P.S.R. ENGINEERING COLLEGE

(An Autonomous Institution & Affiliated to Anna University, Chennai)

SIVAKASI - 626140

B.Tech. Bio-Technology

UG REGULATION-2012

CURRICULUM AND SYLLABI

[I TO VIII Semester]

THIS IS THE FINAL VERSION OF THE SYLLABUS AS APPROVED BY THE ACADEMIC COUNCIL OF THE COLLEGE IN THE MEETING HELD ON 1ST JUNE 2013

PROGRAMME EDUCATIONAL OBJECTIVES OF B.Tech– BIOTECHNOLOGY:

- Graduates will be successful in professional career by acquiring the knowledge in the fundamentals of Electronics and Communication Engineering principles and professional skills.
- Graduates will analyze real life problems and design the socially accepted and economically feasible electronics and communication systems.
- Graduates will engage in lifelong learning and professional development by pursuing higher studies and participation in professional organizations.
- Graduates will exhibit good communication skills in their professional career, lead a team with good leadership traits and good interpersonal relationship with the members in other engineering teams.

PROGRAMME OUTCOMES OF B.Tech– BIOTECHNOLOGY

- Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the emerging complex problems in electronics and communication engineering.
- Identify, formulate, research literature and solve complex electronics and communication engineering problems using first principles of mathematics and engineering sciences.
- Design solutions for complex electronics and communication engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- Conduct investigations of complex problems including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
- Create, select and apply appropriate techniques, resources and modern engineering tools, including prediction and modeling, to complex electronics and communication engineering activities, with an understanding of the limitations.
- Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary tasks.
- Communicate effectively with the engineering community and with society at large.
- Demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.
- Understand and commit to professional ethics and responsibilities and norms of engineering practice.
- Understand the impact of engineering solutions in a societal context and demonstrate knowledge of and need for sustainable development.
- Demonstrate a knowledge and understanding of management and business practices and their limitations.
- Recognize the need for, and have the ability to engage in independent and life-long learning.

CANDITATES ADMITTED DURING 2012 – 2013 AND ONWARDS

Regulations for fulltime candidates admitted during the academic year 2012 – 2013 and onwards

1. Conditions for admission

Candidates for admission to the first year of the four year B.E / B.Tech Degree course shall be required to have passed.

i) The higher secondary examinations (academic stream) conducted by the Government of Tamilnadu, with mathematics, Physics and Chemistry

(**or**)

ii) The Higher secondary examination (Vocational stream offering the vocational groups of Engineering and Technology) conducted by the Government of Tamilnadu

(**or**)

iii) The Diploma examinations in Engineering conducted by the State Board of Technical education and Training , Tamilnadu

(**or**)

iv) An examination of any university or authority, accepted by the Syndicate of the Anna University as equivalent there to

(**or**)

v) Any other examinations as notified by the Government of Tamilnadu

Candidates who have passed the Diploma in Engineering /Technology conducted by the State Board of Technical education and Training are eligible for admission to the first semester / Third semester under lateral entry scheme of the B.E /B.Tech degree programs. Any other conditions as notified by the Government of Tamilnadu. The First two conditions are not applicable for B.E /B.Tech. lateral entry students.

2. Branches of study

Branches will be offered at the time of admission to the course. The following are the courses offered in this college.

1) B.E-Civil engineering
2) B.E-Mechanical engineering
3) B.E-Electrical and electronics engineering
4) B.E-Electronics and communication engineering
5) B.E-Computer science and engineering
6) B.Tech-Information technology
7) B.Tech-Bio Technology

3. STRUCTURE OF PROGRAMMES

3.1 Every programme shall have a curriculum with well-defined syllabi comprising of both theory and practical courses such as:

i. General core courses comprising Mathematics, Basic Sciences, Engineering Sciences, Humanities and Engineering arts.
ii. Core courses of Engineering/ Technology
iii. Elective courses for specialization in related fields.
iv. Workshop practice, computer practice, engineering graphics, laboratory work, industrial training, seminar presentation, project work, educational tours, campus etc.
v. **NSS/RRC/ISTE/CISCO/IEEE/YRC** activities for character development.

3.2 The subjects of study shall be both theory and practical and shall be in accordance with the prescribed syllabus.

3.3 Each semester curriculum shall normally have a blend of lecture courses not exceeding 6 and practical courses not exceeding 4.

3.4 A student who has passed all the subjects prescribed in the curriculum for the award of the degree shall not be permitted to-enroll to improve his/her marks in a subject or the aggregate marks.

3.5 The medium of instruction, examinations and project report shall be in English, except for courses on language other than English.

4. DURATION OF THE PROGRAMME

The duration of the programme for the Degree of B.E/B.Tech Programme shall be four academic years with semester pattern. The number of working days will be 90 days (which includes the days for conducting unit tests), 450 hours, or 540 periods of each 50 minutes duration for semester pattern. The number of working days is to be calculated excluding study holidays, Government holidays, and end-semester examination days. The Head of the Department shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

5. SYSTEM OF EXAMINATIONS

Performance in each course of study shall be evaluated based on i) Continuous internal assessment throughout the semester and ii) an end semester examinations.

Theory

End semester examinations will be conducted in all the theory subjects of study at the end of each semester for all the courses. The maximum marks of each subject shall be 100, Out of which the continuous internal assessment will carry 25 marks, while the end semester Examination will carry 75 marks

To derive the internal mark the following guidelines are to be followed.

1) Test (3 Nos.) {Each test is to be conducted for 50 marks} : 60 marks
2) Assignment (3 Nos.)/Assignment + Seminar
   a) Assignment 3 Nos.
   b) 2 Assignments and 1 Seminar presentation } : 30 marks
   c) Assignment + Seminar + Mini Project
   d) Attendance* : 10 marks

100 marks

Total 100 marks should be reduced to 25 marks

*Attendance (10 marks)

Percentage of attendance	Marks
75	2
76 – 80	4
81 – 85	6
86 – 90	8
91 and above	10

Practical

The Practical classes for all the Practical/Lab component courses will be assessed continuously and marks will be entered in the prescribed proforma. The Progress classes will be monitored by a committee formed by the concerned Head of the Departments/ Professor in-charge of the course to ensure that the concerned staff conducts the laboratory experiments as specified in the syllabus. The proforma should be submitted at the end of the each month for approval of Principal/ Chairman, Board of Examination. The maximum marks for the Practical /Lab component courses shall be 100, out of which the continuous internal assessment will carry 25 marks, while the end semester practical examination will carry 75 marks. If any practical course contains Part A and Part B components, the maximum marks for each Part of the lab will be 50 marks, while the end semester practical examination will carry 37.5 marks. The award of the end semester practical examination marks shall be conducted by both the Internal and External examiners. To derive the internal mark the following guidelines are to be followed.

(i)	Continuous Assessment	:	50 Marks
(ii)	Test (minimum one)	:	40 Marks
(iii)	Attendance	:	10 Marks

Total 100 Marks should be reduced to 25 Marks

Attendance (10) Marks

Percentage of attendance	**Marks**
75	2
76-80	4
81-85	6
86-90	8
91 and Above	10

PROJECT WORK AND VIVA-VOCE

For the project work and viva-voce examination the maximum marks shall be 200 comprising of 50 marks for internal assessment and 150 for the end semester examination. The award of the end semester marks for 150 shall be evaluated by both the Internal and External examiners. Out of which the project report shall carry a maximum of 50 marks (same mark must be awarded to every student of the project work) while the viva-voce examinations shall carry 100 marks (awarded to each student of the project group based on the individual performance in the viva-voce examinations).

For Internal Mark:
Work assessed by Guide/Supervisor : 50 % weight
Work assessed by Committee : 50% weight
(Committee consists of 3 members out of whom one member is the Guide/Supervisor)

6. REQUIREMENTS OF EXAMINATIONS AND ATTENDANCE

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

6.1. A candidate will be permitted to appear for the Examination for any semester, only if

i. He/she secures not less than 75% of attendance in the number of working days during that semester, if it shall be open to Chairman of the Academic council or any authority delegated with such powers (by the governing body) to a grant condonation (based on the recommendation of the Head of the Department) to a candidate who has failed to secure 75% of the attendance for valid reasons and has secured not less than 66% of the attendance. Such exemptions can be allowed only TWO times during his/her entire course of study.

ii. Candidates representing University in State/National/International /Inter University Sport events, Co and Extra-Curricular activities, paper or project presentation with prior permission from the Head of the Institution are give exemption up to 10% of the required attendance and such candidates shall be permitted to appear for the current semester examination.

iii. his/her conduct has been certified to be satisfactory by the concerned Head of the Department.

iv. Condonation can be allowed only two time during his/her entire course of study.

6.2 Candidate who do not complete the semester (as per clause 6.1) 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.

7. Procedures for awarding marks for internal assessment

i. Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks and the record of class work (topic covered), for each course. This should be submitted to the Head of the Departments periodically (at least three times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the Departments will put his signature and date after due verification at the end of the semester, the record should be verified by the Head of the Institution who will keep this document in safe custody (for five years)

ii. Theory Courses (25 marks)

(a) **Unit Tests [60 % weights]**

Three tests each carrying fifty (50) marks shall be conducted by the Department/ Institution. The total marks obtained in all the tests put together out of 150, shall be reduced to 60 marks and rounded to nearest integer (this implies equal weight to all the three tests). However retest at the discretion of the Head of the Department may be conducted for the deserving candidates.

(b) Assignment [30% weight]

Three assignments requiring work of average 5 to 6 hours of study and written work of average 5 to 6 hours, each carried out by a student in a separate assignment folder, duly indexed with headings, date of submission, marks, remarks and signature of faculty with date etc

(c) Attendance [10 % weight]

Attendance (10 marks)

Percentage of attendance	**Marks**
75	2
76-80	4
81-85	6
86-90	8
91 and Above	10

The Internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2012-2013 and onwards. If a candidate scores 50% of marks only in the end semester examination, after three attempts (First attempt+ two more attempts), he/ she would be declared as a passed candidate in that examinations.

ii. Theory Courses (25 marks)

Every practical exercise / experiment shall be evaluated based on conduct of exercise / experiment and records maintained. There shall be at least one test. The criteria for deriving the internal assessment marks are:

Experiment / Record/Average Practical classes' performance	:	50% weight
Practical Test	:	40% weight
Attendance	:	10% weight

Total 100 marks should be reduced to 25 marks

5. PROJECT WORK

There shall be three assessments during the semester by a review committee. The students 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 criteria for arriving the internal assessment marks for the Project Work evaluated for 50 marks are:

Work assessed by the Project Guide	:	50 % weight
Assessment by a three (3)-member internal review committee	:	50% weight

Guide will be one of the members of the committee.

The Internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted form the academic year 2012-2013 and onwards. If a candidate scores 50% of marks only in the end semester examination, after three attempts (First attempt+ two more attempts), he, /she would be declared as a passed candidate in that examinations.

8. PROCEDURE FOR COMPLETING THE COURSE

(i) A candidate who has for some reason discontinued the course can join the course of study of any semester only at the time of its normal commencement in the institution for regular students upon satisfying all the following conditions.

(a) he/she should have completed the course of study of the previous semesters.

(b) he/she should be eligible to register for the examinations and satisfy rule 8(iii)

(c) he/she should have registered for all the examinations of the previous semesters.

(ii) A candidate will be permitted to proceed from one semester to the next higher semester only if he concerned semester, subject to the condition that the candidate should register for all the arrear subjects of lower semesters along with the current (higher) semester subjects.

(iii) A candidate should have completed B.E / B.Tech Degree course within a period of SEVEN consecutive academic years (14 semesters) form the date of admission to the course, even if the candidate discontinues and rejoins subsequently, to be eligible for the award of the degree. The minimum and maximum period for completion of the U.G.Programmes (B.E/B.Tech) are given below.

PROGRAMME	Min.No.of Semesters	Max.No.of Semesters
B.E/B.Tech.(Full Time)	**8**	**14**

9. REQUIREMENTS FOR APPEARING FOR SEMESTER EXAMINATION

A candidate shall normally be permitted to appear for the semester examinations of the current semester if he/she has satisfied the semester completion requirements (Subject to Clause 6.1) and has registered for examination in all courses of that semester. Registration is mandatory for current semester examinations as well as arrears examinations failing which the candidate will not be permitted to move to the higher semester.

