: 45

REFERENCE BOOKS:

PTTT 202 PHYSICAL STRUCTURE AND PROPERTIES OF FIBRES

1. STRUCTURAL INVESTIGATION OF FIBRES
Study of natural and man-made fibres – physical, chemical and morphological structure; study of investigation techniques – Scanning electron microscope, X-ray diffraction, Infrared radiation and dichroism.

2. MOISTURE ABSORPTION IN FIBRES

3. MECHANICAL PROPERTIES OF FIBRES
Tensile characteristics – stress-strain relations, influence of humidity and temperature on tensile characteristics; elastic properties – elastic recovery and its relation to stress and strain of fibres, mechanical conditioning and its influence on elastic recovery of fibres; torsional rigidity of fibres – measurement techniques; flexural rigidity of fibres – measurement techniques.

4. OPTICAL PROPERTIES AND FRICTIONAL PROPERTIES
Luster index, refractive index and its measurement, birefringence, factors influencing birefringence; friction and its measurement, comparison of fibres, directional friction in wool.

5. ELECTRICAL AND THERMAL PROPERTIES
Electrical resistance of fibres – measurement, factors influencing electrical resistance; di-electricity – factors influencing dielectricity; static electricity – measurement, problems and elimination techniques; thermal conductivity, thermal expansion and contraction, melting.

Total No. of periods: 45
REFERENCE BOOKS:

PTTT 301 SPUN YARN TECHNOLOGY

1. GINNING AND BLOWROOM MACHINERY
Description and working of different types of gins; selection of right type of gins; ginning performance on yarn quality; objects, principle and description of opening, cleaning and blending machines used in blowroom; chute feed.

2. CARD
Objects and principle of carding; detailed study of flat card; card clothing and its maintenance; drives and production calculation.

3. COMBER
Objectives of comber preparatory; detailed study of silver lap, ribbon lap and super lap formers; objects and principles of combing; sequence of combing operation; combing efficiency and production calculations.

4. DRAWFRAME AND SPEEDFRAME
Tasks of drawframe; drafting systems used in modern drawframes; draft and production calculation; objects of speedframe; working of speedframe; bobbin builder mechanism; draft, twist and production calculations.

5. YARN SPINNING AND YARN TWO-FOLDING
Principle of yarn production in ring, rotor, friction and air-jet spinning machines; working of ring frame; cop building, design features of important elements used in ring spinning; draft, twist and production calculations in ring frame; merits of two-folding of yarns; methods followed for two-folding, selection of twist level for two-folding, calculation of resultant count of two-folded yarns.

Total No. of periods: 45

REFERENCE BOOKS:

SEMESTER IV

PTTT402 PROCESS CONTROL IN SPINNING 3 0 0 100

1. LEVELLING AND BLENDING
Different levelling methods adopted in the spinning machines; influence of the uniformity of the intermediate products on the yarn quality; effect of machines and processing parameters on product uniformity; importance of fibre-mix homogeneity on yarn quality; types and levels of mixing in the preparatory processes; control of blend ratio; assessment of fibre-blend variations.

2. WASTE CONTROL, NEP AND HOOK REMOVAL
Control of waste in blowroom, card and combers, influence of machine and processing parameters on waste removal; controlling the lint content in waste; cleaning efficiency and cleaning intensity; causes of nep and hook formation in the fibre-opening processes; removal of neps in the carding and combing machines; fibre hook straightening during the preparatory operations; measurement of neps and hooks.

3. PRODUCTION CONTROL
Factors affecting the production limits of the spinning machinery; achieving maximum production in the given machinery; new concepts in achieving higher production in the spinning machinery; role of machinery maintenance and humidity control on production efficiency; computation of the productivity indices.

4. YARN QUALITY ANALYSIS
Analysis of within length and between length variations and spectrogram; yarn faults classifications; causes and remedies for yarn defects.

5. MAN-MADE FIBRE PROCESSING
Processing conditions required for man-made fibres like polyester; viscose in the spinning machinery; generation of static electricity; its influence on spinning process; control of static generation.

Total No. of periods : 45
REFERENCE BOOKS:

PTTT 315 TECHNOLOGY OF WEAVING PREPARATION AND WEAVING  3 0 0 100

1. WINDING AND WARping  12
Principles of cheese and cone winding machines; uniform build of yarn package; types of drums – half accelerated and fully accelerated drums; control of balloons; study of modern automatic cone and cheese winders; cross and precision winding; concepts in yarn cleaning – mechanical, optical and electronic cleaners; knotters and splicers; data systems; faults in wound packages, their causes and remedies; winding synthetic and blended yarns and sewing threads; pmr winding; winding for colouration; process control in winding. Creels used in warping machines; beam and sectional warping machines; end breaks in warping; hard waste in warping; other process control measures.

2. SIZING AND DRAWING-IN  12
Objects of sizing; sizing materials and recipes used for different types of fibres; size preparation equipment; sizing machines; control systems used in sizing machine; sizing filament yarns; concept of single end sizing, single end sizing machines; combined dyeing and sizing, energy conservation in sizing; process control in sizing, faults in sizing- causes and remedies; modern developments in sizing machines. Need for drawing-in operation; manual and automatic drawing-in, leashing, knotting and pinning machines.

3. SHEDDING MOTIONS  12
Principles of tappet, dobby and jacquard shedding mechanisms, types of sheds, positive and negative shedding mechanisms, reversing mechanisms, limitations of various shedding mechanisms, motion of the heald shafts, principles of single lift and double lift dobbies and jacquards, modern developments in shedding mechanism, special jacquards.

4. SHUTTLE PICKING AND BEAT UP  5
Shuttle picking mechanisms, shuttle flight and timing, acceleration and retardation of the shuttle, power required for picking, kinematics of sley, sley eccentricity, timing of the primary motions.

5. SECONDARY AND AUXILIARY MOTIONS  4
Take up and let-off motions used in power looms, cloth formation, warp protector and weft work motion, plain loom accessories.

Total No. of periods : 45

REFERENCE BOOKS:


PTT 303 FABRIC STRUCTURE 3 0 0 100

1. INTRODUCTION 4
Introduction to fabric structure; theory of colours—light and pigment theory—modification of colours—colours in combination—application of colours.

2. STANDARD WEAVES 14
Construction of elementary weaves—plain and its derivatives, twill and its modifications, sateen—satin and their derivatives, ordinary and Brighton honey comb, Mock leno, Huck—a—back and its modification: crepe weaves; bedford cords—plain faced, twill faced, wadded; wets and piques; wadded piques—loose back and fast back; backed fabrics—warp and weft backed, wadded.

3. SPECIAL WEAVES 13
Extra warp and extra weft figuring, double cloth; warp pile and weft pile—terry weaves, wire plies, plain back and twill back velvetees, lashed pile, corduroy, damasks, multi ply fabrics, gauze and leno—principles.

4. SPECIAL JACQUARDS 9
Cross border jacquard, Bannister harness, pressure harness, self twilling jacquard and inverted hook jacquard—system of designing, functioning and application.

5. ORNAMENTATION 5
Various types of ornamentation; colour and weave effect; ornamentation by lappet and swivel system.

Total No. of periods : 45

REFERENCE BOOKS:

PTT 304 KNITTING TECHNOLOGY 3 0 0 100

1 INTRODUCTION 4
Comparison between different types of fabrics - wovens, knits and bonded fabrics; classification of knitting processes; yarn quality requirements for knitting and its preparation.
2 FUNDAMENTALS OF WEFT KNITTING

General definitions and principles of knitting; knitting needles; elements of knitted loop structure; fundamentals of formation of knit, tuck and float stitches; basic knitted structures and their production - plain, rib, interlock and purl; knitted fabric geometry.

3 CIRCULAR KNITTING

Construction and working of circular knitting machines used for the production of basic structures; production of derivatives of weft knitted structures; needle control in circular knitting machines; factors affecting the formation of loop; effect of loop length and shape on fabric properties; quality control in knitted fabric production; production calculation.

4 FLAT KNITTING

Basic principles; elements of flat knitting machines; different types of flat knitting machines - manual, mechanical and computer controlled; production of various fabric structures.

5 WARP KNITTING

Basic principles; machine classification; preparation of yarns for warp knitting; production of elementary structures.

Total No. of periods : 45

REFERENCE BOOKS:


PTT305 CHEMICAL PROCESSING OF TEXTILE MATERIALS I

1. STRUCTURE AND PROPERTIES

Chemical structure and chemical properties of cotton, flax, wool, silk, viscose, polyester, nylon, acrylic, polypropylene and polyurethane.

2. GREY PREPARATION - I

Singeing; Desizing- hydrolytic and oxidative techniques; scouring-natural and synthetic fibres; application of biotechnology.

3. GREY PREPARATION - II

Mercerization - action of alkali on cellulose; cold and hot mercerization; bleaching; heat setting.

4. PROCESSING MACHINES

Loose stock machine; hand and package machines; yarn singeing machine, gas singeing machine, shearing and raising machines; kiers; manglers; jigger, winch; jet and soft flow machines; yarn mercerizer, chain and chainless mercerizers; continuous scouring and bleaching machines; washing ranges, hydro extractors, dewaters, dryers, stenter and stretching devices.

5. FINISHING

Calendering; crease proofing; anti-shrinking; softening; felting and non-felting of wool; application of biotechnology.

Total No. of Periods : 45.
REFERENCE BOOKS:


SEMINAR V

TT 308 TECHNOLOGY OF FABRIC MANUFACTURE  3 0 0 100

1 AUTOMATIC SHUTTLE LOOMS

Automatic weft replenishment in shuttle looms – pim changing and shuttle changing looms; mechanisms involved in automatic weft replenishment – feelers, cutters, design of shuttle, three try motions; warp stop motions; let off motions; multi shuttle looms, pile fabric weaving looms, tape looms.

2 SHUTTLELESS LOOMS

Principles of weft insertions in shuttle less looms; weft accumulators and selvedges used in shuttle less looms; mechanism of weft insertion by projectile, rapier, air jet and water jet; techno economics of shuttle less loom weft insertion systems; multi face weaving systems; quick style change.

3 PREPARATIONS FOR HIGH SPEED WEAVING

Yarns quality requirements for high speed automatic shuttle looms and shuttle less loom; warp and weft preparation for high speed looms.

4 NON-WOVEN AND BONDED FABRICS

Web forming techniques for dry method of web preparation; production of bonded fabrics by mechanical, chemical and thermal methods; productions of spun bonded and melt blown fabrics; end uses of bonded fabrics.

Total No. of Periods : 45

REFERENCE BOOKS:


PTT 309 CHEMICAL PROCESSING OF TEXTILE MATERIALS II

1. DYEING – I
   Adsorption isotherms; dye-fibre interaction; properties and application of direct, azoic, vat, sulphur and reactive dyes.
   10

2. DYEING – II
   Properties and application acid, mordant, metal-complex, disperse and basic dyes; dyeing of blends.
   10

3. PRINTING
   Methods and styles of printing; printing machines; constituents of printing paste; printing with direct, reactive, acid and disperse dyes; printing with pigments.
   10

4. ASSESSMENT OF COLOR AND FINISHES
   Theories of colour measurement, Beer–Lambert’s law and Kubelka-Munk theory; whiteness and yellowness indices and lustre measurement; assessment of finishes: crease proofing, anti-shrinking, softening; assessment of eco-friendliness of textiles.
   10

5. KNITS AND GARMENTS
   Finishing of knits- machines and processes; Garment dyeing and washing.
   5

Total No. of Periods: 45

REFERENCE BOOKS:

PTT 310 QUALITY ASSESSMENT OF TEXTILES

1. INTRODUCTION
   Importance of quality assessment; understanding of textile quality parameters; online and off line testing methods.
   5

2. FIBRE TESTING
   Measurement of length and length uniformity, fineness, strength, maturity, trash content, moisture content of fibres using conventional and modern testing methods; advanced fibre information systems, high volume testing instruments and their limitations.
   9
3. YARN TESTING
Assessment of count, twist, harness, strength and extension - single and group, evenness, imperfection, friction, crimp rigidity, work of rupture, fatigue, abrasion resistance of yarn; classification of yarn faults, measurement of lap, sliver and roving irregularity.

4. FABRIC TESTING
Determination of fabric construction parameters; assessment of tensile, bursting and tear strengths; low-stress mechanical properties, permeability and insulation properties of fabrics; durability, comfort and handle properties of fabrics; grading of fabrics based on defects.

5. QUALITY CONTROL SYSTEMS
Statistical significance tests, quality control - acceptance sampling and control charts.

Total No. of Periods : 45

REFERENCE BOOKS:


PTTT 311 NEW SPINNING TECHNOLOGY
1. CONDENSED YARN SPINNING
Principle of condensed yarn spinning; working of different methods of condensed yarn spinning; advantages of this method over conventional ring spinning method.

2. ROTOR SPINNING
Description of the working of the rotor spinning; requirements of the raw materials; preparation of the sliver for rotor spinning; yarn formation and its structure; yarn withdrawal and winding; rotor design and its implications on production and yarn quality; production limits; comparison with ring spinning.

3. FRICTION SPINNING
Detailed study of the DREF-2, DREF-3 and master spinner machines working on the principles of friction spinning; the use of raw materials; application of these machines for different end products; the economics; technological limitations.

4. AIR-JET SPINNING
Description of the yarn production in air jet spinning machine; feasibility of higher draft applied in this machine; structure and quality of the air-jet spun yarn; raw materials requirement.

5. OTHER SPINNING TECHNOLOGIES
Production of yarn in PLY fil spinning, process applying similar principle; comparison with other spinning methods; working details.
of the production of double-rove yarns and wrap yarns; use of raw materials; economics of these methods of yarn production; yarn characteristics and their application.

Total No. of Periods: 45

REFERENCE BOOKS:

PTTT 306 GARMENT TECHNOLOGY  3  0  0  100

1. INTRODUCTION
   7
   Body dimensions; mass production; mass customisation.

2. GARMENT DESIGNING
   12
   Pattern development; grading; marker planning; spreading and cutting.

3. SEWING
   13
   Seams; stitches; sewing machines - feeding systems, sewing needles; sewing threads - fibre types, construction, finishes, thread sizes, thread packages; basic sewing machine and its associated work aids.

4. COMPONENTS AND TRIMS
   4
   Labels; linings; inter linings; wading; lace; braid; elastics; hook and loop fastening; shoulder pads; zip fasteners; buttons.

5. PRESSING
   4
   Categories of pressing; equipments.

6. GARMENT PROCESSING
   4
   Garment dyeing; printing; finishing.

Total No. of Periods: 45

REFERENCE BOOKS:
PTTT 317 Textile Manufacture Laboratory

1. Study of blow room machinery
2. Card – Draft and production calculations and setting
3. Draft and production calculations in Draw frame.
4. Study of Comber preparatory machines and comber
5. Draft and twist calculations of speed frame and ring frame.
7. Study of primary motions.
8. Study of secondary motions
9. Study of auxiliary motions
10. Study of circular and flat knitting machine
11. Securing and bleaching of cotton
12. Dyeing of cotton with different classes of dyes
13. Degumming and dyeing of silk
14. Dyeing of synthetic fibre

SEMESTER VI

PTTT 312 MECHANICS OF TEXTILE MACHINERY 3 0 0 100

1. MACHINE DESIGN
   - Equations of forces, motion and energy; introduction to fluid dynamics; design of cam, gear trains and draft calculations; principles of clutches and brakes - practical application in textile machines.

2. ROTARY MOTION
   - Equations of rotary motion; energy stored in rotating masses; power transmitted by rope and belt drives; friction calculations; balancing of rotating masses.

3. SPINNING MACHINES
   - Differentials and variable speed drives; design of cone drums – piano feed regulation, speed frame builder mechanism; principles of auto-levelers, traveller and balloon dynamics.

4. PREPARATORY AND WEAVING MACHINES
   - Principles of different types of winders; yarn winding calculations; kinematics of shedding; picking (cams and torsion bars) and beat up.

   Total No. of Periods : 45

REFERENCE BOOKS:

PTTT401 COMPUTER APPLICATION IN TEXTILE TECHNOLOGY

1. INTRODUCTION AND OVERVIEW
   History of Computers - Hardware including networks and software; history of computers used in textile Industry; elements of 'control theory'; overview of development methods for Large Software Packages.

2. CURRENT TECHNOLOGY
   Details of current Hardware including networks and software capabilities; sensors and actuators; A/D and D/A conversion; use of networks.

3. GENERAL SOFTWARE
   Applications of spreadsheets, image processing and database management software and their application in textiles industries; computer applications in front office and administration - payrolls, inventory control, databases, the paperless office.

4. COMPUTERS IN TEXTILES
   Scope for application of computers to spinning, weaving, wet processing and garment manufacture; software for cotton blending; product mix decisions, fabric design, garment design, colour matching, use of operations research concepts - PERT, CPM and LP.