10. PASSING MINIMUM AND CLASSIFICATION OF SUCCESFULL CANDIDATE

(i) For each subject the examinations will be conducted for 100 marks. A candidate who secures not less than 50% of the total marks in the End semester examinations and Internal Assessment put together in both theory and Practical courses, including Project work, subject to securing a minimum of 50% in the End-Semester examination, wherever applicable, shall be declared to have passed the examination in that subject. When the mark secured for 100 is converted d to 75, minimum 37 marks must be secured for pass. Any programme, during any semester, conducts the lab in two parts, say A and B lab, only if he/she secures a minimum 50% put together, subject to a minimum of 505 in each part of the lab and the student must compulsorily appear for both the parts of the in the end semester practical examination. If the candidate is absent for any one part of the lab, the candidate is declared as fail in both the parts of A and B of the lab [marked as absent in External Examinations] and he/she should appear in both, part A and B in the subsequent semesters.

(ii) A candidate who successfully completes the course requirements and has passed all the prescribed examinations in all the Eight Semesters within a maximum period of Seven years reckoned from the commencement of the first semester to which the candidate was admitted is eligible to get the degree.

(iii) A candidate who qualifies for the Degree by passing the examination in all subjects of the entire course in first attempt within a period of four consecutive academic years from the date of admission to the course and secures an aggregate of not less than 75% (CGPA of not less than 8.5) of the total marks for the entire course shall be declared to have passed the examination for the degree in FIRST CLASS WITH DISTINCTION. For this purpose, the withdrawal from examination will not be constructed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.

(iv) A candidate transferred from other Institution, who qualifies for the Degree by passing the examination in all subjects of the entire course in first attempt within a period of four consecutive academic years from the date of admission to the course and secures an aggregate of not less than 75% (CGPA of not less than 8.5) of the total marks for the entire course shall be declared to have passed the examination for the degree in FIRST CLASS WITH DISTRINCTION. For this purpose, the withdrawal from examination will not be constructed as appearance. Further, the authorized break of study will not be counted for the purpose of classification.

(v) A candidate who qualifies for the award of the Degree having passed the examinations in all the subjects of the course in the semesters First to Eight within a maximum period of Ten Consecutive semesters after his/her commencement of study in the First semester and secures an aggregate of not less than 60% (CGPA of not less than 6.50) of the total marks for the entire course shall be declared to have passed the examination for the degree in FIRST CLASS. For this purpose, the authorized break of study will not be counted for the purpose of classification.

(vi) All other successful candidates shall be declared to have passed the examination for the Degree in SECOND CLASS.

(vii) A candidate who is absent in semester examination in a course/project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification.

11. ISSUE OF MARK SHEETS

Individual mark sheet for each semester will be issued, containing the following information through the Head of the Department concerned, after the publication of the results.

i) The marks obtained in each course in internal assessment and end semester examination and total marks obtained for each course.

ii) Whether the candidate has passed /failed in the courses concerned.

12. MALPRACTICE

If a student indulges in malpractice in any of the end semester examinations, he/she shall be liable for punitive action as prescribed by the Anna University of Technology, Tirunelveli from time to time.

13. REVALUATION

i) Copies of answer script for theory course(s) can be obtained from the Office of the Controller of Examinations on payment of a prescribed fee specified for this purpose through proper application.

ii) A candidate can apply for revaluation of his/her examination answer paper in a theory course, within a week from the declaration of results, on payment of a prescribed fee through proper application to the Office of the Controller of Examinations, as per the norms given by the Chairman, Academic Council. Revaluation is not permitted for Practical Courses and for Project work.

iii) Retotaling is permissible for all arrear and current theory subjects.

14. ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall be declared eligible for the award of the B.E/B.Tech Degree provided the candidate have

i) Successfully completed the course requirements and has passed all the prescribed examinations in all the 8 semesters within a maximum period of 7 years from the commencement of first semester to which the candidate was admitted.

ii) The Syndicate of the University must have approved the award of degree.

15. CLASS COMMITTEE

15.1. A class committee consists of teachers of the concerned class, student representatives and a chairperson who is not teaching the class. It is like the 'QUALITY Circle' (more commonly use in industries) with the overall goal of improving he teaching-learning process. The functions of the class committee include

- Solving problems experienced by students in the class room and in the laboratories.
- Clarifying the regulations of the degree programme and details of rules therein.
- Informing the student representatives the academic schedule including the dates of assessments and the syllabus coverage for each assessment.
- Informing the student representatives the details of Regulations regarding weight used for each assessment. In the case of practical courses(laboratory/drawing/project work/seminar etc.) the breakup of marks for each experiment /exercise /module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.

- Identifying the weak students, if any, and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students.

15.2. The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in each class of the first semester (Generally common to all branches), the class committee is to be constituted by the head of the institution.

15.3. The class committee shall be constituted on the first working day of any semester or earlier

15.4. At least 6 student representatives (usually 3 boys and 3girls) shall be included in the class Committee.

15.5. The Chairperson of the class committee may invite the Faculty Adviser(s) and the Head of the Department to the meeting of the class committee.

15.6. The Head of the Institution may participate in any class committee of the institution

15.7. The chairperson is required to prepare the minutes of every meeting, submit the sam to the Head of the Institution within two days of the meeting and arrange to circulate among the concerned students and teachers. If there are some points in the minutes requiring action by the authorities concerned, the same shall be brought to the notice of the authority by the Head of the Institution.

15.8. The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weight of assessments within the framework of the regulations. Two or three subsequent meetings may be held at suitable intervals. During these meetings the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

16. FACULTY ADVISER

To help the student in planning their courses of t study and for general advice on the academic programme, the Head of the Department of the student will attach a certain number of students to a teacher of the Department who shall function as Faculty Adviser for those students throughout their period of study. Such Faculty Adviser shall advise the student s and monitor the courses taken by the students, check the attendance and progress of the students attached to him/her and counsel them periodically. If necessary, the faculty adviser may also discuss with or inform the parents about the progress of the students.

17. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or group shall have a "Course Committee" comprising all the teachers teaching the common course with one of them nominated as Course Coordinator. The nomination of the course Coordinator shall be made by the Head of the Department/Head of the institution depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The 'Course committee' shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests, where it is feasible, the committee may also prepare a common question paper for the test(s).

18. PROVISION FOR WITHDRAWAL FROM EXAMINATION

i) A candidate may, for valid reasons, be granted permission to withdraw from appearing for the examination in any course or courses of only one semester examination during the entire duration of the degree programme. Also only one application for withdrawal is permitted for that semester examination in which withdrawal is ought. Withdrawal from appearing for the examination in any course or courses in the middle of the examination is not permitted.

ii) Withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination and if it is made prior to the commencement of the last examination in that semester and duly recommended by the Head of the Department and approved by the Head of the Institution.

iii) Withdrawal shall not be constructed as an appearance for the eligibility of a candidate for First Class with Distinction.

iv) Withdrawal is possible only if the candidate satisfies the attendance requirements [as per Clause 6.1]

19. TEMPORARY BREAK OF STUDY FROM A PROGRAMME

i) A candidate is not normally permitted to temporarily break the study. However if a candidate intends to temporarily discontinue the programme in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the programme in a later semester he/she shall apply to the Head of the Institution in advance, in any case, not later that the last date for registering for the semester examinations of the semester in question, through the Head of the Department starting the reasons thereof.

ii) the candidate permitted to rejoin the programme after the break shall be governed by the rules and regulations in force at the time rejoining.

iii) The duration specified for passing all the courses for the purpose of classification vide Clause 10(iii), 10(iv) and 10(v) shall be increased by the period of such break of study permitted.

iv) The period for completion of the programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 8(iii) irrespective of the period of break of study in order that he/she may be eligible for the award of the degree (vide clause 14).

v) If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' and Clause 19(iii) is not applicable for this case.

20. RANK OF STUDENT

A candidate who qualifies for the Degree by passing the examination in all subjects of the entire course in first attempt within a period of four consecutive academic years from the date of admission to the course can be given his/her position in the class as rank. The Rank is

determined from III Semester to VIII semester examination mark percentage. Students transferred from other institution to PSREC are not eligible for rank.

21. PROCEDURE FOR USING SCRIBER

If a candidate is physically handicapped (in case of accidents/ ill Health) at the time of examination, then he/she may be permitted to use a scriber to write the examination. In such case 30 minutes, extra time will be permitted. The Scriber shall be a non-engineering student/graduate.

22. INDUSTRIAL VISIT

Every student is required to undergo one Industrial visit, starting form the third semester of the Programme. Every teacher shall take the students at least for one industrial visit in a semester.

23. PERSONALITY AND CHARACTER DEVELOPMENT

All students shall enroll, on admission, in any one of the personality and character development programmes (NSS/YRC/ RRC/ISTE /IEEE/CISCO). The training shall include classes on hygiene and health awareness and training in first aid.

- **NATIONAL SERVICE SCHEME (NSS)** will have social service activities in and around the College/Institution.
- **YOUTH RED CROSS (YRC) will have activities related to social services in and around college institution.**
- **RED RIBBON CLUB (RRC)** will have activities to improve health awareness among the people in and around the college campus.
- **INDIAN SOCIETY FOR TECHNICAL EDUCATION (ISTE)** will have activities to improve students technical skill and career development
- **INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)** will have activities to enhance professional students innovative skills
- **COMPUTER INFORMATION SYSTEM COMPANY (CISCO)** will have activities to enhance professional student's innovative skills with the help enhanced human network.

While the training activities will normally be during weekends, the camp will normally be during vacation period.

24. DISCIPLINE

Every student is required to observe disciplined and decorous behavior both inside and outside the college and not to indulge in any activity, which will tend to bring down the prestige of the College. In the event an act of indiscipline being reported, the Principal shall constitute and disciplinary committee consisting of three Heads of Department of which one should be from the faculty of the student, to inquire into acts of discipline. The disciplinary action is subject to review by the University in case the student represents to the University.

Any expulsion of the student from the college shall be with prior concurrence form Director of Technical Education /University.

25. CREDIT SYSTEM

The letter grade and the grade point are awarded based on percentage of marks secured by a candidate in individual course as detailed below:

Range of Total Marks	Letter Grade	Grade Points(GP)
90 to 100	**S**	**10**
80 to 89	**A**	**9**
70 to 79	**B**	**8**
60 to 69	**C**	**7**
55 to 59	**D**	**6**
50 to 54	**E**	**5**
0 to 49	**U**	**0**
INCOMPLETE	**I**	**0**

"**U**" denotes failure in the course

"**I**" denotes incomplete as per clause 6.1 and hence prevention from writing End semester

Examination.

"**W**" denotes withdrawal from the course.

After results are declared, Grade sheets will be issued to each student which will contain the following details:

- The list of subjects enrolled during the semester and the grades scored.
- The Grade Point Average (GPA) for the semester and
- The Cumulative Grade Point Average (CGPA) of all subjects enrolled from first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of courses registered and the points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

$$GPA = \frac{Sum\ of\ [C*GP]}{Sum\ of\ C}$$

Where C - credit of a particular course

GP - grade point obtained by the student in the respective course.

CGPA will be calculated in a similar manner, considering all the courses enrolled form first semester. "U","I", and "w" grades will be excluded for calculating GPA and CGPA.

Each course is normally assigned certain number of credits with 1 credit per lecture period per week, 1 credit per tutorial period per week, 1 credit for 2 periods of laboratory or practical or seminar or project work per week(2 credits for 3 or 4 periods of practical).

However, the performance of a student is evaluated only based on the mark system.

26. REVISION OF REGULATION AND CURRICULUM

The college may from time to time revise, amend or change the regulations, scheme of examinations and syllabus, if found necessary.

REGULATION – 2012
B.TECH.BIOTECHNOLOGY
CURRICULUM & SYLLABI

Full time candidates admitted during 2012-2013 and onwards

S.No	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Marks	Credits			
						L	T	P	C
SEMESTER – I									
Theory									
1	12F1Z1	Technical English-I	25	75	100	3	1	0	4
2	12F1Z2	Engineering Mathematics-I	25	75	100	3	1	0	4
3	12F1Z3	Engineering Physics-I	25	75	100	3	0	0	3
4	12F1Z4	Engineering Chemistry-I	25	75	100	3	0	0	3
5	12F1Z5	Fundamentals of Computing and Programming	25	75	100	3	0	0	3
6	12F1Z6	Engineering Graphics	25	75	100	3	1	0	4
Practicals									
7	12F1Z7	Physics and Chemistry Laboratory - I	25	75	100	0	0	3	2
8	12F1Z8	Computer Practice Laboratory -I	25	75	100	0	0	3	2
9	12F1Z9	Engineering Practices Laboratory	25	75	100	0	0	3	2
Total					**900**	**18**	**3**	**9**	**27**

S.No	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Marks	Credits			
						L	T	P	C
SEMESTER – II									
Theory									
1	12F2Z1	Technical English-II	25	75	100	3	1	0	4
2	12F2Z2	Engineering Mathematics-II	25	75	100	3	1	0	4
3	12F2Z3	Engineering Physics-II	25	75	100	3	0	0	3
4	12F2Z4	Engineering Chemistry-II	25	75	100	3	0	0	3
5	12F2Y5	Engineering Mechanics (For Non-Circuit branches)	25	75	100	3	1	0	4
6	12F2Y6	Basic Electrical and Electronics Engineering(For Non-Circuit branches)	25	75	100	3	1	0	4
Practicals									
7	12F2Z7	Physics and Chemistry Laboratory – II	25	75	100	0	0	3	2
8	12F2X7	Computer Aided Drafting and Modeling Laboratory (For Non Circuit Branches)	25	75	100	0	0	3	2
9	12F2Z8	Computer Practice Laboratory – II	25	75	100	0	0	3	2
Total					**900**	**18**	**4**	**9**	**28**

S. No	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Mark	Hrs & Credits			
						L	T	P	C
SEMESTER III									
Theory									
1	12MA31	Transforms and Partial Differential Equations	25	75	100	3	1	0	4
2	12BT31	Principles of Chemical Engineering	25	75	100	3	1	0	4
3	12GE31	Environmental Science and Engineering	25	75	100	3	0	0	3
4	12BT32	Cell Biology	25	75	100	3	0	0	3
5	12BT33	Bio Organic Chemistry	25	75	100	3	0	0	3
6	12BT34	Biochemistry-I	25	75	100	3	0	0	3
Practical									
7	12BT35	Cell Biology Laboratory	25	75	100	0	0	3	2
8	12BT36	Bio Organic Chemistry Laboratory	25	75	100	0	0	3	2
9	12BT 37	Biochemistry Laboratory	25	75	100	0	0	3	2
10	12HS31	Professional English-I	25	75	100	0	0	3	1
Total					**1000**	**18**	**2**	**10**	**27**

S.No	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Marks	Hrs & Credits			
						L	T	P	C
SEMESTER IV									
Theory									
1	12BT41	Genetics	25	75	100	3	0	0	3
2	12MA45	Probability and Statistics	25	75	100	3	1	0	4
3	12BT42	Unit Operations	25	75	100	3	0	0	3
4	12BT43	Chemical Engineering and Thermodynamics	25	75	100	3	1	0	4
5	12BT44	Instrumental Methods of Analysis	25	75	100	3	0	0	3
6	12BT45	Microbiology	25	75	100	3	0	0	3
Practical									
7	12BT46	Microbiology lab	25	75	100	0	0	3	2
8	12BT47	Instrumental Methods of Analysis Lab	25	75	100	0	0	3	2
9	12BT 48	Chemical Engineering lab	25	75	100	0	0	3	2
10	12HS41	Professional English-II	25	75	100	0	0	3	1
Total					**1000**	**18**	**2**	**10**	**27**

S.No	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Marks	Hrs & Credits			
						L	T	P	C
SEMESTER V									
Theory									
1	12BT51	Bioethics	25	75	100	3	0	0	3
2	12BT52	Basic Industrial Biotechnology	25	75	100	3	0	0	3
3	12BT53	Bioinformatics	25	75	100	3	0	0	3
4	12BT54	Biochemistry-II	25	75	100	4	0	0	4
5	12BT55	Mass Transfer Operations	25	75	100	4	0	0	4
6	12BT56	Molecular Biology	25	75	100	4	0	0	4
Practical									
7	12BT57	Molecular biology laboratory	25	75	100	0	0	4	2
8	12BT58	Bioinformatics laboratory	25	75	100	0	0	4	2
9	12HS51	English for employment I	25	75	100	0	0	3	1
Total					**900**	**21**	**0**	**11**	**27**

S.No	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Marks	Credits			
						L	T	P	C
SEMESTER VI									
Theory									
1	12BT61	Bioprocess principles	25	75	100	3	0	0	3
2	12BT62	Chemical reaction engineering	25	75	100	4	0	0	4
3	12BT63	Immunology	25	75	100	4	0	0	4
4	12BT64	Genetic engineering	25	75	100	4	0	0	4
5		Elective I	25	75	100	3	0	0	3
6		Elective II	25	75	100	3	0	0	3
Practical									
7	12BT65	Genetic engineering laboratory	25	75	100	0	0	4	2
8	12BT66	Immunology lab	25	75	100	0	0	4	2
9	12HS61	English for employment II	25	75	100	0	0	3	1
Total					**900**	**21**	**0**	**11**	**26**

S.No	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Marks	Credits			
						L	T	P	C
SEMESTER VII									
Theory									
1	12BT71	Bioprocess Engineering	25	75	100	3	1	0	4
2	12BT72	Protein Engineering	25	75	100	4	0	0	4
3	12BT73	Downstream Processing	25	75	100	4	0	0	4
4	12MG71	Total Quality Management	25	75	100	3	0	0	3
5		Elective III	25	75	100	3	0	0	3
6		Elective IV	25	75	100	3	0	0	3
Practical									
7	12BT74	Bioprocess Engineering Lab	25	75	100	0	0	4	2
8	12BT75	Downstream Processing lab	25	75	100	0	0	4	2
Total					**800**	**20**	**1**	**0**	**25**

S.No	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Marks	Credits			
						L	T	P	C
SEMESTER VIII									
Theory									
1		Elective V	25	75	100	3	0	0	3
2		Elective VI	25	75	100	3	0	0	3
Practical									
3	12BT81	Project Work	25	75	100	0	0	12	6
Total					**300**	**6**	**0**	**12**	**12**

LIST OF ELECTIVES

ELECTIVE – I

CODE NO.	COURSE TITLE	L	T	P	C
12BT6A	Biophysics	3	0	0	3
12BT6B	Biological Spectroscopy	3	0	0	3
12BT6C	Biopharmaceutical Technology	3	0	0	3

ELECTIVE - II

CODE NO.	COURSE TITLE	L	T	P	C
12BT6D	Principles of Food Processing	3	0	0	3
12BT6E	Marine Biotechnology	3	0	0	3
12BT6F	Cancer Biology	3	0	0	3
12BT6G	Metabolic Engineering	3	0	0	3

ELECTIVE - III

CODE NO.	COURSE TITLE	L	T	P	C
12BT7A	Bioconjugate Technology	3	0	0	3
12BT7B	Stem Cell Technology	3	0	0	3
12BT7C	Molecular Pathogenesis	3	0	0	3
12BT7D	Plant Biotechnology	3	0	0	3

ELECTIVE – IV
(Open Choice)

CODE NO.	COURSE TITLE	L	T	P	C
12BT7E	Industrial Safety Management	3	0	0	3

ELECTIVE -V

CODE NO.	COURSE TITLE	L	T	P	C
12BT8A	Genomics and Proteomics	3	0	0	3
12BT8B	Animal Biotechnology	3	0	0	3
12BT8C	Immunotechnology	3	0	0	3
12BT8D	Molecular Modeling & Drug Design	3	0	0	3
12BT8E	Neurobiology and Cognitive Sciences	3	0	0	3
12BT8F	Process Instrumentation Dynamics and Control	3	0	0	3

ELECTIVE – VI
(Open Choice)

CODE NO.	COURSE TITLE	L	T	P	C
12BT8G	Process Equipments and Plant Design	3	0	0	3

12F1Z1 TECHNICAL ENGLISH - I

L	T	P	C
3	1	0	4

AIM

- To familiarize with the Basics of Language
- To know the mechanics of Writing for various Situations
- To communicate with error-free messages
- To understand all formats of the text
- To Get enough confidence on Business Communication

UNIT I FOCUS ON LANGUAGE 12

General Vocabulary- prefix, suffix –Denotative & connotative- Parts of Speech-Types of Sentences-Conditionals Connectors Concord -Tenses- -Active &Passive voice -Phrases & Clauses-Spelling& Punctuation-Cause & Effect-Correct use of words(parts of speech)-Question Tags-'wh'&'Yes/No'Type questions-Rearranging Jumbled Sentences-One-Word Substitution

UNIT II READING 12

Reading for gist/Identifying information/gap filling-Reading different types of text like advertisement, instruction, manuals, report - Reading passage with multiple choice questions/cloze type passage/sentence matching/completing passage-Reading for flow chart completion/matching information/matching headings, Reading for sentence completion

UNIT III WRITING 12

Writing Sentences for Brevity, Clarity and Simplicity-Writing Topic sentences/General Information/Description Paragraph-structuring an Essay-Writing effective conclusions-Writing a Process- Writing formal letter like Requisition letter, Placing an order, Quotation letter, Acknowledgement letter, Enquiry Letter, Complaint Letter, Permission Letter.

UNIT IV LISTENING 12

Listening for Learning-Word Stress and Pronunciation practices-Listening for Specific information-Note taking-Listening to announcements- Listening to News on the radio/TV

UNIT V SPEAKING 12

Introducing oneself–offering Suggestions and recommendations-Expressing opinions suggestions-(agreement/disagreement)-Role play- Purchase Manager& Customer, Customer care executive (voice) & Customer, Bank manager& Employee, Commenting on the basis of Discussion-Using Verbal & Non-verbal cues in speech-Using Familiar Expressions in different situations.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Department of Humanities & Social Sciences, Anna University, '*English for Engineers and Technologists*' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006.

REFERENCES

1 CambridgeBECPreliminary2Student'sBookwithAnswers: ExaminationpapersfromUniversityof CambridgeESOL Examinations, Cambridge ESOL, PB, ISBN: 9780521544504
2. Meenakshi Raman and Sangeetha Sharma-"Technical Communication: English skills for Engineers"-Oxford University Press-2008,ISBN:0-19-569574-7

E-MATERIALS

1.www.usingenglish.com
2.www.ego4u.com
3.www.letterwritingguide.com
4.www.randallsenglishlab.com

12F1Z2	ENGINEERING MATHEMATICS – I	L	T	P	C
		3	1	0	4

UNIT I MATRICES 9+3

Characteristic equation - Eigen Values and Eigen vectors of a real matrix - Properties of Eigen values - Problem solving using Cayley-Hamilton - Similarity Transformation - Orthogonal Transformation of a Symmetric matrix to diagonal form - Quadratic form - Orthogonal reduction to canonical form

UNIT II THREE DIMENSIONAL GEOMETRY 9+3

Introduction – Sphere - Tangent plane - Plane section of a sphere–Lines - Skew lines – Coplanar lines - – Equation of cylinder - Right circular cylinder.

UNIT III DIFFERENTIAL CALCULUS 9+3

Curvature - Radius of curvature - Cartesian and Parametric Coordinates - Circle of Curvature - Involutes and Evolutes – Envelope - Evolutes as Envelope of its normal.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial Derivatives - Euler's Theorem for homogeneous function - Total Derivative - differentiation of Implicit function – Jacobian - Taylor's Expansion - Maxima/Minima for function of two variables - Method of Lagrange's multipliers

UNIT V MULTIPLE INTEGRALS 9+3

Double integration - Cartesian and Polar co-ordinates - Change of order of integration - Change of variable between Cartesian and polar co-ordinates - Triple integration - Area as a double integration - Volume as a triple integral

TOTAL: 60 PERIODS

TEXT BOOKS

1. B.S.Grewal,'Higher Engineering Mathematics', Thirty Sixth Edition,Khanna Publishers,Delhi,2005.
2. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001
3. Dr.P.Kandasamy , Dr.K.Thilagavathy , Dr.K.Gunavathy , S. Chand & Company Ltd. Ram nagar, New Delhi.

REFERENCES

1. Greenberg, M.D. Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman.M.K.,"Engineering Mathematics",Volume I and II Revised enlarged Fourth Edition, The National ?Publishing Cpompany,Chennai,2004.
3. Veerarajan.T"Engineering Mathematics",Fourth Edition,Tata McGraw – hill publishing company Ltd,New Delhi,2005.

12F1Z3	ENGINEERING PHYSICS – I	L	T	P	C
		3	0	0	3

UNIT I ULTRASONICS 9

Introduction – Production – magnetostriction effect - magnetostriction generator- piezoelectric effect - piezoelectric generator- Detection of ultrasonic waves, properties – Cavitations - Velocity measurement – acoustic grating - Industrial applications – drilling, welding, soldering and cleaning – SONAR - Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonograms

UNIT II LASERS 9

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coeffcients - derivation. Types of lasers – He-Ne, CO2 , Nd-YAG, Semiconductor lasers- Qualitative Industrial Applications - Lasers in welding, heat treatment, cutting – Medical applications - Holography and uses.