5. AUTOMATION AND THE 'SMART MILL'
   Automation in spinning, weaving, wet processing and garment manufacture; development of Computer Aided Design and Computer Aided Manufacture; online testing and 100% inspection; networks and the 'Smart Mill'; information glut, Management Information Systems.

Total No. of Periods: 45

PTTT 403 PROCESS CONTROL IN FABRIC MANUFACTURE

1. INTRODUCTION
   Scope of process control in weaving and preparation to weaving.

2. WINDING
   Quality of knots and splices; classification of faults and its removal; winding performance; productivity; maintenance; quality control, material handling.

3. WARping
   End breaks; quality of warpers beam; hard waste; productivity; maintenance; quality control; material handling.

4. SIZING
   Choice of size recipe and pick up, size preparation and storage, control of size pick up, yarn stretch and moisture, quality of sized beam, dead loss, Hard waste, productivity, maintenance, quality control, material handling.

5. DRAWING-IN
   Selection and care of reeds, healds and drop pins, control of cross ends and extra ends.

6. WEAVING, KNITTING AND NONWOVENS
   Control of efficiency and waste; productivity; machine data; maintenance; quality control, material handling.

Total No. of Periods: 45
REFERENCE BOOKS:

ELECTIVE I

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 0 0 100</td>
</tr>
</tbody>
</table>

ELECTIVE II

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 0 0 100</td>
</tr>
</tbody>
</table>

PTTT 411 QUALITY ASSURANCE LAB

<table>
<thead>
<tr>
<th>Component</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre length and length uniformity</td>
<td>3 0 0 100</td>
</tr>
<tr>
<td>Fibre fineness and maturity</td>
<td>3 0 0 100</td>
</tr>
<tr>
<td>Fibre strength</td>
<td>3 0 0 100</td>
</tr>
<tr>
<td>Fibre moisture study</td>
<td>3 0 0 100</td>
</tr>
<tr>
<td>Yarn count and strength</td>
<td>3 0 0 100</td>
</tr>
<tr>
<td>Yarn twist</td>
<td>3 0 0 100</td>
</tr>
<tr>
<td>Yarn evenness</td>
<td>3 0 0 100</td>
</tr>
<tr>
<td>Fabric tensile, tear and bursting</td>
<td>3 0 0 100</td>
</tr>
</tbody>
</table>

SEMESTER VII

PTCH 401 Process Economics and Industrial Management

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 0 0 100</td>
</tr>
</tbody>
</table>

AIM
To introduce process economics and industrial management principles to chemical engineers

OBJECTIVES
The objective of this course is to teach principles of cost estimation, feasibility analysis, management, organization and quality control that will enable the students to perform as efficient managers.

PART A

UNIT I PRINCIPLES OF MANAGEMENT AND ORGANISATION

<table>
<thead>
<tr>
<th>Component</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning, organisation, staffing, coordination, directing, controlling, communicating, organisation as a process and a structure; types of organisations</td>
<td>5</td>
</tr>
</tbody>
</table>

UNIT II PRODUCTION AND MANAGEMENT

<table>
<thead>
<tr>
<th>Component</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning; routing; scheduling; despatching; costs and costs control, inventory and inventory control.</td>
<td>10</td>
</tr>
</tbody>
</table>

UNIT III QUALITY AND QUALITY CONTROL

<table>
<thead>
<tr>
<th>Component</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elements of quality control, role of control charts in production and quality control.</td>
<td>4</td>
</tr>
</tbody>
</table>

PART B

UNIT I ENGINEERING ECONOMICS FOR PROCESS ENGINEERS

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

56
UNIT II INTEREST, INVESTMENT COSTS AND COST ESTIMATION
Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, invested capital and profitability.

UNIT III PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT
Estimation of project profitability, sensitivity analysis; investment alternatives, replacement policy; forecasting sales, inflation and its impact.

UNIT IV ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE

UNIT V ECONOMIC BALANCE
Essentials of economic balance – Economic balance approach, economic balance for insulation, evaporation, heat transfer.

Total No. of Periods: 45

TEXT BOOKS:

REFERENCE BOOKS:

PTT 408 TEXTILE PRODUCT ENGINEERING
1 INTRODUCTION
Factors to be considered while designing a textile product standardization of product parameters.

2 FIBRE ENGINEERING
Engineering a fibre for a given end use – concepts, modification of the fibre structure.

3 YARN ENGINEERING
Engineering a yarn using staple and filament fibre for a given end use - concepts of yarn engineering, different yarn constructions, different spinning systems, yarn design elements.

4 FABRIC ENGINEERING

5 GARMENT ENGINEERING
Engineering garments from application point of view, interaction between fibre, yarn and fabrics on the properties of garments.

Total No. of Periods: 45

REFERENCE BOOKS:
PTTT 410 TEXTILE MILL PLANNING AND MANAGEMENT

3 0 0 100

1. Principles of management - planning, organisation, coordination, directing, controlling; selection of site for textile mills; plant layout - types of layout - advantages and disadvantages of different types of layouts, building structure, balancing of machinery for spinning and weaving.

13

2. Maintenance of machinery - types of maintenance, comparison between different systems of maintenance; maintenance schedule for spinning and weaving machinery; lubricants - types and characteristics

5

3. Lighting for textile mills; humidification and ventilation - R.H requirements, air conditioning, various systems of air conditioning and humidification; electrical power and drives of various textile machinery.

9

4. Material handling in textile mills; selection and training of operatives, workload of operatives in spinning and weaving mills; personnel management - functions in textile mills.

9


9

Total No. of Periods : 45

REFERENCE BOOKS:


60

ELECTIVE III

3 0 0 100

PTTT 409 PROJECT WORK

3 0 0 100

Each student is required to submit a report on the project assigned to him by the department. The report should be based on the information available in the literature or data generated in the laboratory/industry. The object of the project is to make use of the knowledge gained by the students at the various stages of degree course. This helps to judge the level of proficiency, Originality and capacity for application of the knowledge attained by the students by the end of the course.

ELECTIVE SUBJECTS

PTTT001 FIBRE AND TEXTILE COMPOSITES

3 0 0 100

1. INTRODUCTION AND THEORY

Chemistry and development of Resins, resin additives and their effects; reinforcements, properties of composite materials; comparison of structural materials.

9

2. CONSTRUCTION OF COMPOSITE STRUCTURES

Techniques for manufacturing composites - open and closed moulds and continuous processes; preparation of reinforcing structures; 3D woven and knits; curing - chemical and temperature effects; fiber volume fraction.

9

3. PROPERTIES AND BEHAVIOR OF COMPOSITES

Behavior of composites under stress - Anisotropy of stress; elasticity-thermal and electrical conductivity; fatigue resistance, effect of manufacturing settings, chemicals and materials on the properties of composites.

9

4. QUALITY CONTROL

Quality control in raw materials; material selections/preparation, mould preparation, operation control in manufacturing and curing; control of finished products.

9
5. REINFORCING FIBERS
Chemistry and manufacture of high performance filaments – kevlar, high performance polyethylene, glass, carbon; and uses with composite structures reinforced with reinforcing fibres.

Total No. of Periods : 45

REFERENCE BOOKS:
1. Pipes R. B., "Composite Materials" Vol. 1, 2 and 3, Elsevier

PTTT 002 TEXTURED YARN TECHNOLOGY  

1. INTRODUCTION
Need for bulking of synthetic yarns; texturability of fibres, classifications and principles of methods of texturing.

2. HEAT SETTING
Heat setting – need, types of setting, factors involved; effect on fibre morphology and yarn properties; evaluation of heat setting processes.

3. FALSE TWIST TEXTURING
Draw texturing - simultaneous and sequential draw texturing; twisting devices, heating and cooling systems; take-up systems; characteristics of feed yarns; process parameters – time, temperature, twist, tension; evaluation of false-twist textured yarns; end-uses.

4. AIR JET TEXTURING
Types of yarns produced; airflow pattern in different types of nozzles; loop formation mechanism, factors involved; evaluation of air-jet textured yarn; comparison of air-jet textured yarn with spun and false twist textured yarns; end-uses.

PTTT 003 SILK YARN TECHNOLOGY  

1. REARING
Domestic silk worm rearing – mulvolline, bivolline and univolline species; wild silk worms rearing – tasar, muga and eri culture.

2. SILK REELING
Coconol quality, stiffing and conditioning of cocoons, boiling and brushing of cocoons, reeling, re-reeling; raw silk testing and classification; wild silk reeling; production of spun silk yarn.

3. SILK WEAVING
Technological parameters of weaving and productivity; weaving of silk fabrics using semi automatic, automatic, shuttleless and pile looms.
4. PREPARATION OF SILK
Properties of sericin; degumming of silk - extraction with water, treatment with alkalies and digestion with enzymes; bleaching of silk - origin and nature of colours, bleaching with reducing and oxidising agents.

5. DYEING, PRINTING AND FINISHING
Dyeing with acid, basic and reactive dyes; different styles of printing with acid and reactive dyes, printing with pigments, khadi and metallic powders, sublimation transfer printing; finishing of silk - weighing, softening, flame proofing, crease proofing, mildew proofing.

Total No. of Periods: 45

REFERENCE BOOKS:


PTT004 THEORY OF STAPLE FIBRE OPENING 3 0 0 100

1. FIBRE INDIVIDUALIZATION
The necessity of fibre individualization; effect of fibre-group size on yarn uniformity; minimum requirements to achieve fibre individualization; basic mechanisms followed for fibre individualization in the opening machines.

2. PRINCIPLE OF FIBRE OPENING IN BLOWROOM
The principle of fibre opening in the blowroom machines; calculation of tuft size reduction in openers based on machine and processing parameters; limitation of fibre opening in blowroom machinery; control tuft size variation and fibre rupture during opening.

3. ROLE OF CARDING MACHINE
The function of licker-in in card; degree of opening in licker-in; the mechanics of fibre opening in the carding area; study of effect of fundamental factors like wire point design and density, speed; setting and transfer coefficient on fibre individualization; calculation of parameters to assess the carding performance; card grinding on carding efficiency.

4. CARDING PRODUCTIVITY
Relationship between carding productivity and degree of fibre individualization; limiting factors of carding productivity; new concepts to improve carding productivity.
5. CLEANING
Role of fibre opening on fibre cleaning; the factors affecting fibre cleaning in the blowroom and carding machines; control of air suction for efficient cleaning.

REFERENCE BOOKS:

PTTT005 MECHANICS OF STAPLE - FIBRE DRAFTING
3 0 0 100

1. IDEAL DRAFTING
5
Definition of ideal drafting; conditions required to achieve ideal drafting in a roller drafting system; deviations from ideal drafting situation during actual drafting conditions.

2. DRAFTING WAVE
13
Definition of drafting wave; condition for drafting wave formation during roller drafting; estimation of the magnitude of the irregularity caused by the occurrence of the drafting wave; forces acting on a fibre during drafting; methods to avoid drafting wave formation; role of apron in controlling drafting wave formation.

3. ROLLER SLIP
9
Definition of roller slip; conditions for the formation of forward and backward slips in the roller drafting systems; measures to avoid roller slip occurrence.

4. OTHER DRAFTING INEQUALITIES
9
The causes for roller nip movement and roller speed variation during drafting and their effect on products irregularity; control of the irregularity formed from these sources.

REFERENCE BOOKS:

PTTT006 TECHNOLOGY OF STAPLE - FIBRE YARN TWISTING
3 0 0 100

1. FUNDAMENTALS OF TWISTING
9
Mechanics of imparting strength to a stable-fibre strand by twisting; meaning of twist multiplier and the basis of selection of required twist; principles of false twisting; fundamental requirements to create real twist in the strand.
2. TWISTING IN RING SPINNING
   Principle of twist insertion in ring spinning, limitation of ring twisting; mechanics of balloon formed during twisting; influence of twisting on spinning triangle size and the subsequent effect on yarn quality and spinning performance; design features of rings and travellers used for twisting different types of yarns.

3. TWISTING IN OPEN-END SPINNING
   Principle of twist insertion in open-end spinning, application of this principle in rotor spinning and friction spinning machines; advantages of this method of twisting over ring twisting method; comparison of yarn tension developed during twisting in these two machines.

4. TWISTING IN AIR-JET SPINNING
   Principle of twist formation in air-jet spinning, advantage of using two air nozzles; the merits and demerits of this method of twisting; application of this method of twisting in PLY/T yarn production.

5. OTHER TWISTING METHODS
   Principle of two-for-one twisting; the advantages of this method of twisting; working of two for one twister; twisting of yarns in double-rove fed spinning machines; operating principle involved in the twisting of wrap spun yarns; technological and economic interrelationships in these methods of twisting; role of twisting in fancy yarn production.

Total No. of Periods: 45

REFERENCE BOOKS:

REFERENCE BOOKS:

PTTT 008 PROCESS CONTROL IN PRODUCTION OF MAN MADE FIBRE YARNS

1. Polyester, viscose, acrylic, lyocell fibres – fibre characteristics and effects on yarn spinning performance; objectives of blending, measures of blending, selection of blend ratio, different mechanics of blending; effect of fibre properties and blend composition on yarn properties.
2. Processing of manmade fibres in short staple system; tension; RH and temperature control at preparatory and spinning; generation of static electricity and its influence on spinning processing; control of static generation.
3. Blending at blow room; blow room – conditioning, opening, speeds and settings; process related problems and remedies; carding – selection of wires, speeds and settings, neps removal and process related problems and remedies.
4. Blending at drawframe; number of passages; calculations of number of doubling and silver linear density for each component; roller lapping – causes and remedies; speedframe – process parameters, process related problems and remedies.
5. Ring frame – process parameters; process related problems and remedies; yarn faults; rotor spinning – selection of fibres, material preparation, machine and process parameters; spinning of dyed fibres – process related problems and remedies.

Total No. of Periods: 45

REFERENCE BOOKS:

PTTT 009 MECHANICS OF TEXTILE STRUCTURES

1. YARN GEOMETRY
   - Idealized helical yarn structure; yarn count and twist factors, twist contraction; packing of fibers in yarns, measurement of yarn diameter; ideal migration, tracer fiber technique, characterization of migration behavior; migration in blended yarns, mechanics of migration, effect of various parameters on migration behavior.

2. MECHANICS OF CONTINUOUS FILAMENT YARNS
   - Analysis of tensile behavior; prediction of breakage; analysis of yarn mechanics by energy method; observed extension and breakage of continuous filament yarns; mechanics of torque in filament yarns.

3. MECHANICS OF STAPLE FIBRE YARNS
   - Theoretical analysis; fiber obliquity and slippage; influence of fiber length, fineness and friction; strength of blended yarns - Hamburger’s model.
4. WOVEN FABRIC GEOMETRY AND DEFORMATION
Elements of woven fabric geometry: Pierce and Olufsson models - form factor, jamming of threads, cover factor, crimp interchange, degree of set, modification to Pierce model - race track, saw tooth and bilinear models, extension behavior of woven fabric; prediction of modulus, tensile properties in bias direction; other fabric deformation - shear, buckling, bending and compression; fabric handle.

5. NONWOVEN AND KNITTED STRUCTURES
Geometry of plain knitted structure, mechanics of non-woven fabrics

REFERENCES:
Total No. of Periods: 45


PTTT 010 BONDED FABRICS
3 0 0 100

4. INTRODUCTION
Definitions and classification of bonded fabrics; historical development; fibres and their characteristics for the production of bonded fabrics; used; production methods and consumption of non-wovens.

2. WEB FORMING
Production of staple-fibre web by dry and wet methods; web laying methods and its influence on fabric properties; manufacture of web from filaments, uniformity and quality control of web.

3. BONDING
Bonded fabric production by needling, stitching, water jet consolidation, thermal and chemical methods; production of bonded fabrics by spin bonding and melt blown process; effect of processing parameters on fabric properties.

4. FINISHING
Dry finishing – shrinkage, wrenching and creping, calendaring, perforating, slitting and splitting; wet finishing – washing, dyeing, printing, softening, flame proofing, coating, laminating, flocking.

5. END USES
Various end uses of bonded fabrics; evaluation of non-woven fabrics, structure-property relationship in bonded fabrics.

REFERENCES:
Total No. of Periods: 45

PTTT011 TECHNICAL TEXTILES

1 INTRODUCTION
Definition, classifications, market overview and growth projections of technical textiles in India.

2 FIBRES AND YARNS IN TECHNICAL TEXTILES
Manufacture and properties of glass fibres, asbestos, carbon fibres and aramid fibres; applications; Yarns used for tyre cords, sewing threads and ropes – types, method of production and applications.

3 FABRICS IN TECHNICAL TEXTILES -I
Filtration textiles, geo textiles and automotive textiles - Functional requirements, methods of production and properties.

4 FABRICS USED IN TECHNICAL TEXTILES -II
Clothing requirements for thermal protection, ballistic protection, UV-protection, protection from electro-magnetic radiation and static hazards, protection against microorganisms, chemicals and pesticides; design principles and evaluation of protective clothing.

5 MISCELLANEOUS
Stimuli sensitive intelligent textiles – production, properties and applications; smart textiles incorporating functional devices.