UNIT III FIBER OPTICS AND APPLICATIONS 9

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre drawing - Fibre optical communication system (Block diagram) - Light sources - Detectors - Fibre optic sensors – temperature and displacement - Endoscope.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation)- Compton effect- Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box.

UNIT V CRYSTAL PHYSICS 9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures –Crystal defects – point, line and surface defects- Burger vector

TOTAL: 45 PERIODS

TEXT BOOKS

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi(2003).
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi, 2005.
3. K.Rajagopal , " Engineering Physics " Prentice – Hall of India Pvt. Ltd. New Delhi , 2007.

REFERENCES

1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics',6th Edition, Thomson Brooks/Cole, Indian reprint (2007).
2. Rajendran, V and Marikani A, 'Engineering Physics' Tata McGraw Hill PublicationsLtd, III Edition, New Delhi, (2004).
3. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2007).
4. Jayakumar. S, 'Engineering Physics', R.K. Publishers, Coimbatore, (2003).
5. Chitra Shadrach and Sivakumar Vadivelu, 'Engineering Physics', Pearson Education,New Delhi, (2007).

12F1Z4	ENGINEERING CHEMISTRY – I	L	T	P	C
		3	0	0	3

AIM

To impart a sound knowledge on the principles of chemistry involving the different Application oriented topics required for all engineering branches

OBJECTIVES

- The student should be conversant with the principles water characterizationand treatment of potable and industrial purposes.
- Principles of polymer chemistry and engineering applications of polymers.
- Industrial applications of surface chemistry.
- Conventional and non-conventional energy sources and energy storage.
- Devices and Chemistry of engineering materials.

UNIT I WATER TECHNOLOGY 9

Characteristics – alkalinity – types of alkalinity and determination – hardness –types and estimation by EDTA method (problems); Domestic water treatment –disinfection methods (Chlorination, ozonation. UV treatment) – Boiler feed water– requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – demineralization process – desalination and reverse osmosis

UNIT II POLYMERS AND COMPOSITES 9

Polymers-definition – polymerization – types – addition and condensation Polymerization – free radical polymerization mechanism – Plastics, classification–Preparation, properties and uses of PVC, Teflon, polycarbonate, polyurethane, Nylon-6, 6, PET- Rubber -vulcanization of rubber, synthetic rubbers – buty1Rubber, SBR, Composites – definition, types polymer matrix composites – FRP only.

UNIT III SURFACE CHEMISTRY 9

Adsorption – types – adsorption of gases on solids – adsorption isotherms –Frendlich and Langmuir isotherms – adsorption of solutes from solution – role of adsorbents in catalysis, ion-exchange adsorption and pollution abatement.

UNIT IV NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear energy – fission and fusion reactions and light water nuclear reactor for

Power generation (block diagram only) – breeder reactor – solar energy Conversion – Solar cells – wind energy – fuel cells – hydrogen – oxygen fuel cell – Batteries – Alkaline batteries – lead–acid, nickel–cadmium and lithium batteries

UNIT V ENGINEERING MATERIALS 9

Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks, Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide. Lubricants – mechanism of lubrication, liquid lubricants, - properties – viscosity index, flash and fire points, cloud and pour points, oilyness) – solid lubricants – graphite and molybdenum sulphide. Nanomaterials – introduction to nanochemistry – carbon nanotubes and their Applications

TOTAL: 45 PERIODS

TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. Dr.A.Ravikrishnan, "Engineering Chemistry" Sri Krishna Publications, Chennai. (2002)
3. S.S. Dara "A text book of engineering chemistry" S.Chand and Co.Ltd., New Delhi (2006).

REFERENCES

1. B.K.Sharma "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar "Engineering Chemistry" Tate McGraw-Hill Pub.Co.Ltd, New Delhi (2008).

12F1Z5	FUNDAMENTALS OF COMPUTING AND PROGRAMMING	L	T	P	C
		3	0	0	3

AIM

To provide an awareness to Computing and Programming .

OBJECTIVES

- To enable the student to learn the major components of a computer system
- To know the correct and efficient ways of solving problems
- To learn to program in C

UNIT I INTRODUCTION TO COMPUTERS 9

Introduction – Characteristics of Computers – Evolution of Computers - Computer Generations – Classification of Computers – Basic Computer organization – Number Systems- Computer Software – Types of Software – Software Development Steps – Internet Evolution – Basic Internet Terminology- Internet Services

UNIT II PROBLEM SOLVING 9

Problem Solving Using Computers- Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudo code.

UNIT III INTRODUCTION TO C 9

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping .

UNIT IV ARRAYS AND FUNCTIONS 9

Arrays- Handling of Character Strings – User-defined Functions – Definitions – Declarations - Call by reference – Call by value.

UNIT V STRUCTURES AND POINTERS 9

Structures and Unions – Pointers – Arrays – The Preprocessor – Developing a C Program : Some Guidelines

TOTAL: 45 PERIODS

TEXT BOOKS

1. Ashok.N.Kamthane," Computer Programming", Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications, (2007).

REFERENCES

1. Pradip Dey,Manas Ghoush, "Programming in C", Oxford University Press.(2007).
2. Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, (2006). (Unit II, III, IV, and V).
3. Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India, (2005).
4. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., (2005).
5. E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGRaw-Hill Publishing Company Limited, (2008).
6. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers, (2008).

12F1Z6	ENGINEERING GRAPHICS	L	T	P	C
		3	1	0	4

AIM

To develop Graphic skills of the students.

OBJECTIVES

To develop in students graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings

UNIT I PLANE CURVES AND FREE HAND SKETCHING 15

Curves used in engineering practices:

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method –Construction of cycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves.

Free hand sketching:

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 15

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS 15

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 15

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL: 75 PERIODS

TEXT BOOKS

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46 Th Edition, (2003).

REFERENCES

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).
3. K. Venugopal and V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.IandII), Subhas Publications (1998).
6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

12F1Z7 PHYSICS LABORATORY – I

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. a.Particle size determination using Diode Laser
   b.Determination of wavelength of the Laser source.
   c.Determination of acceptance angle and Numerical aperture of an optical fiber.
2. Determination of thickness of a thin wire – Air wedge method
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Spectrometer- Dispersive power of a prism.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of Young's modulus of the material – non uniform bending.
7. A minimum of FIVE experiments shall be offered.

12F1Z7 CHEMISTRY LABORATORY – I

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. Estimation of hardness of Water by EDTA
2. Estimation of Copper in brass by EDTA
3. Estimation of ferrous iron by Potentiometric titrations
4. Estimation of hydrochloric acid by P^H metry.
5. Determination of DO in water (Winkler's method

REFERENCE:

1. Text book of Quantitative Inorganic Analysis,A.I.Vogel, ELBS, London.
2. A.Ravikrishnan,"Practical Engineering Chemistry", Sri Krishna Publications, Chennai(2002)

12F1Z8 COMPUTER PRACTICE LABORATORY-I

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1) **Word Processing**

a) Create a word Document using Table creation, Table Formatting and Scientific notations

b) Create Mail Merge

c) Drawing Flowchart for the following

i) To find the largest of three numbers A,B, and C

ii) To find the sum of first 50 Natural numbers

iii) Factorial of given number using Recursion

2) **Spreadsheet**

a) Create Spreadsheet using the following features:

Tables, Charts, Formula, Formula Editor

Sorting, Import/Export Features.

3) **Power-point**

a) Create a Power point Presentation about your college.

"C" Programs

Aim:

To practice C programs for the following concepts:

4) Simple C Programs using Data types, Expression Evaluation
5) Program using Conditional and Looping Statements
6) Program using Arrays
7) Program using functions
8) Program using Switch…case Statement
9) Program using Strings
10) Program using Structures
11) Program using Unions
12) Program using Pointers.

12F1Z9	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

LIST OF EXPERIMENTS

GROUP A (CIVIL and MECHANICAL)

I CIVIL ENGINEERING PRACTICE 9

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe Connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE 13

Welding:

(a) Preparation of arc welding of butt joints, lap joints and tee joints.
(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:

(a) Forming and Bending:

(b) Model making – Trays, funnels, etc.

(c) Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump

(b) Study of air conditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example Exercise – Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL and ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 10

1. Residential house wiring using switches, fuse, indicator, lamp and energymeter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power and power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 13

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

		L	T	P	C
12F2Z1	**TECHNICAL ENGLISH-II**	**3**	**1**	**0**	**4**

AIM

- To Build Vocabularies for an effective communication
- To know the mechanics of Writing for various Situations
- To obtain excellence in Oral Communication
- To Know the basics of Presentation Techniques
- To improve listening skill with all types of audio script.

UNIT I READING 12

Intensive reading and predicting content, Reading and interpretation, Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and

factual description) – Reading comprehension exercises with texts including graphic communication– Exercises in interpreting non-verbal communication-Reading comprehension exercises with critical questions, multiple choice, Reading comprehension exercises with analytical questions on content – Evaluation of content questions

UNIT II WRITING 12

Writing a Report-Writing a Proposal-Writing a Feasibility Report-Writing Situational Report- Memo-Writing Agenda -Writing Minutes -Writing Manuals-Writing Thesis statements-Writing Recommendation, Checklist, Instruction-Writing Statement of Purpose-Writing Letter of Recommendation-Writing Statement of the Problem-Transcoding Flow Chart, Pie Chart, Bar Diagram, Line Graph.

UNIT III LISTENING 12

Listening to gather Information- Listening to stories- Listening to a conversations/Interviews Listening to a News Report- Listening to a famous speeches, ceremonial speech, awareness programme and technical presentation- Intensive Listening to find exact information-Listening for gist-Listening to identify expressions used in Discussions-Listening to identify tonal Variations in Speeches

UNIT IV SPEAKING 12

Talking about General Contents, localities, home town, ambition in life, Future plan- Introducing others-Describing/Introducing function of a product/ machine, talking about pros and cons of the product-Communication for the Mass-Welcome Address, Special Address, Presidential Address, Vote of thanks -Speaking with good Pronunciation-Famous quotes, speeches- Public Speech-Speaking on the General Topic-Appropriate Communication-Answering to the Question, adding valuable points to the discussion, giving an appropriate reply, appropriate vocabulary according to the audience-Giving a specific information about Statistics used in Bar diagram, Pie Chart -Role-Play-Hr and applicant, Purchase Manager and Customer, Industrialist- Reporter, Employer- Employee, Managing Director-HR

UNIT V FOCUS ON LANGUAGE 12

Synonym-Antonym- Homonym-Tenses-Phrasal Verbs- Acronym- Abbreviations-Foreign words-Confusing Words-Analogy- Numerical Expressions- Purpose Statement- Error Corrections-Direct andIndirect Speech.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Department of Humanities and Social Sciences, Anna University, '*English for Engineers and Technologists*' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.

REFERENCES

1. Sharan J.Genrson and Steven M.Gerson – "Technical Writing – Process and Product" – Pearson Education – 2000.
2. Raymond V.Lesikar, John D. Pettit and Mary E.Flatley – Lesikass BasicCommunication Tata McGraw Will 8th Edition – 1999.
3. Stevel. E. Pauley, Daniel G.Riordan – Technical Report Writing Today – AITBS Publishing and Distributors, India 5th edition – 2000.
4. Robert L.Shurter, Effective letters in business Third Ed. 1983.
5. Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
6. CambridgeBECPreliminary1:PracticeTestsfromtheUniversityof CambridgeLocalExaminations Syndicate, University of Cambridge Local Examinations Syndicate, PB, ISBN: 9780521753012.
7. CambridgeBECPreliminary2Student'sBookwithAnswers: ExaminationpapersfromUniversityof CambridgeESOL Examinations, Cambridge ESOL, PB, ISBN: 9780521544504

12F2Z2	ENGINEERING MATHEMATICS – II	L	T	P	C
		3	1	0	4

UNIT I LAPLACE TRANSFORM 9+3

Laplace transform – Conditions for existence – Transform of elementary functions –Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions. Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT II VECTOR CALCULUS 9+3

Gradient , Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT III ANALYTIC FUNCTIONS 9+3

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy–Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3

Statement and application of cauchy's theorem and Cauchy's integral formula, Taylor and Laurent expansion, Singularities, Classification, Residues, Cauchy's residue theorem, Contour integration, Unit circle and semi-circular contours (excluding poles on real axis)

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

TOTAL: 60 PERIODS

TEXT BOOKS

1. B.S. Grewal,'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi,2005.
2. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001.

REFERENCES

1. Greenberg, M.D. Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman. M.K., "Engineering Mathematics", Volume I and II Revised enlarged Fourth Edition The National ?Publishing Cpompany,Chennai,2004.
3. Veerarajan.T "Engineering Mathematics", Fourth Edition, Tata McGraw – hill publishing company Ltd,New Delhi,2005.