REFERENCE BOOKS:

Total No. of Periods: 45

PTTT012 COLOUR SCIENCE, MEASUREMENT AND APPLICATIONS

1. FUNDAMENTAL OF COLOUR SCIENCE
The perception of color – mechanism of color vision, color vision theories, defects in color vision, color vision tests; additive and subtractive color mixing; confusion in color perception; Beer’s Law, Lambert’s Law and Kubelka and Munk’s simplified model of theory of interaction of matter and radiation.

2. COLOUR ORDER SYSTEMS
Description of color, various color order systems, CIE system and its components, illuminants, standard observer and the chromaticity diagram.

3. COLOUR MATCHING
Reflectance curves of dyed samples, application of the Kubelka-Munk theory to color matching, techniques of computer color matching, prediction of color recipe, limitations of computer color matching.

4. METAMERISM
Illuminant metamerism, observer metamerism, geometric metamerism, assessment of metamerism, metamerism in textiles.

5. COLOUR DIFFERENCE MEASUREMENTS AND COLOUR ASSESSMENT IN TEXTILES
Visual colour assessment, variables, standard conditions and methods of visual assessment; evaluation. Instrumental colour assessment – colour difference equations and measurements (Lab/Luv scales), pass fail standards.

Total No. of Periods: 45
REFERENCE BOOKS:

PTTT 013 FABRIC AND GARMENT FINISHING 3 0 0 100

1. Garment dyeing; selection of fabrics; selection of garment accessories; fabric and sewing thread selection; selection of dyes; garment-dyeing machinery. 10
2. Washing; stone washing; acid washing; enzyme washing; bio polishing; emerisation; bleaching; laser fading; ozone fading. 10
3. Finishing; optical brightening; mercerization; liquid ammonia treatment. 10
4. Softening; softening; crease resistant and crease retentive finish; anti-static finish; anti-bacterial finish; waterproofing; flame proofing; soil release finish; mildew and moth proofing. 10
5. Stain removal; care labels; laundering equipment and procedures. 5

Total No. of Periods : 45

REFERENCE BOOKS:

PTTT 014 ENVIRONMENTAL MANAGEMENT IN TEXTILE INDUSTRY 3 0 0 100

1. Waste water characteristics; waste water treatment; objectives, methods and implementation considerations; recycling of effluents. 10
2. Identification and reduction of pollution sources in textile wet processing; pollution control in man-made fibre industry. 10
3. Analysis of textile processing effluents – colour; odor; pH, total solids, suspended solids, total dissolved solids, BOD, COD; total alkalinity, chloride, sulphates, calcium and chromium; tolerance limits for effluents; bio-degradability of textile chemicals and auxiliaries. 10
4. Technical regulations on safety and health aspects of textile materials – banned dyes and chemicals; Eco labelling, eco friendly textile processes, machines and specialty chemicals; natural dyes and environmental considerations. 10
5. Air pollution in textile industry; solid waste disposal. 5

Total No. of Periods : 45

REFERENCE BOOKS:

PTTT 015 SYNTHETIC FIBRE COLORATION

1. MASS COLOURATION
   Different methods of mass colouration, mass colouration of polymers - polyester, nylon, acrylic and polypropylene.

2. PRETREATMENTS
   Pretreatments for polyester, nylon, acrylic and polypropylene fabrics, pretreatments for blends - polyester/cotton, polyester/wool, acrylic/wool and acrylic/cotton.

3. DYEING OF POLYESTER AND POLYPROPYLENE
   Different mechanisms of dyeing polyester, dyeing of textured polyester, differentially dyeable polyester and its blends, carrier free dyeable polyester, dyeing of polyester blends - polyester/cotton and polyester/wool; dyeing of unmodified and modified polypropylene.

4. DYEING OF NYLON AND ACRYLIC
   Dyeing of nylon with acid and disperse dyes, dyeing of polyamide blends, differentially dyeable nylon and its blends, dyeing of acrylic with cationic and disperse dyes, dyeing of acrylic blends, differentially dyeable acrylic and its blends.

5. PRINTING
   Different styles of printing polyester, polyamide and polypropylene fabrics; transfer printing - different systems of transfer printing, heat transfer printing, advantages and limitations.

REFERENCE BOOKS:

PTTT 016 PROCESS CONTROL IN TEXTILE CHEMICAL PROCESSING

1. Quality control tests for dyes, chemical auxiliaries and finishing agents.
2. Quality control tests in singeing, desizing, scouring, bleaching and mercerisation; process control aspects in the above processes.
3. Quality control tests in dyeing and printing; concept of CCM in quality control; process control in dyeing and printing.
4. Quality Control tests in finishing treatments; process control in above treatments.
5. Quality control tests for eco-labelling; process control measures to achieve eco-standards.

Total No. of Periods : 45
REFERENCE BOOKS:

PTTT 017 CAD AND CAM IN TEXTILES

1. BASIC CONCEPTS

   Overview of CAD and CAM and their application in various fields of textiles.

2. COMPUTER HARDWARE

   Centralized and distributed computer systems, CPUs and memory, video terminals, graphic workstations, digitizers and scanners, storage devices, printers and plotters.

3. DESIGN SOFTWARE

   AUTOCAD and its emulators; specific software for textile applications; CIE color system and true color representation; concepts of image processing.

4. DESIGN FUNDAMENTALS

   Weave patterns, printable designs - generation using computers.

5. COMPUTER AIDED MANUFACTURING

   Pattern generation and cutting in tailoring, shade tolerance testing; computer controlled machines; stock control, statistical quality control, process costing.

Total No. of Periods : 45

REFERENCE BOOKS:

PTTT 018 CAD / CAM FOR APPAREL PRODUCTS

1. INTRODUCTION

   Introduction to computer; concepts of CAD / CAM; CAM in garment manufacturing; complete pattern design system in preparation for grading, marker making and pattern manipulation.

2. COMPUTERIZED PRODUCTION OF APPAREL

   Computerized production pattern making - Hardware, software and system programming to produce a sample production pattern; computer aided manipulation of pattern pieces to create individual styles; operation of garment CAD software, use of computer for
purchase, inventory control and sales, computerization in quality control and production control; computer aided production planning in garment manufacturing.

3. FINITE SCHEDULING
   Introduction to finite scheduling concept and fast react software; creating product and order planning and updating; elimination of late deliveries; general set up; allowances and matrices; analyzing loan balancing in different departments; control mechanisms; critical path and time tables.

4. COMPUTER CONTROL AND TECHNIQUES
   Computer controlled machinery for garment manufacturing; automated layout planning by various techniques; algorithm for computer production of garment parts; intelligent systems; 3D scanning technology; use of microcomputers for production control in garment industry; imaging techniques for various designs; development of robotics for CAM.

5. MANAGEMENT
   Management information system in garment industry: EDI in garment technology; concept of Enterprise Resource Planning (ERP) and computerization in exports/documentation.

Total No. of Periods : 45

REFERENCE BOOKS:

Total No. of Periods : 45
REFERENCE BOOKS:

PTTT 020 APPAREL MARKETING AND MERCHANDISING

1. ORGANIZATION OF THE APPAREL BUSINESS
   Introduction to apparel industry; organization of the apparel industry; types of exporters; business concepts applied to the apparel industry; international trade.

2. MARKETING
   Functional organization of an apparel firm; responsibilities of a marketing division; marketing objectives and strategies; marketing research; types of markets; Retail and wholesale strategies for merchandise distribution; retailers' sourcing flows and practices; marketing plan; labeling and licensing.

3. MERCHANDISING
   Definition of merchandising; functions of merchandising division; role and responsibilities of a merchandiser; different types of buyers; communicators with the buyers; awareness of current market trends; product development line planning – line presentation.

4. SOURCING
   Need for sourcing, sourcing materials; manufacturing resources planning; principles of MRP; overseas sourcing; sourcing strategies; supply chain and demand chain analysis; materials management for quick response; JIT technology.

5. DOCUMENTATION
   Order confirmation; various types of export documents; pre-shipment and post-shipment documentation; terms of sale; payment and shipment; export incentives; foreign exchange regulation acts; export management risk; export finance.

Total No. of Periods : 45

REFERENCE BOOKS:

PTTT 021 APPAREL PRODUCTION CONTROL

1. INTRODUCTION
   Control parameters, apparel production parameters, planning and lead-time; product development; steps from prototype to production model; importance of pre-production activities; introduction to timetable concepts; product data management; understanding and interpretation of specification sheet.

2. OPERATION
   Operation sequence development; garment breakdown with machine and attachment details; development of production grid for garment construction; development of production flowchart.
3. PRODUCTION
   Bundle tickets - guidelines for bundle ticket design, functions of bundle tickets, bundle ticket control, different manufacturing systems; make through and assembly line manufacturing - advantages and disadvantages, lay out planning - numerical exercises on lay out planning to optimize cutting cost, bundling, ticketing and cutting room control formats.

4. PRODUCTION, PLANNING AND CONTROL
   Production planning and control; capacity calculation for cutting, sewing and finishing; determination of machine requirements for new factory, line balancing - determination and allocation of manpower, machine for balanced production in existing plant for a given target.

5. QUALITY CONTROL
   Quality in product development; quality assurance during product development - methods to avoid problems during pattern making, garment construction and other areas; inspection procedures; work-study in garment industry - methods to control time and cost.

REFERENCE BOOKS:

PTTT 022 GARMENT CONSTRUCTION

1. DESIGN FEATURES
   Fabric design constraints in garment manufacture; observation of defects in fabrics; grains; lines; direction of nap; single ply cutting; multiply cutting; nap one way, nap two way, reversible, non reversible.

2. STITCHES
   Different types of stitches - inter loop, intra loop, inter lace; methods of stitch formation - hand stitch, machine stitch and embroidery stitch; advantages and disadvantages of various type of stitches.

3. SEAMS
   Different types of seams - flat seam, superimposed seam, bound seam, decorative seam; applications; advantages and disadvantages of different kind of seams.

4. SEWING THREADS
   Different types of sewing threads - polyester, cotton and woolen; their properties.

5. BUTTONS
   Study on different kind of buttons - MOP, beads, woolen, metal; size of button; miscellaneous embellishment - zips, snap buttons, fastness beads; fusing and its techniques, velcro.

REFERENCE BOOKS:
4. Carbon B., "How do you Look & Dress".
5. Cock, "Dress Making Simplified",
6. Anna Jacob Thomas, "The Art of Sewing".

PTT 023 PATTERN MAKING

1. BASIC PATTERN MAKING
9
Measurement taking, size chart and measuring of sizes, definition of various garment parts, pattern making - bespoke method and industrial method (Using Blocks), basic block construction, block preparation and correction.

2. DRAFTING
9
Basic principles and methodologies used to draft standard size block patterns for men, women and kids wear viz., shirts, pants, skirts, blouses, jackets.

3. DRAFTING OF SLEEVE AND COLLAR
9
Construction of sleeve block, crown height and its relationship with the fit of garment, introduction to silhouettes of sleeves: sleeve variation — cap, regular short sleeve, bishop, leg’s o mutton, puff sleeve; cuffs and sleeves opening, sleeve plackets; collars - set-in collars and collar variations, band collars, Peter pan, sailor, gents shirt collar, one piece and two piece collar, convertible collar.

4. DART MANIPULATION
9
Pattern making by manipulation of dart; manipulation as seen through existing suppressions points (dart points), away from suppression points, as gathers or trims, as multiple darts; methods - slash and spread, pivot; difference between permanent pattern (draft), working patterns and production patterns; importance of drill hole marks in the darts; seam allowances and its importance; importance of notches; balances marks and grain lines.

5. GRADING
9
Principles of grading, master and basic grades - basic back grades, basic front grading, basic sleeve grading, basic collar grading, basic facing grading; trousers grading, jacket grading, shirt grading, grading men’s waist coat, size chart, displacement of bust dart to waist line; side seam, arm hole, neck and front edge; women’s sizing chart, selecting a grading system - multi track grading.

REFERENCE BOOKS:

PTT 024 QUALITY ASSURANCE IN GARMENT INDUSTRY

1. Design satisfaction tests - fabric specification, cloth defects, various point systems, shrinkage potential.

2. Garment specification; manufacturing specification; name of operation and associated details in respect of sewing, dying and washing of garments; Style features, trims specification, stitch specification, size scale, garment dimensions and tolerances; quality of trims and accessories.

3. Defects in garments and their remedies - A, B and C zones in a garment with respect to defects.
4. Quality management concepts; quality control and inspections; S.O.C.; acceptance sampling; T.Q.M.; I.S.O. 9
5. Laboratory testing for quality and performance. 5

Total No. of Periods : 45

REFERENCE BOOKS:

PTTT 025 CLOTHING SCIENCE 3 0 0 100

1. FABRIC APPEARANCE 9
Fibre structure, yarn structure and fabric construction; their effect on fabric appearance; study of properties such as pilling, fastness, and lustre.

2. COMFORT 9
The effect of fibre properties, yarn structure and fabric construction on the fabric properties - drapability, air permeability, moisture absorption, bending rigidity, shear.

3. DURABILITY 8
Study of Tensile, tearing strength, bursting strength with respect to fibre properties, yarn structure and fabric design.

4. FABRIC AS PROTECTION 4
Study of protective properties of apparel for various applications; desirable properties of protective textiles; method of testing for thermal protective performance, impact, abrasion and wear resistance; evaluation of resistance to mildew, ageing, sunlight, chemical, static electricity and flame propagation; ASTM standards for protective garments.

5. EASY CARE 6
Crease resistance, anti-shrink, pilling resistance behaviour – role of fibre properties and chemical treatments.

6. FABRIC ENGINEERING 9
Fabric engineering for a given end use - selection fibre, type of yarn, fabric structure and finishing treatments.

Total No. of Periods : 45

REFERENCE BOOKS:
PTTT 026 PROTECTIVE GARMENTS

1. Selection of fibres - Suitability and properties of high performance fibres for various protective clothing - chemical composition and physical structure, characteristics and working of various fibres according to different end uses like thermal protection, ballistic protection, anti-microbial protection. Protection against cold etc.


3. Chemical finishes for protective garments: Use of coated fabrics - different types of finishes like fire retardant finishes, for different textile materials, water repellent finishes, anti-microbial finishes. Chemical finishes against radiation and chemicals - method of application of these finishes. Protective finishes for health care garments.

4. Garment construction: Method of construction of garments according to various protective end uses like protection against cold, ballistic protection, use of different fabric type (knitted, woven, and Non-woven), coated / laminated in different places. Use of inter lining and composites. 3D structures. High tech textiles - variable electronics. Protective garments for industrial and apparel end uses.


Total No. of Periods: 45

REFERENCE BOOKS:


PTTT 027 PRODUCT ENGINEERING AND PLANT LAYOUT

1. PRODUCT ANALYSIS

Relationship between quality and construction of a sewn product; geometric principles of draping, drafting and industrial patterns; product specifications.

2. PRODUCTION CONTROL AND ENGINEERING

Industrial engineering concepts; development and application of standard data for pre-costing and factory scheduling; basic production systems; production control charts; manufacturing information system - systems and procedures.

3. PRODUCTION MANAGEMENT ANALYSIS

Analysis of techniques for material utilization and cutting of raw materials for all types of sewn products; principles and methods of costing; evaluation of equipment for examining, spreading, cutting, marking and ticketing; solution of production problems in spreading, cutting and cost control.

4. PLANT LAYOUT

Types of production layout; criteria for evaluation of a plant layout, determining minimum space requirement, calculation grid, plant size location; basic production line layout; Government regulations for plant layout.

5. TIME AND MOTION STUDY

General approach for making a time and motion study - preliminary data for time and motion study sheet; sewing work study: principles of work cycle timing methods, objectives of time study.
statistical approaches, statistical calculation of time study; operator efficiency distributions; evaluating motion study data; principles for improving sewing and pressing operations.

**REFERENCE BOOKS:**


**PTTT 028 WORK STUDY IN TEXTILE INDUSTRY**

1. Method study - procedure process chart, flow and handling of materials, movements of workers, string diagram, method and movement in the working place.  
2. Principles of motion economy - SIMO chart work, application in garment industry  
3. Measurement procedures, time study, equipment and forms, job breaking down into units; work measurement procedures applied to textile industry.  
4. Rating, Scales, Factors, human factor; working condition, allowances, use of time standards, estimating, standardisation.

**PTTT 028 ENERGY MANAGEMENT IN TEXTILE INDUSTRY**

1. Source of energy; limitations of natural sources.  
2. New technologies for energy; unexploited energy resources and problems in their exploitation.  
3. Total energy concept; energy consumption in spinning, weaving and processing, conservation of energy in such processes.  
4. Techniques of energy saving; modification of technology or techniques towards saving in energy.  
5. Scope of utilisation of by products for energy production; captive power generation and its economics.

**REFERENCE BOOKS:**

PTTT 030 COSTING 3 0 0 100

2. Depreciation on land, buildings and machines; methods of computing depreciation; methods of calculating pay back period, return on investment, discounted cash flow.
3. Cost accounting, profit and loss account; balance sheets; ratio analysis
4. Costing of yarn and fabrics; cost control – material, labour and overhead.
5. Budget and budgetary controls; tools for financial analysis and control; analysis of operating and financial leverage.

Total No. of Periods : 45

REFERENCE BOOKS:

PTTT 032 OPERATIONAL RESEARCH 3 0 0 100

1. LINEAR PROGRAMMING 13
   Formulation of LP problem; solution of LP problem by graphical method, simplex method.
2. TRANSPORTATION PROBLEM 5
   Northwest corner rule, inspection method, Vogel Approximation method; application of optimality test.

PTTT 033 PRODUCTION & OPERATIONS MANAGEMENT 3 0 0 100

3. INVENTORY CONTROL
   ABC analysis; Fixation of inventory level, EOQ (Wilson's Formula), Problems related to above theoretical aspects.
4. PERT / CPM
   Drawing of CPM and PERT networks; finding critical path; project cost control; determining standard deviation, variances and the value of z- variate - PERT networks.
5. GAME THEORY
   Rule of saddle point determination; rule of dominance; mixed strategy approach, graphical approach, problems related to above theoretical aspects.

Total No. of Periods : 45

REFERENCE BOOKS:
2. Capacity planning – single stage system, multistage system; facility planning – objectives; different types of layouts; developing process layout, product layout; job design techniques.  

3. Aggregate production planning – procedure, importance; scheduling in operation management – mass production system, batch and job shop.  

4. Material management – material planning, purchase, stores, material handling and disposal, inventory models – basic inventory model, gradual replacement model, basic model with backlogging, bulk discount model, independent demand system for multiple products, models with uncertain demand, multiple period model; MRP – objectives, elements of MRP, MRP computation, implementation.  


Total No. of Periods : 45

REFERENCE BOOKS:  


PTTT 034 PERSONNEL MANAGEMENT  
1. Human Resource Development Systems – concepts and structure; personnel management – characteristics, objectives, functions and operations; organization chart; role of personnel managers  

2. Manpower planning – objectives, planning for future; methods of recruitment, process of recruitment and induction, training- objectives, methods; management development – concepts, objectives and techniques; career planning and development  

3. Job analysis, description, evaluation; hierarchy of human needs; creating motivation, types of motivation, job enrichment; performance measurement-objective, methods; wage policy; industrial pay structure-components, laws and methods of payment; methods of wage fixation; laws governing employees benefits and welfare; salary administration.  

4. Factories Acts; Industrial disputes Acts; Payment of wages Act; Minimum wages Act; Payment of bonus Act; Workman compensation Act; Employees state insurance Act; Employees provident fund Act; Payment of Gratuity Act; employee discipline – disciplinary actions, rules and procedures; suspension, dismissal and retrenchment - rules and procedures; grievances handling.  

5. Role of trade unions – goals and objectives, Indian context; Trade Union Act; collective bargaining – concepts, functions, position in India; industrial disputes – problems & solutions; industrial democracy; workers participation in management.  

Total No. of Periods : 45
REFERENCE BOOKS:


REGULATIONS AND SYLLABUS

(REGULATIONS 2005)

Controller of Examinations
A.C. Tech, Anna University,
Chennai-600 025, India

B.TECH DEGREE PROGRAMME
(PART TIME 7 SEMESTERS)

CHEMICAL ENGINEERING

A.C. COLLEGE OF TECHNOLOGY
ANNA UNIVERSITY
CHENNAI - 600 025
A.C. COLLEGE OF TECHNOLOGY
ANNA UNIVERSITY: CHENNAI – 600 025
(An Autonomous Constituent Institution of Anna University)

REGULATIONS 2005

B.E. / B.Tech. (Part-Time – 7 Semesters)
Degree Programmes

Effective from December 2004-2005 and applicable to the students admitted to the A. C. College of Technology.

1. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these regulations, unless the context otherwise requires


(ii) “Branch” means specialization or discipline of B.E./B.Tech. (Part-Time – 7 Semesters) Degree Programme, like Chemical Engineering, Textile Technology, etc.

(iii) “Course” means a theory or practical subject that is normally studied in a semester like, Mathematics, Physics, etc.

(iv) “Institution” means the A.C. College of Technology the autonomous constituent Institution of Anna University.

(v) “Head of Institution” means the Dean of the Institution who is responsible for all activities of the Institution and for implementation of relevant rules of this Regulations.

(vi) “University” means Anna University.

2. CONDITIONS FOR ADMISSION

2.1 Candidates seeking admission to the first semester, also known as Bridge semester of the part-time B.E. / B.Tech degree programme shall be required to have passed the Diploma in Engineering/Technology in the relevant branch
of specialization awarded by the State Board of Technical Education, Tamil Nadu or any other authority accepted by the Syndicate of the University as equivalent thereto.

2.2 Eligibility Candidates seeking admission shall satisfy the following conditions:
(i) Eligibility conditions such as class, marks, number of attempts shall be as prescribed by the Syndicate of the University from time to time.
(ii) Shall have been employed for at least one year after qualifying for the Diploma, the period being counted as on 1st January of the academic year in which admission is sought.
(iii) Notwithstanding the qualifying examination the candidate might have passed vide clause 2.1 he/she have a minimum level of proficiency in Mathematics, Physics, Chemistry and the relevant branch of study as may be prescribed by the University.
(iv) Shall be employed within a zone of 65km radius from the institution.
(v) Shall satisfy the conditions of physical fitness as prescribed by the syndicate of the University.

3. DURATION OF THE PROGRAMME
The duration of the programme shall be seven consecutive semesters, spread over 3.5 academic years, two semesters constituting an academic year. Each semester shall have a minimum of 75 working days (evenings) excluding the end-semester examination.

4. BRANCHES OF STUDY
A candidate may be offered, at the time of admission, one of the following branches of study.
1. B.Tech. Chemical Engineering-Diploma in Chemical Engineering / Chemical Technology / Chemical Technology (SW) / Petroleum Engineering / Petro

5. COURSES OF STUDY
The Courses of study shall include theory and practical as detailed in the respective curriculum. The medium of instruction shall be English.

6. EVALUATION OF CANDIDATES PERFORMANCE
6.1 The maximum marks for each theory and practical course (subject) shall be 100 comprising of 20 marks for continuous assessment and 80 marks for the end-semester examinations conducted by the Institution. The examinations shall ordinarily be conducted in November/December or in April/May depending on odd or even semesters. For practical examinations (including Project Work), both internal and external examiners shall be appointed by the Institution.

6.2 Procedure for Awarding Marks for Continuous Assessment
6.2.1. Theory Subjects:
Three tests each carrying 100 marks shall be conducted by the department / institution. The total marks obtained in all the tests put together out of 300, shall be reduced to 20 marks and rounded to nearest integer (This implies equal weightage to all the three tests.)
6.2.2. Practical Subjects:

Every practical exercise/ experiment shall be evaluated based on conduct of experiment/ exercise and records maintained. There shall be at least one mid-semester test. The criteria for arriving at the internal assessment marks shall be decided by the Head of the institution and shall be announced at the beginning of every semester.

6.2.3. Theory Subjects with Laboratory Component:

If there is a theory subject with laboratory component, there shall be three tests; the first two tests (each 100 marks) will be from theory portions and the third test (maximum mark 100) will be for laboratory component. The sum of marks of first two tests shall be reduced to 10 marks and the third test mark shall be reduced to 10 marks. The sum of these for 20 marks may then be arrived at and rounded to nearest integer.

6.2.4. Project Work:

There shall be three assessments (each 100 marks) during the semester by a review committee. The student shall make presentation on the progress made before the committee. The Head of the institution shall constitute the review committee for each branch of study. The total marks obtained in the three assessments shall be reduced to 20 marks and rounded to the nearest integer.

7. DISCIPLINE

7.1. Every student is required to be disciplined and to have decorous behavior both inside and outside the campus and not to indulge in any activity, which will tend to bring down the prestige of the Institution and university.

7.2. Any act of indiscipline of a student reported to the Head of Institution will be referred to a Discipline and Welfare Committee nominated by the Institution/University from time to time, for taking appropriate action.

7.3. If a student indulges in malpractice during tests/ examinations, the student shall be liable for punitive action as prescribed by the Institution/University from time to time.

8. REQUIREMENT FOR COMPLETION OF A SEMESTER:

8.1. A candidate who fulfills the following conditions shall be deemed to have satisfied the requirements for the completion of a semester:

   i) He/She secures not less than 70% overall attendance taking into account the total number of periods attended by the candidate in all the courses put together as against the total number of periods in all the courses offered during the semester.

   ii) He/She earns a progress certificate form the Head of the Department and the Head of Institution for having satisfactorily completed the programme of study in all the courses pertaining to that semester.

   iii) His/Her conduct is found to be satisfactory as certified by the Head of the Department and the Head of Institution.

8.2. Candidates who do not complete the semester (as per clause 8.1) will not be permitted to write the end-semester examination and are not permitted to go to next semester. They are required to repeat the incomplete semester in the next academic year.

9. REQUIREMENTS FOR APPEARING FOR END-SEMESTER EXAMINATION

A candidate shall normally be permitted to appear for the end-semester examination of the current semester, if he/ she has satisfied the semester completion requirements (vide clause 8) and has registered for examination in all the courses of that semester.
10. REQUIREMENT FOR PROCEEDING TO A HIGHER SEMESTER
A candidate shall be permitted to proceed from the current semester to the next semester, irrespective of the arrear courses he / she may have in the earlier semester only if,

i) He / She has satisfied all the semester completion requirements of the current semester and

ii) He / She has registered for the end-semester examination in all the courses of the current semester and also in all arrear courses, if any.

11. PASSING REQUIREMENT AND CLASSIFICATION OF SUCCESSFUL CANDIDATES

11.1. A candidate shall be declared to have passed the examination in a course of study if he / she secures 50% of the total marks (continuous assessment plus end-semester examination marks) prescribed for that course and if he / she has also secured 45% of the marks in the end-semester examination conducted by the Institution. The rule is applicable to theory and practical courses including Project Work.

11.2. A candidate who has been declared as "failed" in a particular course may reappear for the end-semester examination in that course as and when the examination in that course is conducted and secure a pass. However, the continuous assessment marks obtained by the candidate in the first attempt shall be retained and considered valid for all subsequent attempts.

11.3. A student can apply for revaluation of his / her end-semester examination answer paper in a course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Heads of Departments concerned. The Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Heads of the Departments.

11.4. A candidate who qualifies for the award of the degree (vide clause 14) passing the examination in all the courses in all the seven semesters in his / her first appearance within seven consecutive semesters (3.5 academic years) and in addition secures an aggregate of not less than 75% of the total marks (continuous assessment plus end-semester examination marks) for all the courses in the semester II to VII put together shall be declared to have passed the examination in First Class with Distinction. For this purpose, the withdrawal from examination (vide clause 12) shall not be construed as an appearance. Further any authorized break of study will be excluded from the total duration while finding the period of completion (vide clause 13.3).

11.5. A candidate who qualifies for the award of the degree (vide clause 14) passing the examination in all the courses in the Semester II to VII within a period of eight consecutive semesters after his / her commencement of study in the second semester and in addition secures an aggregate of not less than 60% of the total marks (continuous assessment plus end-semester examination marks) for all the courses in the semesters II to VII put together shall be declared to have passed the examination in First Class. For this purpose the period of completion will be arrived at by excluding any authorized break of study (vide clause 13.3).

11.6. All other candidates who qualify for the award of the degree (vide clause 14) shall be declared to have passed the examination in Second Class.

11.7. A candidate who absents in the end-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.
12. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

12.1 A candidate, may for valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

12.2 Such withdrawal shall be permitted only once during the entire period of study of the degree programme.

12.3 Withdrawal application is valid only if it is made within the prescribed number of days prior to the commencement of the examination in that course or courses and recommended by the Head of the Department and approved by the Head of the Institution.

12.4 Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.

12.5 The candidate shall reappear in the examination only when the examination in the withdrawn course or courses is conducted subsequently.

13. PROVISION FOR BREAK OF STUDY

13.1 Break of study shall not normally be permitted. However, if a candidate intends to temporarily discontinue the programme in the middle for valid reasons, and to rejoin the programme in a later semester, permission may be granted based on the merits of the case provided he/she applies to the Institution in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Department stating the reasons and the probable date of rejoining the course.

13.2 The candidate rejoining the programme after the authorized break of study shall be covered by the rules and regulations in force at the time of rejoining.

13.3 The duration specified for passing all the courses for the purpose of classification (vide clause 11.4 and 11.5) shall be increased by the period of such authorized break of study.

13.4 The total period for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed the prescribed maximum period (vide clause 14), irrespective of the period of break of study.

13.5 If any student is either detained in a semester for want of requisite attendance, progress and good conduct or suspended from the programme indiscipline, the resulting period of break of study shall not be considered as an authorized break of study for purpose of classification and clause 13.3 is not applicable in this case.

14. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A candidate shall be declared to be eligible for the award of the Degree if he/she has,

i) Undergone the programme for a period of seven semesters.

ii) Passed the examinations in all the courses prescribed in the respective curriculum within a maximum period of 16 Semesters reckon from the commencement of the first semester to which the candidate was admitted. This maximum period shall be 20 Semesters in the case of women candidates.

iii) No disciplinary action pending against him/her.

iv) The award of the degree must be approved by the syndicate

15. REVISION OF REGULATIONS AND CURRICULUM

The Institution may from time to time revise, amend or change the regulations, courses of study, curriculum, syllabi and assessment procedure, if found necessary.
## DEGREE OF BACHELOR OF TECHNOLOGY

### REGULATION 2005 CURRICULUM

#### SEMESTER – I

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTCY 171</td>
<td>Chemistry I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTGE 171</td>
<td>Engineering Graphics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTMA 171</td>
<td>Mathematics I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTPH 171</td>
<td>Physics I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTGE 172</td>
<td>Fundamentals of Computing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

#### SEMESTER – II

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTCY 181</td>
<td>Chemistry II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTEE 191</td>
<td>Electrical and Electronics Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTGE 181</td>
<td>Engineering Mechanics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTPH 181</td>
<td>Physics II</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>PTMA 181</td>
<td>Mathematics II</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

#### SEMESTER III

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTC 201</td>
<td>Organic Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 202</td>
<td>Material Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 203</td>
<td>Chemical Technology</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 204</td>
<td>Mechanical Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 205</td>
<td>Mechanics of Solids</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

#### SEMESTER IV

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTC 206</td>
<td>Chemical Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 207</td>
<td>Thermodynamics I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 208</td>
<td>Physical Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 209</td>
<td>Fluid Mechanics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 210</td>
<td>Chemical Process Calculations</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 211</td>
<td>Instrumental Methods of Analysis</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

#### SEMESTER V

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTC 301</td>
<td>Chemical Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 302</td>
<td>Thermodynamics II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 303</td>
<td>Mass Transfer-I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 304</td>
<td>Heat Transfer</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 305</td>
<td>Chemical Reaction</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 306</td>
<td>Engineering I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 307</td>
<td>Mechanical Operations</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 308</td>
<td>Chemical Process</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 309</td>
<td>Equipment Design and Drawing I</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

#### SEMESTER VI

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTC 307</td>
<td>Mass Transfer-II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 308</td>
<td>Chemical Reaction</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 309</td>
<td>Engineering II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 310</td>
<td>Process Instrumentation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 311</td>
<td>Environmental Science and Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTC 312</td>
<td>Elective – I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

#### Practical

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTC 211</td>
<td>Fluid Mechanics Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>
### Semester VII

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTCH 401</td>
<td>Process Economics and Industrial Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 402</td>
<td>Professional Ethics and Human Values</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Elective – II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Practicals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTCH 403</td>
<td>Chemical Process Equipment Design</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>and Drawing II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTCH 404</td>
<td>Project Work</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

**Branch: Chemical Engineering**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTCH 001</td>
<td>Petroleum Refining and Petrochemical Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 002</td>
<td>Drugs and Pharmaceutical Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 003</td>
<td>Polymer Science and Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 004</td>
<td>Food Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 005</td>
<td>Safety in Chemical Process Industries</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 006</td>
<td>Energy Management in Chemical Industries</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 007</td>
<td>Entrepreneurship</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 008</td>
<td>Modern Separation Techniques</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 009</td>
<td>Electrochemical engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 010</td>
<td>Corrosion science and engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 011</td>
<td>Electrochemical environmental technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 012</td>
<td>Environment impact assessment and clean technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 013</td>
<td>Biochemical engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 014</td>
<td>Biomedical Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 015</td>
<td>Risk analysis and Hazop</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 016</td>
<td>Process Automation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 017</td>
<td>Process Modeling and Simulation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 018</td>
<td>Optimization of Chemical Processes</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>PTCH 019</td>
<td>Computer Aided Design</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>

**PTCY 171 Chemistry I**

**AIM**

- To develop a sound knowledge of theoretical and modern technological aspects of chemistry
- To enable the student to correlate the theoretical principles with application oriented studies

**OBJECTIVES**

- Should be conversant with the language of thermodynamics, electrochemistry, spectroscopy, surface chemistry to solve simple problems related to different industrial processes.
- Should be conversant with the theoretical principles and experimental methodology in the use of sophisticated analytical instruments.
- The knowledge gained will be a prerequisite for the application oriented topics to be pursued in the later semesters.