12F2Z3	ENGINEERING PHYSICS – II	L	T	P	C
		3	0	0	3

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level

with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives. Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V MODERN ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA.

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.

Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Charles Kittel ‘ Introduction to Solid State Physics’, John Wiley and sons, 7 edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, ’Introduction to Nanotechnology’, Wiley India(2007) (for Unit V)
3. K.Rajagopal , “Engineering Physics” Prentice Hall of India Pvt. Ltd. New Delhi , 2007

REFERENCES

1. Rajendran, V, and Marikani A, ‘Materials science’ Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. ‘Materials science’, R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, ‘Materials science’, Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, ‘Materials Science’ Anuradha publications, Kumbakonam, (2006).

		L	T	P	C
12F2Z4	**ENGINEERING CHEMISTRY – II**	**3**	**0**	**0**	**3**

AIM

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches .

OBJECTIVES

- The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
- Principles of corrosion control.

- Chemistry of Fuels and combustion
- Industrial importance of Phase rule and alloys
- Analytical techniques and their importance.

UNIT I ELECTROCHEMISTRY 9

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode - Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe^{2+} vs dichromate and precipitation – Ag+ vs CI- titrations) and conduct metric titrations (acid-base – HCI vs, NaOH) titrations

UNIT II CORROSION AND CORROSION CONTROL 9

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating

UNIT III FUELS AND COMBUSTION 9

Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV PHASE RULE AND ALLOYS 9

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V ANALYTICAL TECHNIQUES 9

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co.,New Delhi (2002).
2. Dr.A.Ravikrishnan, "Engineering Chemistry" Sri Krishna Publications, Chennai. (2002)
3. S.S.Dara "A text book of Engineering Chemistry" S.Chand and Co.Ltd., New Delhi (2006).

REFERENCES

1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub. Co. Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

12F2Y5	ENGINEERING MECHANICS	L	T	P	C
		3	1	0	4

OBJECTIVES

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.

UNIT I BASICS & STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia.

Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).

REFERENCES

1. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
3. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, (2001).

4. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
5. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).

12F2Y6	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	1	0	4

UNIT I ELECTRICAL CIRCUITS and MEASUREMENTS 12

Ohm's Law – Kirchhoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Wattmeters and Energy meters.

UNIT II ELECTRICAL MACHINES 12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre

TOTAL: 60 PERIODS

TEXT BOOKS

1. N. Mittle "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, "Applied Electronics" S. Chand and Co., 2006.

REFERENCES

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
3. Mehta V K, "Principles of Electronics", S. Chand and Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).
5. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, (2003).

12F2Z7	PHYSICS LABORATORY-II	L	T	P	C
		0	0	3	2

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – uniform bending.
2. Determination of viscosity of liquid – Poiseuille's method.
3. Determination of wavelength of mercury spectrum- Spectrometer Grating.
4. Torsional pendulum – Determination of rigidity modulus.

5. Determination of Band Gap of a semiconductor material.
6. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.

A minimum of FIVE experiments shall be offered.

12F2Z7	CHEMISTRY LABORATORY – II	L	T	P	C
		0	0	3	2

LIST OF EXPERIMENTS

1. Estimation of chloride ion in water sample by Argentometric method.
2. Conductometric titration of strong acid vs strong base.
3. Conductometric precipitation titration.
4. Conductometric titration of mixture of acids.
5. Estimation of alkalinity of water sample.

REFERENCE:

1. Text book of Quantitative Inorganic Analysis, A.I. Vogel, ELBS, London.
2. A. Ravikrishnan,"Practical Engineering Chemistry", Sri Krishna Publications, Chennai (2002)

12F2X7	COMPUTER AIDED DRAFTING AND MODELING LABORATORY	L	T	P	C
		0	0	3	2

LIST OF EXPERIMENTS

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3D models of simple objects and obtaining 2D multi-view drawings from 3D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 Nos.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 Nos.

TOTAL: 45 PERIODS

12F2Z8 COMPUTER PRACTICE LABORATORY-II

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. Study of Unix OS
2. Basic Commands in Unix

Shell Programs

1. Simple Shell Programs
2. Script using for Loop
3. Script using if loop
4. Script using combination of for and if loop
5. Script using while and until loop
6. Script using combination of while and if loop
7. Script using Switch case
8. String Manipulation
9. File manipulation

C-Programs

1. Function with no arguments and no return type
2. Function with no arguments and return type
3. Function with arguments and no return type
4. Function with arguments and return type
5. Call by value
6. Call by reference
7. Recursion function
8. Pointers
9. Random access functions in files
10. File handling

12MA31 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS
(Common to all B.E. / B.Tech Degree Programmes)

L	T	P	C
3	1	0	4

AIM

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES

- To develop the skills of the students in the areas of Transforms and Partial Differential Equations.
- To know the necessary for their effective studies in a large number of engineering subjects like Signals & Systems, Digital signal Processing ,Communication systems, and Electromagnetic theory.
- To serve as a prerequisite for post graduate and specialized studies and research.

UNIT I FOURIER SERIES **12**

Dirichlet's Conditions – General Fourier Series –Odd and even functions- Half range Sine and Cosine series – Complex form of Fourier Series - Parseval's Identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORMS 12

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z-transform.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Grewal, B.S, "Higher Engineering Mathematics", 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCE BOOKS

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematic", 7th Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company Ltd, New Delhi (2007).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education(2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, Wiley India (2007).

12BT31 PRINCIPLES OF CHEMICAL ENGINEERING

L	T	P	C
3	1	0	4

AIM

The course aims to develop skills of the Students in the area of Chemical Engineering with emphasis in Thermodynamics fluid mechanics. This will be necessary for certain other course offered in the subsequent semesters and will serve as a prerequisite.

OBJECTIVES

- To understand the basic mechanisms of chemical reaction
- To correlate the chemical reaction with biological reaction
- To introduce them prerequisite for biological process.

UNIT I OVERVIEW OF PROCESS INDUSTRY 11

Mass and energy conservation; process automation; environment; SI units; conservation factors; applied mathematics for experimental curve fitting; numerical differentiation; integration.

UNIT II MATERIAL BALANCES 13

Overall and component balances; material balances without and with chemical reactions; degrees of freedom; steady and unsteady state; unit operations; recycle and bypass; humidity calculations.

UNIT III FIRST AND SECOND LAWS OF THERMODYNAMICS 12

Energy balances; sensible heat, latent heat; vapour pressure; steady and unsteady state calculations.

UNIT IV FLUID MECHANICS 13

Fluids; fluid statics and applications in chemical engineering; fluid flow; laminar; turbulent pressure drops; compressible fluid flow concepts; multiphase flow concepts.

UNIT V FLOW THROUGH PACKED COLUMNS 11

Fluidization; centrifugal and piston pumps; characteristics; compressors; work**.**

TOTAL: 60 PERIODS

TEXT BOOKS

1. Bhatt B.I.,VoraS.M.Stoichiometry.3rdEdition.TataMcGraw-Hill,1977.
2. McCabeW.L.,SmithJ.C,HarriotP."UnitOperationsInChemicalEngineering",5th Edition, McGraw-Hill Inc.,1993.

12GE31 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

AIM

The aim of this course is to create awareness in every engineering graduate about the important of environment, the effect of technology on the environment and ecological balance and make him/her sensitive to the environment problems in every Professional endeavor that he/she participates.

OBJECTIVES

At the end of this course the student is expected to understand,

- What constitutes the environment, what are precious resources in the environment, how to conserve these resources,
- The role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.
- The role of government and non-government organization in environment managements.

UNIT I ENVIRONMENT,ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment–need for public awareness-concept of an ecosystem–structure and function of an ecosystem–producers, consumers and decomposers –energy flow in the ecosystem–ecological succession–food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a)forest ecosystem (b)grassland ecosystem (c)desert ecosystem (d)aquaticecosystems(ponds,streams,lakes,rivers,oceans,estuaries)– Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographically classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values–Biodiversityatglobal,nationalandlocallevels–Indiaasamega-diversitynation–hot-spots of biodiversity– threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India–conservation of biodiversity: In-situ and ex- situ conservation of biodiversity. Field study of common plants, insects, birds. Field study of simple ecosystems–pond, river, hillslopes, etc

UNIT II ENVIRONMENTAL POLLUTION 8

Definition–causes, effects and control measures of: (a)Air pollution (b) Water pollution (c)Soil pollution (d)Marine pollution (e)Noise pollution (f)Thermal pollution (g)Nuclear hazards–soil waste management: causes, effects and control measures of municipal solid wastes–role of an individual in prevention of pollution–pollution case studies– disaster management: floods, earthquake, cyclone and

landslides.Field study of local polluted site–Urban/Rural /Industrial /Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies–Food resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies–Energy resources: Growing energy needs, renewable and non -renewable energy sources, use of alternate energy sources. case studies– Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification–role of an individual in conservation of natural resources– Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets–river/forest/grassland/ hill /mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development–urban problems related to energy– water conservation, rainwater harvesting, water shed management–resettlement and rehabilitation of people; its problems and concerns, case studies – role of non- governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.–waste land reclamation–consumerism and waste products– environment protection act–Air (Prevention and Control of Pollution)act–Water (Prevention and control of Pollution)act–Wild life protection act–Forest conservation act–enforcement machinery involved in environmental legislation-central and state pollution control boards-Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations–population explosion–family welfare programme–environment and human health–human rights–value education–HIV/ AIDS– women and child welfare–role of information technology in environment and human health–Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS

1. BennyJoseph,'Environmental Science and Engineering',Tata McGraw-Hill, New Delhi, (2006).
2. P.Meenakshi, " Elements of Environmental science and Engineering", Prientice Hall of India, 2nd Edition.
3. Anubha Kaushik and C.P.Kaushik, 'Environmental Science and Engineering', 3rd Edition New age International Publishers, New Delhi 2008

REFERENCES

1. R.K.Trivedi,'Handbook of Environmental Laws,Rules,Guidelines,Compliances and Standards' ,Vol.IandII, EnviroMedia.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science',2nd edition, Pearson Education (2004).
3. Cunningham,W.P.Cooper,T.H.Gorhani,'Environmental Encyclopedia', Jaico Publ.,House, Mumbai, 2001.
4. Dharmendra S.Sengar, 'Environmental law', Prentice hall of India PVT LTD, NewDelhi,2007.
5. Rajagopalan, R, 'Environmental Studies-From Crisisto Cure', Oxford University Press(2005).

12BT32 **CELL BIOLOGY** **L T P C**
3 0 0 3

AIM

The course aims to develop skills of the Students in the area of Cell Biology and Cell Signalling pathways. This will be necessary for studies in course like Microbiology, Molecular course is also a prerequisite for other Biology,etc. This course offered in the subsequent semesters.

OBJECTIVES

- To know the basic of biological system prerequisite for post graduate and other course.
- To understand the mechanism of cell multiplication and formation of life.
- To ensure students have a strong groundings in cell culture techniques.

UNIT I CELL STRUCTURE AND FUNCTION OF THE ORGANELLES 9

Eukaryotic and prokaryotic cells, principles of membrane organisation, membrane proteins, cytoskeletal proteins, types of cell division, mitosis &meiosis, extracellular matrix, cell cycle and molecules that control cell cycle.

UNIT II TRANSPORT ACROSS CELL MEMBRANES 9

Passive & active transport, permeases, sodium potassium pump, Ca^{2+}ATPase pumps, lysosomal and vacuolar membrane ATP dependent proton pumps, cotransport symport, antiport, transport into prokaryotic cells, endocytosis and exocytosis. Entry of viruses and toxins into cells.

UNIT III RECEPTORS AND MODELS OF EXTRACELLULAR SIGNALLING 9

Cytosolic, nuclear and membrane bound receptors, examples of receptors, autocrine, paracrine and endocrine models of action, quantitation and characterization of receptors.

UNIT IV SIGNAL TRANSDUCTION 9

Signal amplification, different models of signal amplifications, cyclic amp, role of inositol phosphates as messengers, biosynthesis of inositol triphosphates, cyclic GMP and g proteins, role in signal transduction, calcium ion flux and its role in cell signaling, current models of signal amplification, phosphorylation of proteinkinases, regulation of protein kinases, serine–threonine kinases, tumor necrosis factor receptor families.