**UNIT I THERMODYNAMICS**


**UNIT II SURFACE CHEMISTRY AND CATALYSIS**

adsorption in catalytic reactions – ion exchange adsorption –
basic principles in adsorption chromatography – Catalysis –
classification – characteristics of catalysis – auto catalysis –
enzyme catalysis – Michaelis – Menton equation – acid base

catalysis.

UNIT III CHEMICAL KINETICS

Kinetics of second order reaction – characteristics of second
order reactions – half life period – examples of second order
reactions – hydrolysis of ester by sodium hydroxide – simple
problems in second order kinetics – kinetics of opposing parallel
and consecutive reactions – examples for consecutive reactions
– decomposition of dimethyl ether in gaseous phase –
decomposition of ethylene oxide – radioactive decay of polonium
– examples of parallel reactions – reaction of ethyl bromide
with caustic potash – bromination of bromobenzene – example
of opposing reaction – dissociation of hydrogen iodide –
isomerisation of cyclopropane into propene – effect of
temperature on reaction rate – theory of absolute reaction rate
– steady state principle.

UNIT IV ELECTRO CHEMISTRY

Kohlrausch law of independent migration of ions – applications
– conductometric titrations – advantages – galvanic cells –
reversible and irreversible cells – emf and its measurements -
single electrode potential – standard electrodes (H2, & calomel
electrodes) – electrochemical series – Nernst equation –
problems – metal – metal ion electrode – metal – metal insoluble
salt electrode – glass electrode – determination of pH using
glass electrode – application of emf measurements – problems
– concentration cells applications – problems – ion selective
electrodes – polarization – overvoltage – decomposition potential.

UNIT V SPECTROSCOPY

Electromagnetic spectrum – absorption of radiation – electronic
transition – vibrational transition – rotational transition –
intensities of spectral lines – Beer – Lambert’s Law – types of
instruments used for absorption measurements – colorimetric
analysis – estimation of concentration of a solution by colorimetry
– flame photometry – theory, instrumentation and application –
visible & UV spectroscopy – principles, instrumentation and
application – IR spectroscopy – applications only.

Total No. of Periods : 45

TEXT BOOKS:

1. Puri B.R., Sharma L.R. and Madan S. Pathania, Principles of
   Physical Chemistry. Shoban Lal Nagin Chand & Co., Jalandhar,
   2000.

2. Jain P.C and Renuka Jain, Physical Chemistry for Engineers,

REFERENCE BOOKS:


2. Kuriasose J.C. & Rajaram J, Chemistry in Engineering &
   Technology, Vol. 1, Tata Mc Graw Hill publishing company, New
   Delhi, 1996.

PTGE 171 ENGINEERING GRAPHICS 3 1 0 100

OBJECTIVE

To develop graphic skills for communicating concepts, ideas
and designs of engineering products and to give exposure to
national standards relating to technical drawings.

CONCEPTS AND CONVENTIONS (Not for exam) 4

Importance of graphics in design process – visualization,
communication, documentation – BIS conventions – Drafting
tools – construction of curves like ellipse, parabola, cycloid
and involutes.
UNIT I: PROJECTION OF POINTS, LINES AND SURFACES
2
- General principles of presentation of technical drawings as per BIS - Naming views as per BIS - First angle projection
- Orthographic projection of points
- Projections of straight lines located in first quadrant only - determination of true length and true inclination
- Projections of plane surfaces like polygonal plane and similar located in first quadrant only.

UNIT II: PROJECTION OF SOLIDS
8
- Projection of simple solids like prisms, pyramids, cylinder and cone - Drawing views when the axis of the solid is inclined to one reference plane.

UNIT III: SECTION OF SOLIDS AND DEVELOPMENT
12
- Sectioning of simple solids like prisms, pyramids, cylinders, and spheres. Obtaining sectional views when the axis of the solid is vertical and cutting planes parallel to one reference plane.
- Development of lateral surfaces of truncated prisms, pyramids, cylinders, and cones.

UNIT IV: PICTORIAL PROJECTIONS
16
- Isometric projection - Isometric Scale - Isometric views of simple solids, truncated prisms, pyramids, cylinders, and cones.
- Perspective projection of prisms, pyramids, and cylinders by vanishing point method.

UNIT V: FREE-HAND SKETCHING
10
- Free-hand sketching techniques - sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning.
- Sketching pictorial views from given orthographic views, Demonstration (Not for Exam).

TEXT BOOK:

REFERENCE BOOK:

STANDARDS:
1. IS 10711 - 2001 Technical Product Documentation - Sites of drawing sheets
2. IS 9600 - 1983 Lettering on technical drawings
3. IS 10714 - 1983 General Principles of presentation of technical drawings
4. IS 11669 - 1998 General Principles of dimensioning of technical drawings

SPECIAL TOPICS applicable to University Examination on Engineering Graphics
1. There will be five questions, of which the question No.1 will not have choice and can be from any unit of the syllabus. The other four questions will be of "Either – Or" type, from the remaining units.
2. All questions will carry equal marks of 20 each making the total of 100 marks.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit the solution with in A3 size.
4. The University examination in a college, will be conducted in multiple sessions, i.e. one for every 180 candidates or part there of.

PTMA 171 MATHEMATICS

AIM

The course is aimed at developing the skills of the students in the basic chosen topics of Mathematics that are imperative for effective understanding of engineering subjects. It also lays the foundation for learning further topics of Mathematics in higher semesters in a graded manner. The learners will be enabled to appreciate the important role of mathematical concepts in engineering applications.

OBJECTIVES

On completion of the course the students are expected to

- Be capable of identifying algebraic eigenvalue problems from practical areas and obtain the eigensolutions in certain cases and to have acquired the technique of diagonalizing a matrix which would render the eigensolution procedure very simple.
- Have grasped the method of three dimensional analytical geometry to study the properties of lines and planes in space along with sphere as an illustrative curved surface element, providing an elegant tool for enhanced understanding of three dimensional materials which is imperative for engineers.
- Understand effectively the geometrical aspects of curvature, involutes and evolutes of plane curves, essential concepts for an engineer, as elegant applications of differential calculus.
- Understand and handle functions of more than one variable, from the points of view of their differentiation, expansions and extreme values, along with differentiation under integral sign which are encountered in engineering studies.
- Have learnt the method of solving systems of differential equations of certain types that they might encounter in their studies of other subjects in the same or higher semesters.

UNIT I MATRICES

9 + 3

- Rank of matrix – consistency of linear system of equations.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY

9 + 3


UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS

9 + 3

- Curvature – Cartesian and polar co-ordinates – Centre and radius of curvature – Circle of curvature – Involute and involute – Envelopes – Properties of envelopes and involutes – Evolute as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

9 + 3

- Functions of two variables – Partial derivatives – Total differential – Taylor’s expansion – Maxima and minima – Constrained

UNIT V ORDINARY DIFFERENTIAL EQUATIONS
Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients - Homogeneous equations of Euler type – Equations reducible to homogeneous form – Method of variation of parameters.

L + T : 45 + 15 Total No. of Periods : 60

TEXT BOOKS:

REFERENCE BOOKS:

PTPH 171 PHYSICS I

AIM
- To enhance theoretical and modern technological aspects in Physics
- To enable the students to correlate the theoretical principles with application oriented studies

OBJECTIVES
At the end of the course the students would be exposed to:
- Design of acoustically good buildings
- Structure identification of engineering materials
- Non destructive techniques
- Interferometric techniques in metrology, communication and civil engineering
- Application of quantum physics to optical & electrical phenomena
- Application of lasers in engineering and technology

UNIT I ACOUSTICS AND ULTRASONICS
Classification of sound – characteristics of musical sound, Loudness – Weber Fechner law – Decibel, Decibel, Sone
Reverberation – Reverberation time. Derivation of Sabine's formula for reverberation time (Rate of Growth and Rate of Decay) – Absorption coefficient and its determination – Factors affecting acoustics of buildings (Optimum reverberation time, Loudness, Focussing, Echo, Echelon effect, Resonance and Noise) and their remedies.

UNIT II CRYSTALLOGRAPHY & NON-DESTRUCTIVE TESTING
Space lattice, unit cell, Bravais space lattices, Lattice planes, Miller indices, Calculation of number of atoms per unit cell, Atomic radius, coordination number & packing factor for simple cubic, BCC, FCC, HCP and diamond structures – NDT methods.
Liquid penetrant method, Ultrasonic flaw detector, X-ray radiography & fluoroscopy, Thermography
UNIT III WAVE OPTICS
Air wedge (theory and experiment) - testing of flat surfaces, Antireflection coatings, Interference filters. Michelson interferometer, Types of fringes, Determination of wavelength of monochromatic source and thickness of a thin transparent sheet - Theory of plane, circularly and elliptically polarized light - quarter and half wave plates, production and analysis of plane, circularly and elliptically polarized light - Photo elasticity - Birefringence - effect of a stressed model in a plane polariscope - Isoclinic and isochromatic fringes - Photo elastic bench

UNIT IV QUANTUM PHYSICS
Planck's quantum theory of black body radiation (Derivations), Compton effect (derivation) and Experimental verification of Compton effect – Schrödinger wave equation Time independent and time dependent equations, Physical significance of wave function, particle in a box (in one dimension) – electrons in a metal.

UNIT V LASER AND FIBRE OPTICS
Einstein’s coefficients (A & B), Nd:YAG laser, He-Ne laser, CO₂ laser, Light emitting diode, semiconductor laser - Homo-junction and Hetero-junction (only qualitative description) - Applications – Material processing, CD-ROM & Holography (Qualitative) Optical fibre- Principle and Propagation of light in optical fibres - Numerical aperture and acceptance angle-types of optical fibres - Single and Multimode, step index & graded index fibres - Applications - Fibre optics communication system, Fibre optic sensors, Medical endoscope

TEXT BOOKS:

REFERENCE BOOKS:

PTGE 172 FUNDAMENTALS OF COMPUTING 3 0 0 100

AIM
- To provide an awareness to Computers and Computing

OBJECTIVES
- To enable the student to learn the major Components of a Computer System
- To learn how arithmetic is handled in computers
- To know the correct and efficient ways of solving problems
- To learn to use office automation tools
- To learn to program in c

1. INTRODUCTION

2. COMPUTER ARITHMETIC AND SOFTWARE
3. PROBLEM SOLVING AND OFFICE AUTOMATION


4. INTRODUCTION TO C


5. FUNCTIONS AND POINTERS


TEXT BOOKS:


REFERENCE BOOKS:


PTCY 181 CHEMISTRY II

L T P M
3 0 0 100

AIM

- To develop a sound knowledge of theoretical and modern technological aspects of chemistry

- To enable the student to correlate the theoretical principles with application oriented studies

OBJECTIVES

Should be conversant with the language of water treatment, fuels, environmental pollution, lubricants and corrosion, chemistry of engineering materials to solve problems related to different industrial processes.

Should be conversant with the theoretical principles and experimental methodology in the quantitative and qualitative analysis.

The knowledge gained will be a prerequisite for the application oriented topics to be pursued in the later semesters.

UNIT I WATER TREATMENT


UNIT II FUELS

UNIT III ENVIRONMENTAL POLLUTION

UNIT IV LUBRICANTS AND CORROSION

UNIT V CHEMISTRY OF ENGINEERING MATERIALS

REFERENCE BOOKS:

PTEE 191 – BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
1. ELECTRICAL CIRCUITS

2. ELECTRICAL MACHINES
Principles of operation and characteristics of D.C machines. Transformers (single phase and three phase) – Synchronous machines – 3 phase and single phase Induction motors – (op. principles).

3. SEMI CONDUCTORS
Classification of solids as conductors and semiconductors – Intrinsic, Extrinsic semiconductors – P type and N type semiconductors – Junction diode – Zener effect – Zener diode – VI characteristics of junction and Zener diodes.

4. TRANSISTORS
Bipolar Junction Transistor – CB, CE, CC – Configurations – Simple treatment of characteristics and biasing. Elementary treatment of FET, MOSFET, UJT, DIAC and TRIAC.
5. TRANSDUCERS AND COMMUNICATION SYSTEM

Introduction to transducers, Temperature measurement using thermistors, Piezo electric pressure sensors, Principles of AM, FM and PM modulation, Block diagram of AM, FM receivers, AM, FM and PM Demodulators, Gunn Diodes and Microwave oscillators.

TEXT BOOKS:

REFERENCE BOOKS:

PTGE 181 – ENGINEERING MECHANICS

OBJECTIVE
At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

1. BASICS & STATICS OF PARTICLES


2. EQUILIBRIUM OF RIGID BODIES


3. PROPERTIES OF SURFACES AND SOLIDS

section, prism, sphere from first principle – Relation to area moments of inertia.

4. DYNAMICS OF PARTICLES 12

5. FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

L : 45 T : 15 Total No. of Periods : 60

TEXT BOOK:

REFERENCE BOOKS:

UNIT I CONDUCTING MATERIALS 9

UNIT II SEMICONDUCTING MATERIALS 9
Origin of band gap in solids (qualitative treatment only) – Concept of effective mass of electron and hole – carrier concentration in an intrinsic semiconductor (derivation)- Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination - carrier concentration in n-type and p-type semiconductors (derivation) - variation of Fermi level with temperature and impurity concentration – Compound semiconductors - Hall effect - Determination of Hall coefficient
UNIT III: Magnetic and Dielectric materials

UNIT IV: New Engineering materials
Optical properties of semiconductor - Excitons - Traps - Colour centre - types of colour centres - Luminescence - Fluorescence and phosphorescence - Liquid crystal displays - Dynamic scattering display - Twisted nematic crystal display - Photo refractive materials - Metallic glasses, Nano phase materials, shape memory alloys.

UNIT V: Medical Physics
Ultrasound picture of human body - Block diagram of basic pulse Echo system A-scan, B-scan and M-scan - Physiological effect of ultrasound therapy - Phonocardiograph (PCG) - source of radioactivity for nuclear medicine - statistical aspects - Basic instrumentation (Geiger - Muller counter, Photo multiplier Tube & Scintillation detector (Renogram) and its clinical applications (Thyroid and Kidney function) - Nuclear medicine imaging devices - Gamma Camera - Positron camera

Total No. of Periods: 45

TEXT BOOKS:

REFERENCE BOOKS:

PT MA 181 - MATHEMATICS

1. MULTIPLE INTEGRALS
Double integration and area as a double integral – Double integral over a plane area – Change of order of integration – Double integral over the surface of cuboid, sphere and cylinder – Triple integrals – Triple integral over the volume enclosed by cuboid, sphere and cylinder.

2. VECTOR CALCULUS
Gradient and directional derivative – Divergence, Curl and Laplacian – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Green’s, Gauss divergence and Stoke’s theorem – Verification – Application in evaluating line, surface and volume integrals.

3. ANALYTIC FUNCTION
4. Complex Integration

5. Partial Differential Equations
Formation – Solution of first order equations – Standard types and equations reducible to standard types – Lagrange's linear equation – Integral surface passing through a given curve Solution of linear equations of higher order with constant coefficients.

L: 45  T: 15  Total No. of Periods : 60

TEXT BOOK:

REFERENCE BOOKS:

PTCH 201 ORGANIC CHEMISTRY

AIM
To study the type of components in which organic reactions take place and also to know the preparation of the essential organic compounds.

OBJECTIVES
At the end of the course students will be in a position to have knowledge on various reaction mechanism, preparation of organic compounds and their properties. This will be a precursor for the study on Chemical Reaction Engineering.

1 CARBOHYDRATES
Introduction – Mono saccharides – Glucose and Fructose-Interconversion- Reactions and elucidation of structure-Polysaccharides – Cellulose – reaction and structural elucidation -Derivatives of Cellulose -Carboxy Methyl cellulose and gun cotton

2 OILS, FATS AND WAXES
Types of oils-Development of Rancidity in an oil –Factors contributing to rancidity –Free acid value-Saponification value and iodine value of an oil- Methodology of determining these values-Problems on computing free acid, Saponification and Iodine value-Types of Cholesterol- Risk factor in precipitating heart disease- Waxes-Classifications

3 HETEROCYCLIC COMPOUNDS
Definition and reactions of Pyrrole, Furan, Thiophene, Pyridine - Reactions of furfural-Synthesis of Isorazid

4 PROTEINS
Classification of proteins-Tests for proteins- Determination of molecular weight of proteins

5 DYES AND DYEING
Classification of dyes based on the mode of application of the dye to the fabric- Structural classification of dyes-Coupling reaction to produce azo dyes-Synthesis of the following azo dyes- Methyl orange, Methyl red and Congo red- Synthesis of Triphenyl methane dyes- Malachite green and para-rosaniline -Phthalein dye-Preparation of Eosin- Introduction to natural dyes and Reactive dyes.
6 PHARMACEUTICAL CHEMISTRY
Synthesis of Antimalarial drugs-isopentaquine and chloroquine.
Antibacterial drugs-Synthesis of Sulphanilamide and sulphapyridine

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

UNIT 2 FERROUS AND NON-FERROUS METALS
Pure iron, cast iron, mild steel, stainless steel, special alloy steels- iron and iron carbide phase diagram-heat treatment of plain-carbon steels.
Manufacturing methods of Lead, Tin and Magnesium. Properties and applications in process industries

UNIT 3 POLYMERS, COMPOSITES, CERAMICS AND INORGANIC MATERIALS
(i) Industrial polymerization methods, crystallinity and stereo isomers- Thermosetting and Thermo plastics
(ii) FRP-Fiber Reinforced Plastics (FRP), different types of manufacturing methods; asphalt and asphalt mixtures; wood
(iii) Ceramic crystal and silicate structures-processing of ceramics-cements-glasses-enamels-properties

UNIT 4 ADVANCED MATERIALS
Single crystals-production-properties-applications-memory metals-intelligent materials some important metallic and non-metallic single crystals

UNIT 5 CORROSION AND PREVENTION
Definition of corrosion-Basic theories and mechanism of corrosion-Types of corrosion
Anti-Corrosion methods-Organic paints and coatings metal, ceramic coatings

Total No. of Periods : 45

TEXT BOOKS:

PTCH 202 MATERIALS TECHNOLOGY

AIM
To impart knowledge in material properties and manufacturing methods

OBJECTIVES
Students will be able to understand various material and its properties and manufacturing methods

UNIT 1 INTRODUCTION
REFERENCE BOOK:

PTCH 203 CHEMICAL TECHNOLOGY  3  0  0  100

AIM
To integrate various courses such as chemistry, unit operations, mechanical operation, stoichometry etc., and to give the young chemical engineers some comprehension on various fields of production into which they will enter or with which he will be affiliated during the course of study or after completion of the study.

OBJECTIVES
To gain knowledge on various aspects of production engineering and understand the practical methods of production in a chemical factory.

UNIT - I  12
Chemical processing, the role of a chemical engineers in process industries, importance of block diagrams and flow charts, unit operations, unit processes, process utilities and economics, industrial safety and pollution, outline of plant and equipment design, process control and instrumentation.

UNIT - II  12
Chlor-Alkali - Industrial acid - Cement, Glass and Ceramics, Pulp and Paper

UNIT - III  12
Oil, Soap and Detergent, Petroleum, Refining, Petrochemicals, Sugar.

UNIT - IV  12
Pharmaceutical, Polymers, Industrial Gases, Paints and Pigments.

UNIT - V  12
Dyes and intermediates, Fertilizers, Food industry

Total No. of Periods : 60

TEXT BOOKS:

PTCH 204 MECHANICAL ENGINEERING  3  0  0  100

AIM
To impart knowledge on thermodynamics and thermal engineering Power generating units such as engines and theory of machines

OBJECTIVE
Students should learn thermodynamics and thermal engineering and should understand the principles behind the operation of thermal equipments like IC engines and turbines etc. Students should be able to appreciate the theory behind operation of machinery and should be able to design simple mechanisms

UNIT 1 LAWS OF THERMODYNAMICS  10
Basic concepts and hints; Zeroth law, First Law of Thermodynamics - Statement and application, Steady flow energy equation; Second law of Thermodynamics – Statement, Limitations; Heat Engine, Refrigerator and Heat Pump, Available energy, Kelvin - Planck statement and Clausius statements;
Equivalence entropy, Reversibility: Entropy charts; Third law of Thermodynamics - Statement.

UNIT 2 HEATING AND EXPANSION OF GASES
Expressions for work done, Internal energy and heat transfer for constant pressure, constant volume, isothermal, adiabatic and polytropic processes; Free expansion and Throttling.

UNIT 3 AIR STANDARD EFFICIENCY
Carnot cycle; Stirling Cycle; Joule Cycle; Otto Cycle; Diesel Cycle; Dual combustion Cycle.

UNIT 4 I.C. ENGINES, STEAM AND ITS PROPERTIES AND STEAM TURBINES
Engine nomenclature and classifications: SI Engine, CI Engine; Four Stroke cycle, Two stroke cycle; Performance of I.C Engine; Brake thermal efficiency; Indicated Thermal Efficiency, Specific fuel consumption.

Steam - Properties of steam; Dryness fraction; latent heat; Total heat of wet steam; Dry steam; Superheated steam. Use of steam tables; volume of wet steam, volume of superheated steam; External work of evaporation; Internal energy; Entropy of vapour; Expansion of vapour; Rankine cycle.

Steam turbines – Impulse and Reaction types - Principles of operation.

UNIT 5 SIMPLE MECHANISM, FLY WHEEL, DRIVES AND BALANCING
Kinematic Link, Kinematic Pair, Kinematic Chain; Slider Crank mechanism and inversions; Double slider crank mechanism and inversions.

Flywheel-Turning moment Diagram; Fluctuation of Energy.

Belt and rope drives; Velocity ratio; slip; Creep; Ratio of tension; Length of belt; Power Transmitted; simple and compound gear trains.

Balancing of rotating masses in same plane; Balancing of masses rotating in different planes.

Total No. of Periods: 45

TEXT BOOKS:

REFERENCE BOOKS:

PTCH 205 MECHANICS OF SOLIDS

AIM
To give them knowledge on structural, Mechanical properties of Beams, columns

OBJECTIVES
The students will be able to design support column, beams, pipelines, storage tanks and reaction columns after undergoing this course. This is precursor for the study on process equipment design and drawing.
UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS


UNIT II TRANSVERSE LOADING ON BEAMS


UNIT III STRESSES IN BEAMS


UNIT IV DEFLECTIONS OF BEAMS


UNIT V TORSION

Torsion of circular shafts – derivation of torsion equation (T/I = C/R = G'I/D) – stress and deformation in circular and hollow shafts – stresses and deformation in circular and hollow shafts – stepped shafts – shafts fixed at both ends – stresses in helical springs – deflection of springs – spring constant.

UNIT VI COLUMNS

Axially loaded short columns – columns of unsymmetrical sections – Euler’s theory of long columns – critical loads for prismatic columns with different end conditions – effect of eccentricity.

Total No. of Periods : 45

TEXT BOOK:

REFERENCE BOOKS:
3. Elangovan, A., Thirumal Visai iyai (Mechanics of Solids in Tamil), Anna University, Madras, 1995

SEMESTER IV

PTCH 206 CHEMICAL ENGINEERING THERMODYNAMICS-I 3

AIM
To present thermodynamic principles from a chemical engineering viewpoint.

OBJECTIVES
The Students will be well versed with the behavior of fluids under PVT conditions and also apply them for practical purpose. Main advantage will be to deal with power production and refrigeration processes. The study further provides a comprehensive exposition to theory and application of solution thermodynamics.
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 FIRST LAW OF THERMODYNAMICS
The 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.

UNIT III THERMODYNAMIC PROPERTIES OF REAL GASES
The PVT behavior 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; fugacity and fugacity coefficients of real gases.

UNIT IV SECOND LAW OF THERMODYNAMICS
Statements of the second law of thermodynamics, available and unavailable energies, the entropy function, applications of the second law

UNIT V 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 C_v and C_p, complex thermodynamic formulations, thermodynamic properties of an ideal gas, entropy change in reversible and irreversible process.

UNIT VI 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 BOOKS:

REFERENCE BOOKS:

PTCH 207 PHYSICAL CHEMISTRY 3 0 0 100

AIM
To know the basic concepts of physical chemistry aspects of chemical compounds and their behaviour at different processing conditions.

OBJECTIVES
The students get knowledge on the reactors mechanism; use of catalyst and also the reaction stages involved in particular process operations.
UNIT I PHASE RULE

UNIT II NUCLEAR CHEMISTRY
Radioactivity-radioactive disintegration - Transmutation of elements - Radioactive series - Applications of Radioactivity - Nuclear forces - Packing fraction - Binding energy - Nuclear fission - Nuclear reactions - Nuclear fusion - Hydrogen bomb - Nuclear reactions - cyclotron - Induced radioactivity

UNIT III IONIC EQUILIBRIA
Acids and bases - Arrhenius concept - Lewis concept - Dissociation of weak acid, weak base - Ionic product of water - Buffer solutions - Calculation of pH - Henderson’s equation - Hydrolysis of salts - Degree of hydrolysis - Determination - Acid-base indicators - their applications - Solubility product principle - Ionic equilibria involving complex ions

UNIT IV COLLOIDS
Introduction to colloids - properties of colloids - coagulation of solutions - Origin of charge on colloidal particles - Determination of size of colloidal particles - Donnan Membrane equilibrium - Emulsions - Gels - Applications of colloids

UNIT V PHOTOCHEMISTRY

Total No. of Periods: 45

TEXT BOOKS:

REFERENCE BOOKS:

PTCH 208 FLUID MECHANICS 3 0 0

AIM
To have a general idea about the mechanism of fluid, fluid flow and flow measuring devices through basic concepts.

OBJECTIVES
The subject will help the students to have knowledge on the fluid properties, their characteristics while static and during flow through ducts, pipes and porous medium. Knowledge on several machineries used to transport the fluid and their performance are assessed.

UNIT - I
The concept of fluid, the fluid as a continuum - physical and thermodynamic properties - basic laws - Newtonian and non-Newtonian fluids - basic flow analysis techniques - flow patterns - velocity field - stream lines and stream tubes - vorticity and irrotationality

UNIT - II
Pressure and pressure gradient - equilibrium of fluid element - hydrostatic pressure distributions - application to manometry - mass, energy, and momentum balances - continuity equation,
equation of motion, Navier-Stokes equation and Bernoulli’s theorem

UNIT - III
8
The principle of dimensional homogeneity – dimensional analysis, the Pi-theorem - non-dimensional action of the basic equations - similitude - relationship between dimensional analysis and similitude - use of dimensional analysis for scale up studies

UNIT - IV
10
Reynolds number regimes, internal versus external viscous flow, flow through pipes - head loss, friction factor, minor losses in pipe systems and multiple-pipe systems - boundary layer concepts, drag forces on solid particles in fluids - flow through fixed and fluidized beds.

UNIT - V
10
Constant and variable head meters- pipes, fittings and valves - classification of pumps - performance curves – affinity laws, compressors and its efficiency. Introduction to compressible flow, comparison of adiabatic and isothermal flow of gases

Total No of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:
2. Darby, R. Chemical Engineering Fluid Mechanics, Marcel Decker, 1968.

PTCH 209 CHEMICAL PROCESS CALCULATIONS 3 0 0 100

AIM
Every chemical reaction involves consumption of Materials and energy. The reactions are to be balanced with correct quantity of materials and energy to achieve good percentage of conversion for products. The aim of this course is to give fundamental knowledge on such material and energy balances.

OBJECTIVES
To make them understand different types of laws of chemistry of materials and also prepare the students to accurately calculate the stoichiometric relations between the materials involved in a physical and chemical reaction.

UNIT – I COMPOSITIONS OF MIXTURES AND SOLUTIONS
2
Methods of expressing compositions of mixture and solutions, wet and dry basis concept

UNIT – II GAS CALCULATIONS
8

UNIT – III MATERIAL BALANCE
10
Concept of material balance-Application of material balance to unit operations like distillation, evaporation, crystallization, drying etc. - Material balance involving key components, Material balance with chemical reaction - Limiting and excess reactants - Degree of completion- Application of material balance to various types of chemical reactions- recycle and bypassing operations -Concept of purge
UNIT IV HUMIDITY AND SATURATION
Calculation of absolute humidity, molal humidity, relative humidity, and percentage humidity. Dew point. Use of humidity in condensation and drying—wet and dry bulb temperatures. Humidity chart, solving problems using humidity chart.

UNIT V FUELS AND COMBUSTION
Calculation of Orsat analysis of products of combustion of solid, liquid and gas fuels. Calculation of hydrogen to carbon ratio and percentage excess air from flue gas analysis. Calculations of sulphur and sulphur compounds burning operations.

UNIT VI THERMOPHYSICS
Heat capacity of solids, liquids, gases—mean heat capacity. Calculation of sensible heat using heat capacity, Kopp’s rule, various types of latent heats—use of latent heats in heat calculations.

UNIT VII THERMOCHEMISTRY

UNIT VIII UNSTEADY STATE MATERIAL AND ENERGY BALANCES
Concept of unsteady state material and energy balances, problems on unsteady state material and energy balances.

Total No of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

PT CH 210 INSTRUMENTAL METHODS OF ANALYSIS
3 0 0 100

AIM
To introduce various methods of chemical analysis through sophisticated instruments for accuracy.

OBJECTIVES
Several chemical reactions have to be analyzed for composition of raw materials, materials in progress and also the final products. Several sophisticated instruments on the basic principles involving operation and interpretation of data through the instruments are obtained by the students.

UNIT-I INTRODUCTION TO SPECTROSCOPICAL METHODS OF ANALYSIS

ELECTROMAGNETIC RADIATION: Various ranges, Dual properties, Various energy levels, Interaction of photons with matter, absorbance, and transmittance and their relationship. Permitted energy levels for the electrons of an atom and simple molecules, classification of instrumental methods based on physical properties.
UNIT II MOLECULAR SPECTROSCOPY
Various transitions in organic and inorganic compounds effected by UV, visible andinfra red radiations, various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Woodward-Fieser 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), Multicomponent analysis, Photometric titration (Experimental set-up and various types of titrations). Applications of UV, VISIBLE AND IR spectrosopies.

UNIT III ATOMIC SPECTROSCOPY
Atomic Absorption Spectrophotometry: Principle, Instrumentation and Application, Various interferences observed in AAS (Chemical, radiation and excitation).
Flame photometry: Principle, Instrumentation and applications

UNIT IV POLARIMETRY AND REFRACTOMETRY
Polarimetry and refractometry Principle, instrumentation and Applications

UNIT V THERMAL ANALYSIS
Thermogravimetry: Instrumentation, factors affecting the shapes of thermograms, applications, thermograms of some important compounds (CuSO₄·5H₂O, CaC₂O₄·2H₂O etc)
Differential thermal analysis: principle, Instrumentation and applications, differences between DSC and DTA. Applications of DSC (Inorganic and Polymer samples)
5. Flow through annular pipe
6. Pressure drop studies in packed column
7. Minimum fluidization velocity in gas-solid and liquid-solid fluidization column
8. Open drum orifice and draining time
9. Flow through helical coil and spiral coil
10. Characteristic curves of pumps
11. Losses in pipe fittings and valves
12. Viscosity measurement of non Newtonian fluids

Total No of Periods : 45

PTCH 361 CHEMICAL ENGINEERING THERMODYNAMICS

AIM
To present thermodynamic principles from a chemical engineering viewpoint.

OBJECTIVES
The students will be well versed with the behavior of fluids under PVT conditions and also apply them for practical purpose. The study further provides a comprehensive exposition to theory and application of solution thermodynamics.

UNIT - I
Partial molar properties, ideal and non-ideal solutions, standard states definition and choice, Gibbs-Duhem equation, excess properties of mixtures.

UNIT - II
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
Activity coefficient-composition models, thermodynamic consistency of phase equilibria, application of the correlation and prediction of phase equilibria in systems of engineering interest particularly to distillation and liquid extraction processes.

UNIT - IV
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 reactors, calculation of equilibrium compositions for homogeneous chemical reactors, thermodynamic analysis of simultaneous reactions.

UNIT - V

Total No. of Periods : 45

TEXT BOOKS:
REFERENCE BOOKS:

PTCH 302 MASS TRANSFER 3 0 100

AIM
To impart knowledge on how certain substances undergo the change in composition, change in phases and exhibit the properties according to the changed environment.

OBJECTIVES
Students develop a sound knowledge on Mass Transfer operation.

UNIT - I
8
Molecular diffusion in gases and liquids, steady state diffusion under stagnant and laminar flow conditions Diffusivity measurement and prediction, multi-component diffusion, diffusion in solids and its applications, eddy diffusion, mass transfer coefficients, theories of mass transfer, analogy equations.

UNIT - II
8
Concept of mass transfer coefficients, inter phase mass transfer, relationship between individual and overall mass transfer coefficients, steady state co current and countercurrent mass transfer processes, stages, cascade and stage efficiencies, stage-wise and differential contactors, NTU and NTP concepts

UNIT - III
8
Humidification operations, humidity chart, Lewis relation, humidification and dehumidification equipments, enthalpy transfer concepts, temperatures profiles in humidifiers and dehumidifiers, theory and design of cooling towers, dehumidifiers, hot gas quenching towers and spray ponds.

UNIT - IV
8
Gas Absorption - absorption factor, limiting gas-liquid ratio, tray tower absorber, calculation of number of theoretical stages, packed tower absorber - HETP, HTU and NTU calculations - Non-isothermal absorber, absorption with chemical reaction.