UNIT V CELL CULTURE 9

Techniques for the propagation of eukaryotic and prokaryotic cells. Cell line, generation of cell lines, maintenance of stock cells, characterization of cells, immunochemistry, morphological analysis techniques,in cell culture, ex-plant cultures primary cultures, contamination, differentiation, three dimensional cultures, role of matrix in cell growth.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Darnell J, LodishH,BaltimoreD,"Molecular CellBiology",W.H.Freeman;
2. Kimball T.W.,"Cell Biology",WesleyPublishers;

REFERENCES

1. DeRobertis&De Robertis,"Cell Biology".
JamesD.Watson,"Molecular Biologyofthe Cell".

12BT33 **BIOORGANIC CHEMISTRY** **L T P C**
3 0 0 3

AIM

The course aims to develop skills of Students in the area of Organic Chemistry and its applications in Biology. This will be a prerequisite to courses like Molecular Modelling, Bioseparationsetc.

OBJECTIVES

- To understand enzyme reaction and kinetics.
- To provide basic knowledge on immobilization techniques and their applications.
- To support various metabolic and physiological process.

UNIT I INTRODUCTION TO ENZYMES 9

Classification of enzymes. Mechanisms of enzyme action; concept of activesite and energetics of enzyme substrate complex formation; specificity of enzyme action; Stereochemistry–R,Snotation–re-sifaces–e,zisomerism-conformers-ethane–cyclopean-reactivates mechanisms of sn1 sn2 reactions, e1 e2 reactions–ester formation and hydrolysis, reaction rates -hammond's postulate–h/deffects. Catalysis– general acid–base and covalent catalysis.

UNIT II KINETICS OF ENZYME ACTION 9

Allosteric regulation of enzymes, Monod changeux wyman model, ph and temperature effect on enzymes &deactivation kinetics - Stereospecific enzymatic reactions – Stereochemistry of nucleophilic reactions–chiral methyl group–chiral phosphate.

UNIT III ENZYME IMMOBILIZATION & CASE STUDIES OF ENZYME STRUCTURE AND MECHANISM 9

Physical and chemical techniques for enzyme immobilization – adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding etc.,-examples, advantages and disadvantages. Case studies include dehydrogenases, proteases–-lysozyme- stability of proteins

UNIT IV KINETICS OF PROTEIN FOLDING 9

Kinetics of single substrate reactions; estimation of Michelis–Menten parameters, multi substrate reactions-mechanisms and kinetics; turn over number; types of inhibition & models–substrate, product-folding of peptides.

UNIT V FOLDING PATHWAYS & ENERGY LANDSCAPES 9

Folding of ci2 – nucleation condensation mechanism – folding of barnase – time resolution–insights from theory–optimization off folding rates– molecular chaperones. Production and purification of crude enzyme extracts from plant, animal and microbial sources; methods of characterization of enzymes; development of enzymatic assays

TOTAL: 45 PERIODS

TEXT BOOKS

1. Harvey W. Blanch, Douglas S. Clark, “Biochemical Engineering”, Marcel Dekker, Inc.
2. James M. Lee, “Biochemical Engineering”, PHI, USA.

REFERENCES

1. Structure and Mechanism In Protein Science: A Guide To Enzyme Catalysis and Protein Folding; A.R. Fersht, W.H. Freeman, 1999.
2. Bioorganic Chemistry; H.Dugas, Springer Verlag,1999.
3. James. E. Bailey &David F. Ollis, “Biochemical Engineering Fundamentals”, McGraw-Hill.
4. Wiseman, “Enzyme Biotechnology”, Ellis Horwood Pub.

12BT34 **BIOCHEMISTRY - I** **L T P C**
3 0 0 3

AIM

To enable students learn the basic fundamental of biochemical Processes.

OBJECTIVES

- To ensure students have a strong grounding in structures and reactions of biomolecules.
- To introduce the metabolic pathway of the major bimolecular and relevance to clinical conductors.
- To correlate biochemical processes with biotechnology applications.

UNIT I INTRODUCTION TO BIOMOLECULES 5

Basic principles of organic chemistry, types of functional groups, biomolecules, chemical nature, water, pH and biological buffers.

UNIT II STRUCTURE AND PROPERTIES 15

Structure and properties of Important Biomolecules.

Carbohydrates (mono, di, oligo &polysaccharides) Proteoglycans, glucosaminoglycans. Mutarotation, glycosidic bond, reactions of monosaccharides, reducingsugars.

Lipids: fattyacids, glycerol, saponification, iodination, hydrogenation, phospholipids, glycolipids, sphingolipids, cholesterolsteroids, prostaglandins. Amino Acids, Peptides, Proteins, measurement, structures, hierarchy of organization primary, secondary, tertiary and quaternary structures, glycoproteins, lipoproteins. Determine of primary structure.

Nucleic acids: purines, pyrimidines, nucleoside, nucleotide, RNA, DNA, reactions, properties, measurement, nucleoprotein complexes.

UNIT III METABOLISM CONCEPTS 5

Functions of Proteins, Enzymes, introduction to biocatalysts, metabolic pathways, primary and secondary metabolites.

UNIT IV INTERMEDIARY METABOLISM AND REGULATION 15

Glycolysis, TCAcycle, gluconeogenesis, pentosephosphateshunt, glyoxalate shunt, fattyacid synthesis and oxidation, reactions of amino acids, deamination, transamination and decarboxylation, urea cycle, interconnection of pathways and metabolic regulation. Case study on overproduction of glutamic acid, threonine, lysine, methionine, isoleucine and ethanol.

UNIT V BIOENERGETICS 5

High energy compounds, electro negative potential of compounds, respiratory chain, ATP cycle, calculation of ATP yield during oxidation of glucose and fatty acid

TOTAL: 45 PERIODS

TEXT BOOKS

1. Nelson, D.L .andM.M.Cox,"Lehninger'sPrinciplesofBiochemsitry",4th Edition, W.H. Freemen&Co.,2005.
2. Stryer,L.,"Biochemsitry",4th Edition,W.H,Freeman&Co.,2000.
3. Voet,D. and Voet,J.G. ,"Biochemistry", 3rd Edition, JohnWiley & SonsInc., 2004.
4. Murray, R.K.,etal"Harper'sBiochemistry",23rd Edition,PrenticeHallInternational,1993.

12BT35 **CELL BIOLOGY LABORATORY** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS

1. Introduction to principles of sterile techniques and cell propagation
2. Principles of microscopy, phase contrast and fluorescent microscopy
3. Identification of given plant, animal and bacterial cells and their components by microscopy
4. Leishman Staining
5. Micrometry
6. Giemsa Staining
7. Separation of Peripheral Blood Mononuclear Cells from blood
8. Osmosis and Tonicity
9. Tryphan Blue Assay
10. Staining for different stages of mitosis in Allium Cepa (Onion)
11. Staining and observation of meiosis in testes of the grasshopper

12BT36 **BIOORGANIC CHEMISTRY LABORATORY** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS

1. Synthesis of aspirin
2. Hydrolysis of sucrose
3. Preparation of pyruvic acid.
4. Isolation of lycopene from tomato paste
5. Preparation of L-proline
6. Preparation of L-cysteine from hair
7. Screening and Isolation of enzyme
8. Effect of p^H, Temperature, Substrate on Invertase enzyme activity.
9. Protease assay study on Casein isolated from milk.
10. Enzyme Inhibition kinetics.
11. Cell and Enzyme immobilization.

12BT37 **BIOCHEMISTRY LABORATORY** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS

1. Demonstration of use of volume and weight measurements devices.
2. Titration of weak acid-weak base.
3. Quantitative Test for carbohydrates.
4. Distinguish reducing and non reducing sugars.
5. Using ninhydrin for distinguishing Imino and amino acids .
6. Protein estimation by Biuret method.
7. Protein estimation by Lowry's method.
8. Protein estimation by Bradford colorimetric methods.
9. Extraction of lipids and analysis by TLC.
10. Estimation of nucleic acid by absorbance at 260nm and hyper chromicity.
11. Enzymatic assay of phosphatase.
12. Hydrolysis of starch by an enzyme

12HS31 **PROFESSIONAL ENGLISH-I** **L T P C**
0 0 3 1

LIST OF EXPERIMENTS

A. Language & Grammar **2**

1. Use of Verb,Article,Adjectives,Adverbs,Preposition,Conjunction,Comparative Superlative,
2. Noun –Antecedent & Precedent
3. Spelling &Punctuation
4. Concord
5. Use of Active & Passive voice
6. Use of Conditional Sentence & Reported speech

B. Reading **4**

1 Reading technical reports for Gist
2 Reading Technical Article, Graphs, Charts, Adverts, Notices & Proposals for Structure and detail

C. Writing **3**

1. Writing E-mails for giving Instruction/ Summarizing/Persuading/Giving assurance/asking a comment
2. Writing an Introduction to Report/Proposal/Technical Description
3. Writing Instructions & Recommendations for User manuals/Equipments/devices/New Inventions
4.

D. Listening **3**

1 Listening to Technical News for Gist
2 Listening to Technical Interviews for gathering information
3 Listening to a Presentation for inferring meaning

E. Speaking **6**

1 Self-Introduction
2 Have your say- Recent gadgets/Technical Innovations/ Scientific Inventions

12BT41 **GENETICS** **L T P C**
3 0 0 3

AIM

To enable students learn the basic fundamental of genetics

OBJECTIVES

- To understand the basic of character transmission, segregation and expression.
- To introduce them prerequisite for genetic engineering.

To analyze the role of genes and mutation

UNIT I MENDELIAN GENETICS **9**

Mendels experiment and principle of segregation, monohybrid crosses – dominance, recessiveness, codominance, semi dominance and lethals; principle of independent assortment – dihybrid crosses, multiple alleles – ABO blood type and Rh factor alleles.

UNIT II SEX DETERMINATION **9**

Linkage, crossing over and chromosomal mapping, Mechanism of sex determination, sex differentiation, sex linked inheritance, linkage, crossing over and chromosomal mapping.

UNIT III GENETIC MATERIAL AND GENETIC TRANSFER 9

Identification of genetic material by Hersey & Chase, Avery, Mcleod and Fraenkel - Singer experiments; chromosome structure in prokaryotes and eukaryotes, recombination in bacteria - transformation, transduction and conjugation.

UNIT IV MUTATION AND CHROMOSOMAL INHERITANCE 9

Mutations - spontaneous, physical and induced; applications of mutation, organization of DNA in mitochondria and plastids, cytoplasmic male sterility in plants.

UNIT V POPULATION AND EVOLUTIONARY GENETICS 9

Genetic variation, random mating and Hardy-Weinberg method, inbreeding, out breeding and assortative mating, genetic equilibrium and evolutionary genetics.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Gardner, E.J. Simmons M.J and.Snustad. D.P, Principles of Genetics 8 ed., John Wiley, 2006.

REFERENCES

1. Robert H. Tamarin, "Principles of Genetics" 7 ed., Tata McGraw Hill, 2002.
2. Daniel L., Hartl and Elizabeth W. "Essential Genetics" Jones, 3 ed., Jones and Bartlett publishers, Massachusetts, 2002.

12BT42 UNIT OPERATIONS L T P C
3 0 0 3

AIM

The course aims to develop skills of the Students in area of unit operations. This course will be a prerequisite for certain engineering subjects offered in the subsequent semesters.

OBJECTIVES

- To develop skills of the Students in area of unit operations involved in various biological process.
- To correlate the mechanical unit with biological unit
- To understand various convection and transfer factors

UNIT I MIXING AND AGITATION 8

Dimensional analysis; power for agitation; agitation of liquids; gas-liquid systems; gas- solid suspensions; agitator scale up.

UNIT II FILTRATION 8

Constant pressure, constant volume batch filtration; continuous filtration; industrial filters; settling and sedimentation; centrifugation.

UNIT III MECHANISM OF HEAT TRANSFER 10

Steady state conduction; combined resistances; unsteady state conduction; lumped heat capacity; extended surfaces; combined conduction and convection.

UNIT IV CONVECTION HEAT TRANSFER 10

Dimensional analysis; forced and natural convection; convection in flow over surfaces through pipes boiling and condensation.

UNIT V HEAT EXCHANGERS 12

Equipments; over all heat transfer coefficients; design of heat exchangers; NTU concept; evaporators; single and multiple effects; mass and enthalpy balances.

TOTAL: 45PERIODS

TEXT BOOKS

1. GeankoplisC.J. "Transport Processes And Unit Operations" Prentice Hall India.2002.
2. McCabe W.L. Smith J.C. "Unit Operations in Chemical Engineering" 5th Edition McGraw Hill. 1993.

REFERENCES

1. Incropera F.P. Fundamentals Of Heat And Mass Transfer. John Wiley. 1998

12MA45	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

AIM

To develop skills on experimental possibilities and statistical analysis..