UNIT - V
13
Theory and mechanism of drying, drying curves, classification of dryers, design of batch and continuous dryers, theory of crystallization, classification of crystallizers, design of and continuous crystallizers.

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

PTCH 303 HEAT TRANSFER 3 0 100

AIM
To provide fundamental instruction in the various methods of heat transfer through different media.

OBJECTIVES
To gain knowledge in various heat transfer methodology in chemical process engineering.
UNIT - I
Importance of heat transfer in Chemical Engineering operations - Modes of heat transfer - Fourier's law of heat conduction - one dimensional steady state heat conduction equation for flat plate, hollow cylinder - Heat conduction through a series of resistances - Thermal conductivity measurement; effect of temperature on thermal conductivity; Heat transfer in extended surfaces.

UNIT - II
Concept of heat transfer by convection - Natural and forced convection, analogies between transfer of momentum and heat - Reynold's analogy, Prandtl and Coulburn analogy - Dimensional analysis in heat transfer, Correlations for the calculation of heat transfer coefficients, heat transfer coefficient for flow through a pipe, flow through a non circular conduit, flow past flat plate, flow through packed beds. Heat transfer by natural convection.

UNIT - III
Heat transfer to fluids with phase change - heat transfer from condensing vapours, drop wise and film wise condensation, Nusselt equation for vertical and horizontal tubes, condensation of superheated vapours, effect of non-condensable gasses on rate of condensation. Heat transfer to boiling liquids - mechanism of boiling, nucleate boiling and film boiling.

UNIT - IV
Theory of evaporation - single effect and multiple effect evaporation - Design calculation for single and multiple effect evaporation. Radiation heat transfer - Emissive power, Black body radiation, Emissivity, Stefan - Biotzmann law, Planck's law, radiation between surfaces.

UNIT - V
Parallel and counter flow heat exchangers - Log mean temperature difference - Single pass and multipass heat exchangers; plate heat exchangers; use of correction factor charts; heat exchangers effectiveness; number of transfer unit - Chart for different configurations - Fouling factors - Design of various types of heat exchangers - Design of furnaces, condensers, tubular, evaporators.

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOK:

PTCH 304 CHEMICAL REACTION ENGINEERING
13 0 0 100

AIM
To impart knowledge on various types of reaction takes place in chemical processes and type of reactors used. Students develop a sound knowledge on the types of chemical reaction kinetics.

UNIT - I
Loss of mass action, rate equation, elementary, non-elementary reactions and their measurements, theories of reaction rate and temperature dependency, analysis of experimental reaction data, evaluation of rate equation, integral and differential analysis for constant variable volume system, fitting of data to complex reaction mechanism.
UNIT - II
Design of homogeneous systems, batch, stirred tank and tubular flow reactor, design of reactors for multiple reactions, combination of reactor system, size of comparison of reactors.

UNIT - III
Factors affecting choice, optimum yield and conversion, selectivity, reactivity and yield problem, consecutive, parallel and mixed reactions, recycle.

UNIT - IV
Isothermal and non-isothermal homogeneous reactor systems, adiabatic reactors, rates of heat exchanges for different reactors, design for constant rate input and constant heat transfer coefficient, operation, batch and continuous reactors, optimum temperature progression.

UNIT - V
Criteria for stability of reactors, limit cycles and oscillating reactions, parameter sensitivity.

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOK:
UNIT - IV
Theory of filtration, Batch and continuous filters, solid - liquid separation-Filtration, flow through filter cake and filter media, compressible and incompressible filter cakes, filtration equipments - selection, operation and design of filters and optimum cycle of operation, filter aids.

UNIT - V
Mixing and agitation - Mixing of liquids (with or without solids), mixing of solids (with solids), mixing of powders, selection of suitable mixers, power requirement for mixing.

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOKS:

OBJECTIVES
To develop skill to design and install process equipments used widely in a chemical industry. Process design, mechanical design and drawing (Conventional and Computer Aided Approach) of the following equipments
1. Storage tanks and pressure vessels
2. Thickeners
3. Filters
4. Centrifuges
5. Cyclone separator
6. Heat exchangers and condensers
7. Evaporators

PTCH 306 CHEMICAL PROCESS EQUIPMENT DESIGN & DRAWING - I

AIM
To integrate the various courses such as Chemistry, Engineering mechanism, Engineering Graphics, unit operation, Mechanics of solids, Materials Technology for a comprehensive approach to the design of the process equipments.
AIM
To impart knowledge on how certain substances undergo change in composition, change in phases and exhibit properties according to the changed environment.

OBJECTIVES
Students develop a sound knowledge on the types of Mass Transfer through a driving force in the same fashion as temperature differences as driving force for heat transfer.

UNIT I DISTILLATION

UNIT II LIQUID-LIQUID EXTRACTION
Liquid - liquid extraction - solvent characteristics-equilibrium stage wise contact calculations for batch and continuous extractors - differential contact equipment-spray, packed and mechanically agitated contactors and their design calculations-packed bed extraction with reflux. Pulsed extractors, centrifugal extractors-Supercritical extraction.

UNIT III LEACHING
Solid-liquid equilibria- leaching equipment for batch and continuous operations - calculation of number of stages. Leaching - Leaching by percolation through stationary solid beds, moving bed leaching, counter current multiple contact (shank's system), equipments for leaching operation, multi stage continuous cross current and counter current leaching, stage calculations, stage efficiency.

UNIT IV ADSORPTION AND ION EXCHANGE
Adsorption - Types of adsorption, nature of adsorbents, adsorption equilibria, effect of pressure and temperature on adsorption isotherms, Adsorption operations - stage wise operations, steady state moving bed and unsteady state fixed bed adsorbers, breakthrough curves, Principle of Ion exchange, techniques and applications.

UNIT V NOVEL SEPARATION PROCESSES
Membrane separation processes; solid and liquid membranes; concept of osmosis; reverse osmosis; electro dialysis; electrochemical ion exchange, foam separation process, Thermal and sweep diffusion process, supercritical extraction, zone refining and Adductive crystallization

Total No. of Periods : 45

TEXT BOOKS:

REFERENCE BOOK:
PTCH 308 CHEMICAL REACTION ENGINEERING - II

AIM
To introduce non-ideal behaviour of reactors and heterogeneous reactions.

OBJECTIVES
The objective is to study the non-ideal behaviour of homogeneous reactors, gas-solid catalytic and non-catalytic reactors and gas-liquid reactors.

UNIT I NON-IDEAL REACTORS
9
The residence time distribution as a factor of performance, residence time functions and relationship between them in reactor, basic models for non-ideal flow, conversion in non-ideal reactors.

UNIT II HETEROGENEOUS REACTORS AND SOLID CATALYSIS
9
Rate equations for heterogeneous reactions, nature of catalysis, adsorption isotherms, rates of adsorption and desorption, surface reaction analysis of rate equation and rate controlling steps, surface area and pore-volume distribution, catalyst preparation.

UNIT III GAS-SOLID CATALYTIC REACTORS
9
Diffusion within catalyst particle, effective thermal conductivity, mass and heat transfer within catalyst pellets, effectiveness factor, Thiele Modulus, fixed bed reactors.

UNIT IV GAS-SOLID NON-CATALYTIC REACTORS
9
Models for explaining kinetics, volume and surface models, controlling resistances and rate controlling steps, time for complete conversion for single and mixed sizes, fluidized and static reactors.

UNIV V GAS-LIQUID REACTORS
9
Absorption combined with chemical reactions, mass transfer coefficients and kinetic constants; application of film, penetration and surface renewal theories; Hatta number and enhancement factor for first order reaction, tower reactor design.

Total No. of period L+T=45+15 : 60

TEXT BOOKS:

REFERENCE BOOK:

PTCH 309 PROCESS INSTRUMENTATION, DYNAMICS AND CONTROL

AIM
To familiarize the students with concepts of process dynamics and control leading to control system design.

OBJECTIVE
To introduce dynamic response of open and closed loop systems, control loop components and stability of control systems along with instrumentation.

UNIT I OPEN LOOP SYSTEMS
11
Laplace transformation, transform of standard functions, derivatives and integrals, inversion, theorems, application to solve ODEs. Open-loop systems, first order systems and their transient response for standard input functions, first order systems in
series, linearization and its application in process control, second order systems and their dynamics.

UNIT- II CLOSED LOOP SYSTEMS
Closed loop control systems, development of block diagram for feed-back control systems, servo and regulatory problems, transfer function for controllers and final control element, principles of pneumatic and electronic controllers, transportation lag, transient response of closed-loop control systems and their stability.

UNIT- III FREQUENCY RESPONSE
Introduction to frequency response of closed-loop systems, control system design by frequency response techniques, Bode diagram, stability criterion, tuning of controller settings.

UNIT- IV ADVANCED CONTROL SYSTEMS
Introduction to advanced control systems, cascade control, feed forward control, model predictive control, control of distillation towers and heat exchangers, introduction to computer control of chemical processes.

UNIT- V INSTRUMENTATION
Principles of measurements and classification of process instruments, measurement of temperature, pressure, fluid flow, liquid weight and weight flow rate, viscosity, pH, concentration, electrical and thermal conductivity, humidity of gases.

Total No. of periods : 46

TEXT BOOKS:

REFERENCE BOOKS:

PTCH 310 ENVIRONMENTAL SCIENCE AND ENGINEERING

AIM
To impart knowledge on various environmental pollution aspects and issues.

OBJECTIVE
To create an awareness on the various environmental pollution aspects and issues. To give a comprehensive insight into natural resources, ecosystem and biodiversity. To educate the ways and means to protect the environment from various types of pollution. To impart some fundamental knowledge on human welfare measures.

UNIT I

UNIT II
UNIT – III
Solid wastes - quantities and characterizations - industrial - hazardous waste - radio active waste - simple treatments and disposal techniques.

UNIT – IV
Air pollution-types and sources of gaseous pollutants-particulate matter-hazardous air pollutants-global and atmospheric climatic change - acid rain. Industrial exhaust - characterization - various treatment techniques of industrial flue gas.

UNIT – V

Total No. of period : 45

TEXT BOOKS:

REFERENCE BOOKS:


PTCH 311 HEAT AND MASS TRANSFER LABORATORY

0 0 4 100

AIM
To impart knowledge on heat transfer operation by practice.

OBJECTIVES
Students develop a sound knowledge on different types of heat transfer equipments.

List of Experiments
Diffusivity measurements
Wetted wall column
Forced draft cooling tower
Tray dryer
Packed bed absorber
Simple distillation
Steam distillation
Packed/plate column distillation
Batch adsorption
Open pan evaporator
Boiling heat transfer
Heat transfer through packed bed
Heat transfer in a double pipe heat exchanger
Heat transfer in a bare and finned tube heat exchanger
Heat transfer in a condenser
Heat transfer in helical coils
Heat transfer in agitated vessels

Total No of period : 60
SEMESTER VII

PTCH 401 PROCESS ECONOMICS AND INDUSTRIAL MANAGEMENT  3  0  0  100

AIM
To introduce process economics and industrial management principles to chemical engineers

OBJECTIVES
The objective of this course is to teach principles of cost estimation, feasibility analysis, management, organization and quality control that will enable the students to perform as efficient managers.

PART A

UNIT I  PRINCIPLES OF MANAGEMENT AND ORGANISATION  5
Planning, organization, staffing, coordination, directing, controlling, communicating, organization as a process and a structure; types of organizations

UNIT II PRODUCTION AND MANAGEMENT  10
Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning; routing; scheduling; dispatching; costs and costs control, inventory and inventory control.

UNIT - III QUALITY AND QUALITY CONTROL  4
Elements of quality control, role of control charts in production and quality control.

PART B

UNIT I  ENGINEERING ECONOMICS FOR PROCESS ENGINEERS  2

UNIT II INTEREST, INVESTMENT COSTS AND COST ESTIMATION  8
Time value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, invested capital and profitability.

UNIT III PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT  8
Estimation of project profitability, sensitivity analysis; investment alternatives, replacement policy; forecasting sales; inflation and its impact.

UNIT IV ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE  4
Principles of accounting, balance sheet; income statement; financial ratios; analysis of performance and growth.

UNIT V ECONOMIC BALANCE  4
Essentials of economic balance – Economic balance approach, economic balance for insulation, evaporation, heat transfer.

Total No. of periods : 45

TEXT BOOKS:
REFERENCE BOOKS:

PTCH 402 PROFESSIONAL ETHICS AND HUMAN VALUES
AIM
To emphasize the significance and importance of being ethical both personally as well as professionally.

OBJECTIVE
To stimulate critical and responsible reflection on the moral issues surrounding professional career/engineering practice and to provide the conceptual tools necessary for pursuing the moral issues.

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.
PTCH 403 CHEMICAL PROCESS EQUIPMENT DESIGN & DRAWING II

AIM
To develop skill to design and draw process equipments used widely in a chemical industry.

OBJECTIVES
To give practice to students to design and draw mass transfer equipments and reactors
Process design, mechanical design and drawing (conventional and computer aided approach) of the following equipments

1. Dryers
2. Cooling tower
3. Crystallizer
4. Absorption column
5. Distillation column
6. Extraction column
7. Reactors

REFERENCE BOOKS:

Total No. of periods: 60

67

PTCH 404 PROJECT WORK

AIM
To initiate the ability of doing a complete plant design.

OBJECTIVE
The objective of the project is to make use of the knowledge gained by the student at various stages of the degree course. Each student is required to submit a 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 in the laboratory/industry.

ELECTIVES
PTCH 001 PETROLEUM REFINING AND PETROCHEMICAL TECHNOLOGY

UNIT I
Evaluation of crude oil and testing of petroleum products. Refining of petroleum – Atmospheric and vacuum distillation.

UNIT II
Thermal cracking, VGO-breaking, Coking. Catalytic cracking (FCC), Hydro cracking, Air blowing of bitumen.

UNIT III
Treatment techniques for removal of sulphur compounds to improve performance, Storage and stability. Product treatment processes - various solvent treatment processes, Dewaxing, Clay treatment and Hydro fining.

UNIT IV
Cracking of naptha and gas for the production of ethylene, propylene isobutylene and butadiene. Production of acetylene from methane Catalytic Reforming of petroleum feed stocks. Extraction of Aromatics.
UNIT V
Production of petrochemicals like dimethyl terephthalate (DMT), ethylene glycol, synthetic glycerine, linear alkyl benzene (LAB), acrylonitrile, methyl methacrylate (MMA), vinyl acetate monomer, phthalic anhydride, maleic anhydride, phenol and acetone, Methanol, formaldehyde, acetaldehyde, pentaerythritol.
Production of carbon black.

Total No. of periods: 45

TEXT BOOKS / REFERENCE BOOKS:
4. Petrochemicals by Peter Wiseman, UMIST Series in Science and Technology.

UNIT VII DRUGS AND PHARMACEUTICAL TECHNOLOGY

UNIT I INTRODUCTION
Development of drugs and pharmaceutica industry; organic therapeutic agents uses and economics.

UNIT II DRUG METABOLISM AND PHARMACO KINETICS
Drug metabolism; physico chemical principles; radio activity; pharma kinetics-action of drugs on human bodies.

UNIT III IMPORTANT UNIT PROCESSES AND THEIR APPLICATIONS
Chemical conversion processes; alkylation; carboxylation; condensation and cyclisation; dehydration, esterification, halogenation, oxidation, sulfonation; complex chemical conversions fermentation.

UNIT IV MANUFACTURING PRINCIPLES
Compressed tablets; wet granulation; dry granulation or slugging; direct compression; tablet presses formulation; coating pills; capsules sustained action dosage forms; parental solutions; oral liquids; injections; ointments; standard of hygiene and manufacturing practice.

UNIT V PHARMACEUTICAL PRODUCTS
Vitamins; cold remedies; laxatives; analgesics; nonsteroidal contraceptives; external antiseptics; antacids and others.

UNIT VI MICROBIOLOGICAL AND ANIMAL PRODUCTS
Antibiotics; biologicals; hormones; vitamins; preservation.

UNIT VII PHARMACEUTICAL ANALYSIS
Analytical methods and tests for various drugs and pharmaceuticals.

UNIT VIII PACKING AND QUALITY CONTROL
Packing; packing techniques; quality control.

Total No. of periods: 45

TEXT BOOK:

REFERENCE BOOKS:
UNIT I
Introduction - Definitions and concepts, polymerisation reactions, polymer structure, functionality and degradation. Characterisation of polymers.

UNIT II
Different types of polymers - natural and modified natural products, synthetic polymers, addition and condensation products and their preparations.

UNIT III
Methods of polymerisation - mass, solution, emulsion and suspension polymerisation processes, reactions and equipments used.

UNIT IV
Polymer processing - Molding, cold and hot compression molding, injection and jet type molding, extruding, calendering and slicing.

UNIT V
Polymer processing - sheet forming, atmospheric and fluid pressure forming, lamination and impregnating, coating, expanding, casting, embedding, spinning and finishing.