OBJECTIVES

At the end of the course, the students would

- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Be introduced to the notion of sampling distributions and have acquired knowledge of statistical techniques useful in making rational decision in management problems.
- Be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.

UNIT I RANDOM VARIABLES 12

Discrete and continuous random variables-Properties-Moments-Moment generating functions and their properties. Binomial, Poisson, Geometric, Negative binomial, Uniform, Exponential, Gamma, and Weibull distributions.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions-Marginal and conditional distributions–Covariance-Correlation and Regression – function of a random variable-Transformation of random variables – Central limit theorem.

UNIT III TESTING OF HYPOTHESIS 12

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal , t, Chi-square and F distributions-Tests for independence of attributes and Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS 12

Analysis of variance–One way classification–CRD-Two–way classification–RBD- Latin square.

UNIT V RELIABILTY AND QUALITY CONTROL 12

Concepts of reliability-hazard functions-Reliability of series and parallel systems-control charts for measurements (x and R charts)–control charts for attributes (p, c and np charts)

TOTAL: 60 PERIODS

TEXT BOOKS

1. J. S.Milton and J.C.Arnold, "Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, 2007.(Forunits1and2)
2. R.A.JohnsonandC.B.Gupta,"MillerandFreund'sProbabilityandStatisticsfor Engineers", PearsonEducation,Asia,7thedition,(2007)

REFERENCES

1. Walpole,R.E.,Myers,R.H.MyersR.S.L.andYe.K,"ProbabilityandStatistics for Engineers And Scientists", Seventh Edition, Pearsons Education, Delhi,2002.
2. Navidi,W,"Statistics for Engineers and Scientists",Special Indian Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi,2008.
3. Spiegel M.R, Schiller J and Alu Srinivasan R,"Schaum's Outlines Probability and Statistics", Tata McGraw-Hill Publishing Company Ltd. New Delhi, 2007.

12BT43 CHEMICAL ENGINEERING AND THERMODYNAMICS L T P C
3 1 0 4

AIM

The course aims to expose the students to the area of chemical thermodynamics. This will serve as a prerequisite for courses like enzyme engineering, Mass transfer, etc.

OBJECTIVES

- To understand the various law of thermodynamics involving in biological process.
- To correlate chemical thermodynamics with biological thermodynamics.
- To equip the students for engineering design.

UNIT I THERMODYNAMIC PROPERTIES OF FLUIDS 12

Volumetric properties of fluids exhibiting non ideal behavior; residual properties; estimation of thermodynamic properties using equations of state; calculations involving actual property exchanges; Maxwell's relations and applications.

UNIT II SOLUTION THERMODYNAMICS 12

Partial molar properties; concepts of chemical potential and fugacity; ideal and non-ideal solutions; concepts and applications of excess properties of mixtures; activity coefficient; composition models; Gibbs Duhem equation.

UNIT III PHASE EQUILIBRIA 12

Criteria for phase equilibria; v-l-e calculations for binary and multi component systems; liquid-liquid equilibria and solid-solid equilibria.

UNIT IV CHEMICAL REACTION EQUILIBRIA 12

Equilibrium criteria for homogeneous chemical reactions; evaluation of equilibrium constant; effect of temperature and pressure on equilibrium constant; calculation of equilibrium conversion and yields for single and multiple reactions.

UNIT V THERMODYNAMIC ANALYSIS OF PROCESSES 12

Concept of lost work; entropy generation; calculation of real irreversible processes; power cycle; liquefaction.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Smith J.M., VanNess H.C., Abbot M.M. Chemical Engineering Thermodynamics. 6th Edition. McGraw-Hill, 2001.
2. Narayanan K.V. "A Text Book Of Chemical Engineering Thermodynamics" ,Prentice Hall India, 2001.

REFERENCES

1. Sandler S.I. "ChemicalAndEngineeringThermodynamics"JohnWiley,1989

12BT44 INSTRUMENTAL METHODS OF ANALYSIS L T P C
3 0 0 3

AIM

The course aims to develop the skills of the students in the area of Instrumentation in Biotechnology. This will be prerequisite for understanding specialized courses & project work that will be offered in the subsequent semesters.

OBJECTIVES

- To understand the principles of measurements and instrumental methods.
- Providing experimental explanation to understand the mechanism of process.
- To ensure students have a strong background in instrumentation techniques.

UNIT I BASICS OF MEASUREMENT 8

Classification of methods–calibration of instrumental methods–electrical components and circuits–signal to noise ratio–signal–noise enhancement.

UNIT II OPTICAL METHODS 8

General design–sources of radiation–wavelength selectors–sample containers–radiation transducers–types of optical instruments–Fourier transform measurements.

UNIT III MOLECULAR SPECTROSCOPY 10

Measurement of transmittance and absorbance – beer's law – spectrophotometer analysis –qualitative and quantitative absorption measurements -types of spectrometers– UV–visible–IR – Raman spectroscopy–instrumentation–theory.

UNIT IV THERMAL METHODS 7

Thermo-gravimetric methods – differential thermal analysis – differential scanning calorimetry

UNIT V SEPARATION METHODS 12

Introduction to chromatography–models–ideal separation–retention parameters– van–deemter equation–gas chromatography–stationary phases–detectors–kovats indices–HPLC–pumps–columns–detectors–ion exchange chromatography–size exclusion chromatography–supercritical chromatography–capillary electrophoresis

TOTAL: 45 PERIODS

TEXT BOOKS

1. Instrumental Methods of Analysis; Willard and H. Merrit, Phi,1999.
2. Instrumental Methods of Analysis, D. Skoog, 2000.

12BT45 MICROBIOLOGY L T P C
3 0 0 3

AIM

The course aims to develop skills of the Students in the area of Microbiology particularly to identify microbes, their structure, their metabolism and their industrial applications. This will be a prerequisite for all courses offered in Bioprocess Technology.

OBJECTIVES

- To know the microbial classification, characterization and their applications.
- To understand the role of microbes in industrial biotechnology.
- Students got exposure in microbial culture and contaminations.

UNIT I INTRODUCTION 8

Basic of microbial existence; history of microbiology, classification and nomenclature of microorganism, microscopic examination of microorganisms, light and electron microscopy; principles of different staining techniques like gram staining, acid fast, capsular staining, flagellar staining.

UNIT II MICROBES-STRUCTURE AND MULTIPLICATION 10

Structural organization and multiplication of bacteria, viruses, algae and fungi with a special mention of life history of actinomycetes, yeast, mycoplasma and bacteriophage

UNIT III MICROBIAL NUTRITION,GROWTH AND METABOLISM 10

Nutritional requirements of bacteria and different media used for bacterial culture; growth curve and different methods to quantitative bacterial growth, aerobic and anaerobic cultivation of microbes.

UNIT IV CONTROL OF MICROORGANISMS 8

Physical and chemical control of microorganisms; host-microbe interactions; anti- bacterial, anti-fungal and anti-viral agents, mode of action and resistance to antibiotics; clinically important microorganisms.

UNIT V ENVIRONMENTAL MICROBIOLOGY 9

Preservation of food; biogas; bioremediation; leaching of ores by microorganisms; bio-fertilizers and bio-pesticides; biosensors

TOTAL: 45 PERIODS

TEXT BOOKS

1. TalaronK, Talaron A, Casita, Pelczar And Reid. Foundations In Microbiology, W.C. Brown Publishers, 1993.
2. PelczarMJ,ChanECSandKreinNR,Microbiology,TataMcGraw-HillEdition,New Delhi, India.
3. Prescott LM, Harley JP, Klein DA, Microbiology, 3rd Edition, Wm. C.Brown Publishers, 1996.

12BT46 MICROBIOLOGY LABORATORY L T P C 0 0 3 2

LIST OF EXPERIMENTS

1. Laboratory safety and sterilization techniques
2. Microscopic methods in the identification of microorganisms
3. Preparation of culture media–nutrient broth and nutrient agar
4. Culturing of microorganisms–in broth and in plates (pour plates, streak plates, isolation and preservation of bacterial cultures)
5. Staining techniques–Gram's and differential
6. Quantitation of microorganisms.
7. Effect of disinfectants on microbial flora
8. Isolation and identification of microorganisms from different sources–soil, water and milk
9. Antibiotic sensitivity assay
10. Growth curve–observation and growth characteristics of bacteria and yeast.
11. Effect of different parameters on bacterial growth (pH, temperature &UV irradiation)

12BT47 INSTRUMENTAL METHODSOFANALYSISLABORATORY L T P C 0 0 3 2

LIST OF EXPERIMENTS

1. Precision and validity in an experiment using absorption spectroscopy and Validating Lambert-Beer's law using kMnO4
2. Finding the molar absorbtivity and stoichiometry of the Fe(1,10phenanthroline)3 Using absorption spectrometry.
3. Finding the pKa of 4-nirophenol using absorption spectroscopy.
4. UV spectra of nucleic acids.

5. Estimation of Sulphate by nephelometry.
6. Estimation of AL^{+++} by flourimetry.
7. Chromatography analysis using Paper and TLC .
8. UV spectra of nucleic acids.
9. Chromotography using column.
10. UV–spectra of proteins.

12BT48 **CHEMICAL ENGINEERING LABORATORY** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS

1. Flow measurement through annular pipe
2. Flow measurement through straight pipe
3. Pressure drop in pipes and packed columns
4. Fluidization
5. Filtration
6. Heat exchanger
7. Simple and steam distillation
8. Distillation in packed column
9. Liquid-liquid equilibria in extraction
10. Adsorption equilibrium

12HS41 **PROFESSIONAL ENGLISH-II** **L T P C**
0 0 3 1

A. Reading

1. Reading Technical Articles, Reports, Proposals for gathering information
2. Reading Technical Journals, User manuals, annual reports for matching information

B. Writing

1. Writing E-mail to inform/respond/Insist/Convince/comment
2. Writing Technical Report (Format, Types, Abstract)
3. Writing Project Introduction/Website/Product
4. Writing User Manuals/Guidelines
5. Writing Product Reviews
6. Writing Useful Expressions for Persuading, Summarizing, gathering information

C. Listening

1. Listening to Telephonic conversation for filling the gaps
2. Listening to Group discussion to gather information
3. Listening to Interviews for writing short answers
4. Listening to Technical Presentation for evaluation

D. Speaking

1. Mini-Presentation on Technical Themes:
   a) Cloud computing b) 4g c) Mission to Mars
   d) Water Resource e) Sixth Sense Technology
2. Group Discussion on Social and Technical issues

12BT51 **BIOETHICS** **L T P C**
3 0 0 3

AIM

This course aims to deliver students a wide knowledge about bioethics and its need in biological system.

OBJECTIVES

- To study about various ethics analysis systems.
- To study the clinical settings in ethics related to biotechnology.
- To study the need of bioethics practice.

UNIT I HISTORY OF BIOETHICS 9

Bioethics as a discipline – philosophical reflections on experimenting with human subjects – active and passive euthanasia–culture assumption in the history of Bioethics

UNIT II METHODS OF ETHICS ANALYSIS 9

Ethical reasoning, philosophical, clinical and cultural dimensions–challenge of ethical relativism–methods of philosophical theories and principles, methods of casuistry and methods of narrative approaches–narrative & justification in ethics.

UNIT III ETHICS IN CLINICAL SETTING 9

Ethics committee (hospital)–Inner working of an ethics committee–ethics consultation training–skills &roles–Facilitating medical ethics–case studies–ethics consultation in Indian Hospital &US Hospital.

UNIT IV CULTURAL ASSUMPTION IN BIOETHICS AND BIOETHICAL METHODS 9

Western bioethics on the Navajo reservation–communication through interpreters in health care–Aafrica and American perspectives in bioethics–Gender, race and class in delivery of health care–bioethics and human rights in the global ear.

UNIT V PRACTICE OF BIOETHICS 9

Introduction–ethical topics at the beginning of life–abortion, reproductive technologies, genetics and reproduction – ethical topics at the end of life – with holding and with drawing medical treatment–advance care planning and surrogate decision making – euthanasia and physician assisted suicide.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Bioethics, second edition, Nancy S. Jecker, Albert R. Jonsen, Robert A, Pearlman.

12BT52 **BASIC INDUSTRIALBIOTECHNOLOGY** **L T P C**
3 0 0 3

AIM

This course aims to develop the skills of the students in the area of important bio products and its production protocol.

OBJECTIVES

- To know the basic industrial fermentation process.
- To study the industrially important products produced from microbes
- To study the various production protocols of primary and secondary metabolites.

UNIT I INTRODUCTION TO INDUSTRIAL BIOPROCESS 9

A historical overview of industrial fermentation process – traditional and modern biotechnology. A

brief survey of organisms, processes, products relating to modern biotechnology. Process flow sheeting–block diagrams, pictorial representation

UNIT II PRODUCTION OF PRIMARY METABOLITES 9

A brief outline of processes for the production of some commercially important organic acids (e.g. citric acid, lactic acid, acetic acid etc.,); amino acids (glutamic acid, phenyalanine, aspartic acid etc.,) and alcohols (ethanol, butanol etc.,)

UNIT III PRODUCTION OF SECONDARY METABOLITES 9

Study of production processes for various classes of secondary metabolites: antibiotics: beta-lactams (penicillin, cephalosporin etc.), aminoglycosides (streptomycin etc.,) macrolides (erythromycin), vitamins and steroids.

UNIT IV PRODUCTION OF ENZYMES AND OTHER BIOPRODUCTS 9

Production of industrial enzymes such as proteases, amylases, lipases, cellulases etc., Production of biopesticides, biofertilisers, biopreservatives (Nisin), cheese, biopolymers (xanthangum, PHB etc.,), single cell protein.

UNIT V PRODUCTION MODERN BIOTECHNOLOGY PRODUCTS 9

Production of recombinant proteins having therapeutic and diagnostic applications, production of vaccines. Production of monoclonal antibodies. Products of plant and animal cell culture.

TOTAL: 45 PERIODS

TEXT BOOKS

1. CasidaJr, L.E., "Industrial Microbiology", New Age International (P) Ltd.
2. Presscott, Dunn, "Industrial Microbiology", Agrobios (India).

REFERENCES

1. Wulf Cruger and Anneliese Crueger, "Biotechnology: A Textbook of Industrial Microbiology", Panima Publishing Corporation.
2. Murrey Moo & Young, "Comprehensive Biotechnology", Pergamon

12BT53 BIOINFORMATICS

L	T	P	C
3	0	0	3

AIM

This course aims to develop the skills of the students in Bioinformatics. This is a pre-requisite for certain elective courses offered in the subsequent semesters & for project work.

OBJECTIVES

At the end of this course, the students would have learnt about tools used in Bioinformatics & how to use them. This will facilitate the students to undertake projects in the modern biology.

UNIT I INTRODUCTION 9

Basic UNIX commands–telnet–ftp–protocols–hardware–topology-search engines –search algorithms– Perl programming.

UNIT II DATABASES 9

Data management – data life cycle – database technology – interfaces and implementation– biological databases and their uses.

UNIT III PATTERNMATCHING & MACHINE LEARNING 9

Pairwise sequence alignment–local vs. global alignment–multiple sequence alignment – dot matrix analysis – substitution matrices – dynamic programming – bayesian Methods – tools – BLAST – FASTA – machine learning–neural networks–statistical methods–Hidden Markov models– Homology Modeling.

UNIT IV PHYLOGENY 9

Introduction; mutations; irrelevant mutations; controls; mutations as a measure of time; distances; reconstruction; distances between species; estimating time intervals from distances

UNIT V ADVANCED TOPICS IN BIOINFORMATICS 9

Biomolecular and cellular computing–microarray analysis–systems biology.

TOTAL: 45 PERIODS

TEXT BOOKS

1.B.Bergeron, Bioinformatics Computing, PHI, 2002.
2.Westhead, D.R., Parish,J.H., Twyman, R.M., Instant Notes In Bioinformatics, BIOS Scientific Publishers, 2000.

REFERENCES

1. C. Gibas & P. Jambeck, Developing Bioinformatics Skills, O'Reilly, 1999.

12BT54 BIOCHEMISTRY-II

L	T	P	C
4	0	0	4

AIM

To develop skills of the students in Biochemistry with special emphasis on the metabolizing aminoacids, nucleicacids, polysaccharide & lipids and an biomembranes. This maybe a pre-requisite for certain-elective courses like Metabolic Engineering; Molecular Modelling & Drug Design etc.

OBJECTIVES

At the end of the course, the student would have gained an extensive knowledge of Biochemistry particular various metabolic pathways & Biomembranes. This knowledge will be useful for project work.

UNIT I METABOLISM OF AMINOACIDS 12

Biosynthesis of Gly, Ser and Cys; Biosynthesis of six essential aminoacids (Met, Thr, Lys, Ile, Val, Leu) and regulation of branched chain amino acids (concerted inhibition, allosteric regulation and enzyme multiplicity, sequential feedback) from oxaloacetate and pyruvate; Biosynthesis of aromatic amino acids. Metabolic disorders associated with branched chain and aromatic aminoacid degradation.

UNIT II PROTEIN TRANSPORT AND DEGRADATION 12

Protein targeting, signal sequence, secretion; Folding, Chaperons and targeting of organelle proteins, Protein degradation, receptor-mediated endocytosis, turnover.

UNIT III METABOLISM OF NUCLEIC ACIDS, POLYSACCHARIDES AND LIPIDS 12

Biosynthesis of nucleotides, denovo and salvage pathways for purines and pyrimidines, Biosynthesis and degradation of starch and glycogen, Biosynthesis an degradation of Lipids: Fatty acid synthesis and oxidative degradation, Triacylglycerol and phospholipid biosynthesis and degradation; Cholesterol biosynthesis and regulation and targets and action of cholesterol lowering drugs.

UNIT IV METABOLISM OF VITAMINS AND MINERALS 12

Vitamins (fat and water-soluble), Co-enzymes, hormones (steroids like corticoids, aminoacid derived like adrenaline and noradrenaline and peptides like insulin and growth hormone).

UNIT V STRUCTURAL PROTEINS AND CYTOSKELETON 12

Contractile proteins, Actin, myosin, actin polymerization, acto-myosin complexes, mechanism of

myosin ATPase activity, excitation-contraction coupling and relaxation, microtubules, microfilaments and their role inorganelle movements.

TOTAL: 60 PERIODS

TEXT BOOKS

1.Lehninger's Principles of Biochemistry by David L.Nelson and Michael MCox, Macmillan Worth Publisher

2. Lubert Stryer, Biochemistry, 4th Edition,WHFreeman&Co.,2000.

REFERENCES

1. Voet and Voet, Biochemistry, 2nd Edition, John Wiley & Sons Inc.,1995.

2.Murray, R.K., Granner, B.K., Mayes, P.A., Rodwell. V.W., Harper's Biochemistry, Prentice Hall International.

3. Creighton. T.E., Proteins, Structure and Molecular Properties, 2nd Edition, W.H. Freeman and Co., 1993.

4. Salway, J.G., Metabolism at a Glance,2nd Edition, Blackwell Science Ltd., 2000.

12BT55 **MASS TRANSFER OPERATIONS** **L T P C**
4 0 0 4

AIM

To develop skills of the students in Biochemistry with special emphasis on the metabolizing aminoacids, nucleicacids, polysaccharide & lipids and an biomembranes. This maybe a pre-requisite for certain-elective courses like Metabolic Engineering; Molecular Modelling & Drug Design etc.

OBJECTIVES

At the end of the course, the student would have gained an extensive knowledge of Biochemistry particular various metabolic pathways & Biomembranes. This knowledge will be useful for project work.

UNIT I DIFFUSION AND MASS TRANSFER 12

Molecular diffusion in fluids and solids; Inter phase Mass Transfer; Mass Transfer coefficients; Analogies in Transport Phenomenon

UNIT II GAS LIQUID OPERATIONS 12

Principles of gas absorption; Single and Multicomponent absorption; Absorption with Chemical Reaction; Design principles of absorbers; Industrial absorbers; HTU,NTU concepts.

UNIT III VAPOUR LIQUID OPERATIONS 12

V-L Equilibria; Simple, Steam and Flash Distillation; Continuous distillation; McCABE-THIELE & PONCHON-SAVARIT Principles; Industrial distillation equipments, HETP, HTU and NTU concepts.

UNIT IV EXTRACTION OPERATIONS 12

L-L equilibria, Staged and continuous extraction, Solid-liquid equilibria, Leaching Principles.

UNIT V SOLID FLUID OPERATIONS 12

Adsorption equilibria– Batch and fixed bed adsorption; Drying-Mechanism-Drying curves-Time of Drying; Batch and continuous dryers.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Treybal R.E. Mass Transfer Operations. 3iuedition. McGraw-Hill, 1981.

2. Geankoplis C.J. Transport Processes and Unit Operations. 3rd edition, Prentice Hall of India, 2002.

REFERENCES

1. Coulson and Richardson's Chemical Engineering. Vol. I&II, Asian Books Pvt. Ltd, 1998.

12BT56	MOLECULAR BIOLOGY	L	T	P	C
		4	0	0	4

AIM

To develop skills of the students in area of molecular biology specifically central dogma of life in detail.

OBJECTIVES

- To study various molecular techniques.
- To know the basic process DNA replication, transcription & translation.
- To know isolation, restriction etc of DNA etc.

UNIT I STRUCTURE OF NUCLEIC ACIDS AND DNA REPLICATION 12

Conformation of DNA and RNA; replication in prokaryotes, D-loop and rolling circle, mode of replication, replication of linear viral DNA. Organisation of eukaryotic chromosome – cot value, replication of telomeres in eukaryotes

UNIT II TRANSCRIPTION 12

In prokaryotes and eukaryotes, features of promoters and enhancers, transcription factors, nuclear RNA splicing, ribozyme.

UNIT III TRANSLATION 12

Elucidation of genetic code, mechanism, codon usage, suppressor mutation

UNIT IV REGULATION OF PROKARYOTE GENE EXPRESSION 12

Operons: prokaryotic gene regulation; *Lac* and *trp* operon , Lamda phage life cycle and gene regulation

UNIT V REGULATION OF EUKARYOTE GENE EXPRESSION AND REPAIR 12

Regulation of Gene Activity In Eukaryotes, various types of repair mechanisms

TOTAL: 60 PERIODS

TEXT BOOKS

1. David Friefelder, Molecular Biology, Narosa Publ. House. 1999
2. Benjamin Lewin, Gene VII, Oxford University Press. 2000
3. Watson JD, Hopkins WH, Roberts JW, Steitz JA, Weiner AM, Molecular Biology of The Gene. 1987

12HS51	ENGLISH FOR EMPLOYMENT-I	L	T	P	C
	(Common to All B.E./B.Tech)	0	0	3	1

AIM

OBJECTIVES

- To get proficiency in business communication at work place
- To develop students accuracy in communication
- To improve learners ability to understand any kind of text

LIST OF EXPERIMENTS:

Task: 1	Verbal Reasoning	5
Task: 2	Resume and Covering Letter	3
Task: 3	Channel Conversations	2
Task: 4	Group Discussions	10
Task: 5	Debate	10

Task: 6 Mock Interview 1

E-MATERIAL:

www.indiabix.com/verbal-reasoning

Record Lay-out

Record for the 12HS51 ENGLISH FOR EMPLOYMENT-I should comprise the following,

1 Bona-fide Certificate with the sign of the HOD, Staff-in-Charge/Trainer, Internal and External examiners
2 Contents
3 Six Test Question paper and answers scripts for Verbal Reasoning
4 Copy of Resume with Covering letter
5 Materials used for the Group Discussion & Debate-Resources shall be used from Dailies/Internet/Magazine

***Note: Contents for the Internal and External Examinations should be considered only from The BUSINESS ENGLISH oriented Articles/Extracts/Clips/Illustrations/Audio scripts

Mode of Evaluation

INTERNAL ASSESSMENT (100 Marks to be converted to 25)

1. Verbal Reasoning (10 marks)
2. Channel Conversion (10 marks)
3. Group Discussion /Debate (40 marks)
4. Mock Interview (40 marks)

EXTERNAL ASSESSMENT (100 Marks to be converted to 75)

1. Verbal Reasoning (10 marks)
2. Channel Conversion (10 marks)
3. Group Discussion /Debate (40 marks)
4. Mock Interview (40 marks)

TOTAL = 45 PERIODS

12BT58	BIOINFORMATICS LABORATORY	L	T	P	C
		0	0	3	2

AIM

To develop the skills of the students in the area of bioinformatics by using various tools and softwares

OBJECTIVE

- To know the basics of UNIX commands
- To know the basics of PEARL programming
- To know the handling of various bioinformation tools and softwares.

LIST OF EXPERIMENTS

1. Introduction to UNIX basic commands and UNIX Filters.

2. Perl programming and applications to Bioinformatics.

1. Basic scripting.
2. Regular expressions.
3. File i/o & control statement.
4. Subroutines & functions.
5. Writing scripts for automation.

3. **Types of Biological Databases and Using it.**
    