Total No. of periods : 45

TEXT BOOK:

REFERENCE BOOKS:


UNIT I AN OVERVIEW
General aspects of food industry; world food needs and Indian situation.

UNIT II FOOD CONSTITUENTS, QUALITY AND DERIVATIVE FACTORS
Constituents of food; quality and nutritive aspects; food additives; standards; deteriorative factors and their control.

UNIT III GENERAL ENGINEERING ASPECTS AND PROCESSING METHODS
Preliminary processing methods; conversion and preservation operations.

UNIT IV FOOD PRESERVATION METHODS
Preservation by heat and cold; dehydration; concentration; drying; irradiation; microwave heating; sterilization and pasteurisation; fermentation and pickling; packing methods.

UNIT V PRODUCTION AND UTILISATION OF FOOD PRODUCTS
Cereal grains; pulses; vegetables; fruits; spices; fats and oils; bakery; confectionery and chocolate products; soft and alcoholic beverages; dairy products; meat; poultry and fish products.

REFERENCE BOOKS:
AIM
To get awareness on the important of total plant safety in a chemical industry.

OBJECTIVES
Become a skill and person in hazard analysis and able to find out the root cause of an accident. Gain knowledge in devising safety policy and procedures to be adopted to implement total safety in a plant.

UNIT I INTRODUCTION
Safety in industries; need for development; importance safety consciousness in Indian chemical industry; social environmental setup; tolerance limit of the society; psychological attitude towards safety programmes.

UNIT II SAFETY PROGRAMMES
Elements of safety programme; effective realization; economic and social benefits; effective communication training at various levels of production and operation.

UNIT III INDUSTRIAL SAFETY
Chemical process industries; potential hazards; chemical and physical job safety analysis; high pressure; high temperature operation; dangerous and toxic chemicals; highly radioactive materials; safe handling and operation of materials and machineries; planning and layout.

UNIT IV SAFETY PERFORMANCE
Appraisal; effective steps to implement safety procedures; periodic inspection and study of plant layout and constant maintenance; periodic advice and checking to follow safety procedures; proper selection and replacement of handling equipments; personal protective equipments.

UNIT V ACCIDENTS

UNIT VI POLLUTION

UNIT VII HEALTH HAZARDS AND LEGAL ASPECTS

UNIT VIII PROMOTION OF INDUSTRIAL SAFETY
Role of Government, safety organizations, management and trade unions in promoting industrial safety.

Total No. of periods : 45

TEXT BOOK:

REFERENCE BOOKS:
UNIT VII ECONOMIC BALANCE IN ENERGY CONSUMPTION

Cost analysis; capacity; production rate; system rate; system cost analysis; corporate models; production analysis and production using fuel inventories; input-output analysis; economics; tariffs.

Total No. of periods: 45

REFERENCE BOOKS:

UNIT VII ENTERPRENEURSHIP

UNIT I ENTERPRENEURSHIP AND ENTREPRENEURIAL ENVIRONMENT

Definitions of entrepreneurship, entrepreneur, entrepreneurial potential, traits and types of entrepreneurs, differences between entrepreneur and irprenuer, entrepreneurship as a career, business environment, roll of family/society in entrepreneur development, motivation, major motives influencing entrepreneur, institutional support to entrepreneurs, entrepreneur support organizations (financial and non-financial), entrepreneur training organizations, government policies about industrial and entrepreneur development, incentives and subsidies for industries.

UNIT II BUSINESS PLAN/FEASIBILITY REPORT PREPARATION

Small enterprises, definition, classification, characteristics, ownership structure, project history, project formulation, importance of feasibility report, format for preparation of business feasibility report, steps involved in setting up a business, sources of product identification, criteria for selection of products,
selecting a good business opportunity, market survey and research, techno-economic feasibility assessment, preliminary project report, project appraisal, sources of information, classification of needs and agencies.

UNIT III ESTABLISHMENT OF BUSINESS UNIT
Mobilization of resources (financial, personal and material), selection and training of human resource, purchase of project equipments and raw materials, plant location, infrastructure, building, installation of machinery, material production, marketing channel selection, commercialization of product, legal agents of business.

UNIT IV MANAGEMENT OF BUSINESS UNIT
Introduction to general management, financial management, management accounting, production management, human resource development, marketing management, organization development, TQM-ISO9000 series, sickness of industries, strategies for closing business.

UNIT V PROMOTION OF ENTREPRENEURSHIP AND CASE STUDIES
Risk taking and decision making, role of government agencies like DIC, TIC, SIDCO, SIPCOT, TIDCO, IDBI, ICICI, SISI, NSIC, IFC, ITCOT, banks, etc., case study of a successful entrepreneur, case studies on identification and selection of products, preparation of project feasibility report, establishment of business unit and sickness of business unit.

Total No. of periods: 45

REFERENCE BOOKS:
REFERENCE BOOKS:

UNIT 089 ELECTROCHEMICAL ENGINEERING

UNIT I

UNIT II
Mass transfer in electrochemical systems: diffusion controlled electrochemical reaction -the importance of convention and the concept of limiting current; over potential, primary-secondary current distribution -rotating disc electrode.

UNIT III
Introduction to corrosion, series, corrosion theories derivation of potential-current relations of activities controlled and diffusion controlled corrosion process. Potential-pH diagram, Forms of corrosion - definition, factors and control methods of various forms of corrosion-corrosion control measures - industrial boiler water corrosion control - protective coatings - Vapor phase inhibitors - cathodic protection, sacrificial anodes - Paint removers.

UNIT IV
Electro deposition -electro refining -electroforming - electro polishing -anodizing - Selective solar coatings, Primary and secondary batteries - types of batteries, Fuel cells.

UNIT V
Electrodes used in different electrochemical industries: Metals-Graphite - Lead dioxide - Titanium substrate insoluble electrodes - Iron oxide - semi conducting type etc. Metal finishing - cell design, types of electrochemical reactors, batch cell, fluidized bed electrochemical reactor, filter press cell, Swiss roll cell, plug flow cell, design equation, figures of merits of different type of electrochemical reactors.

Total No. of periods: 45

TEXT BOOK:

REFERENCE BOOKS:

UNIT 010 CORROSION SCIENCE AND ENGINEERING

UNIT 1

UNIT 2
Forms of corrosion - definition, factors and control methods of various forms of corrosion such as pitting, inter granular, crevice,
dezeification, stress corrosion, corrosion fatigue, fretting corrosion, hydrogen embrittlement, corrosion processes and control methods in fertilizers, petrochemical, chemical building industries.

UNIT 3
9
Environmental aspects, atmospheric corrosion, classification, factors influencing atmospheric corrosion, temporary corrosion preventive methods, corrosion in immersed condition, effect of dissolved gases, salts, pH, temperature, and flow rates on corrosion, marine corrosion, underground corrosion, Biological corrosion, definition, mechanism of corrosion, control of bio-corrosion.

UNIT 4
9

UNIT 5
9
Corrosion testing, monitoring and inspection, laboratory corrosion tests, 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, newer techniques to study corrosion processes, inspection methods by NDT. Surface analytical techniques such as AES, ESCA, SEM. Evaluation of paints by conventional and electrochemical methods.

Total No. of periods: 45

81

TEXT BOOKS:

REFERENCE BOOK:
1. S.N. Banarjee, An introduction to corrosion and corrosion inhibitors, Oxonian Press Ltd., New Delhi

PTCH 011 ELECTROCHEMICAL ENVIRONMENTAL TECHNOLOGY
3 0 0 100

UNIT I
10
Definition and classification of pollutants, methods of pollutant analysis, pollution monitoring, electrochemical monitoring, monitoring contaminated sites, seawater monitoring, rainfall monitoring, role of sensors in environmental pollution.

UNIT II
10
Conventional methods for pollution control, incinerator, pyrolysis, air stripping, microbial treatment, precipitation, coagulation, adsorption, membrane process. Advanced techniques of pollution treatment, treatment of polluted sites. Introduction to electrochemical systems, current charge transport, potential, electrode interface, electrochemical kinetics. Water disinfections, general consideration, and chemical disinfections, disinfections by products, taste and colour removal, and indicator organism.

UNIT III
8
Electrochemical treatment of wastewater, direct electrolysis, indirect electrolysis, mechanism of electro oxidation, Anodic oxidation of organic and inorganic pollutants, cathodic reduction,
reversible, irreversible process, fenton agents. Electro chemical reduction of metal ions. Membrane assisted process, electro dialysis, and Electrochemical ion exchange process, electrochemical disinfections of water, UV dose and disinfections kinetics. Photo electrochemical disinfections of water.

UNIT IV

Electrochemical remediation of soil, photochemical treatment of organic pollutant, Photo electrochemical reduction CO₂, Electrochemical treatment of mixed and hazardous waste, Electrochemical generation of hypochloric acid, Photoelectrochemical treatment of wastewater.

UNIT V

Materials for electrochemical treatment, electrodes used in different types of industries, types of electrochemical reactors, batch cell, fluidized bed electrochemical reactor, filter press cell, Swiss roll cell, plug flow cell, design equation, electrochemical reactors for pollutant treatment, figures of merits of different type of electrochemical reactors.

Total No. of periods : 45

TEXT BOOKS:

REFERENCE BOOK:

TOTAL NO. OF PERIODS: 48
UNIT I INTRODUCTION
An overview of industrial biochemical processes with typical examples; comparison of chemical and biochemical processes, development and scope of biochemical engineering as a discipline. Industrially important microbial strains and their classification; structure; cellular genetics; typical examples of microbial synthesis of biologics.

UNIT II ENZYMES AND ENZYME KINETICS
Enzymes fundamental concepts, classification of enzymes; industrial applications of enzymes; industrially important enzymes; mechanism of enzymatic reactions; Michaelis-Menten and Briggs-Haldane equation; Models for complex enzyme kinetics; enzymes inhibition; factors affecting the reaction rates; industrial production, purification and immobilization; enzyme reactors with typical examples.

UNIT III MICROBIAL KINETICS
Typical growth characteristics of microbial cells; factors affecting growth; Monod's equation; modeling of batch and continuous cell growth, immobilized whole cells and their characteristics.

UNIT IV TRANSPORT IN MICROBIAL SYSTEMS
Newtonian and Non-Newtonian behavior of broths; agitation and mixing; power consumption; gas-liquid transport in cells; transfer resistances; mass transfer coefficients and their role in scale-up of equipments; enhancement of O₂ transfer; heat transfer correlation; sterilization cycles and typical examples of heat addition during biological production.

UNIT V BIOREACTORS
Batch and continuous types; immobilized whole cell and enzyme reactors; high performance bioreactors; sterile and non-sterile operations; reactors in series with and without recycle; design of reactors and scale-up with typical examples.

UNIT VI DOWNSTREAM PROCESSES AND EFFLUENT TREATMENT
Recovery and purification of products. Different unit operations in down streaming with special reference to membrane separations; extractive fermentation; anaerobic treatment of effluents; typical industrial examples for downstream processing and effluent disposal.

Total No. of periods: 45

TEXT BOOK:

REFERENCE BOOKS:
2. Blanch, H.W and Clark, D.S, Biochemical engineering, Marcel Dekker, 1997

UNIT I INTRODUCTION TO PHYSIOLOGY
5
Cell and its function; nervous system; cardio vascular system; respiratory system, renal physiology.

UNIT II BIOELECTRIC PHENOMENA
5
Basis of biopotentials; principles of ECG, EEG, EMG.

UNIT III ANALYSIS OF SOME MONITORING-DIAGNOSTIC THERAPEUTIC PROCEDURES
3
Introduction to biochemical; biodynamic models and its application; cardiac assist devices; biomechanics of head injury.
UNIT IV MEDICAL INSTRUMENTATION
Amplifier constraints and specification; recording systems; electrical grounding and patient safety; transducers; electrodes for recording biopotentials.

UNIT V ANALYSIS OF BIOELECTRICAL SIGNALS
Introduction; data acquisition; extraction of signals from noise; introduction to pattern recognition.

UNIT VI PHYSIOLOGICAL CONTROL SYSTEMS
Regulation of body temperature; recognition and control in the CV system.

UNIT VII MEDICAL PHYSICS
Rheology of blood; radiation dosimetry; neutron activation analysis; safety procedures for radiation diagnostics; ultrasound effects.

UNIT VIII BIOPOLYMERS
Introduction; nature and composition of polymers used as prosthetic devices with special reference to heart valves; artificial bones; dentures; autotransplantation.

UNIT IX TRANSPORT PHENOMENA IN HUMAN BIOLOGY
Introduction to renal and respiratory system; lung oxygenator and their design characteristics; artificial kidney and their design features.

UNIT X MEDICAL ENZYMEOLOGY
Role of enzyme in clinical tests, their role as therapeutic agents, role of enzyme electrodes in chemical testing, extra corporeal shunts using immobilized enzymes.

UNIT XI RECENT TRENDS IN MEDICAL FIELD
Role of computer in medical data logging and diagnosis; CAT scan; NMR scanning; transplants; introduction to aviation and space medicine specialty drugs and their mode of action.

Total No. of periods: 45

REFERENCE BOOKS:

PTCH 015 RISK ANALYSIS AND HAZOP 3 0 0 100

UNIT I

UNIT II
Radiation —tank on fire-flame length —radiation intensity calculation and its effect on plant, people & property radiation VCCVE— explosion due to over pressure—effects of explosion, risk contour —effects, explosion, BLEVE-jet fire-fire ball.

UNIT III
Over all risk analysis—generation of meteorological data—ignition data—population data-consequences analysis and total risk analysis—overall risk contours for different failure scenarios—disaster management plan—emergency planning—on site & off site emergency planning, risk management ISO 14000, EMS models case studies—marketing terminal, gas processing complex, refinery.
UNIT IV
Hazard identification safety audits, checklist, what if analysis, vulnerability models event tree analysis fault tree analysis, Hazan past accident analysis Friborough-Mexico-Madras-Vizag-Bopal analysis

UNIT V
Hazop-guide words, parameters, derivation-causes-consequences-recommendation-course Hazop study-case studies-pumping system-reactor-mass transfer system.

Total No. of periods : 45

TEXT BOOKS:

REFERENCE BOOK:

PTCH 016 PROCESS AUTOMATION

UNIT I INTRODUCTION
Principles of measurement and classification of process control instruments; temperature, pressure fluid flow, liquid level, velocity, fluid density, viscosity, conductivity, etc., instrument scaling; sensors; transmitters and control valves; instrumentation symbols and labels.

UNIT II PROCESS AUTOMATION
Basic concepts, terminology and techniques for process control, control modes; Tuning process controllers.

UNIT III ADVANCED CONTROL
Advanced control techniques, feed forward and ratio control, controller design, adaptive control system, statistical process control, expert system, multivariable control techniques, supervisory control.

UNIT IV DIGITAL CONTROL
Digital control techniques, z transforms; sampling and filtering, response of discrete time systems; sampled data control systems; design of digital controllers.

UNIT V OPTIMAL CONTROL
Optimisation and simulation, optimisation techniques, single and multivariable constrained optimisation, dynamic simulation of distillation columns and reactors.

Total No. of periods : 45

TEXT BOOKS:

REFERENCE BOOKS:
PTCH 017 PROCESS MODELLING AND SIMULATION

UNIT I INTRODUCTION
Introduction to modeling and simulation, classification of mathematical models, conservation equations and auxiliary relations.

UNIT II STEADY STATE LUMPED SYSTEMS
Degree of freedom analysis, single and network of process units, systems yielding linear and non-linear algebraic equations, flow sheeting – sequential modular and equation oriented approach, tearing, partitioning and precedence ordering, solution of linear and non-linear algebraic equations.

UNIT III UNSTEADY STATE LUMPED SYSTEMS
Analysis of liquid level tank, gravity flow tank, jacketed stirred tank heater, reactors, flash and distillation column, solution of ODE initial value problems, matrix differential equations, simulation of closed loop systems.

UNIT IV STEADY STATE DISTRIBUTED SYSTEM
Analysis of compressible flow, heat exchanger, packed columns, plug flow reactor, solution of ODE boundary value problems.

UNIT V UNSTEADY STATE DISTRIBUTED SYSTEM
Analysis laminar flow in pipe, sedimentation, boundary layer flow, conduction, heat exchanger, heat transfer in packed bed, diffusion, packed bed adsorption, plug flow reactor, hierarchy in model development, classification and solution of partial differential equations.

UNIT VI OTHER MODELLING APPROACHES
Empirical modeling, parameter estimation, population balance and stochastic modeling.

Total No. of Periods : 45

91
UNIT III
Development of Software for reactors—batch, stirred tank and tubular flow reactor, design of reactors for multiple reactions

UNIT IV
Introduction to simulation software Design III, Design of process equipment using Design II—tubular exchanger, surface condenser, evaporator, cryostat, storage tank.

UNIT V

L+T : 30+30 = 60
Total No. of periods : 60

TEXT BOOKS:

REFERENCE BOOKS: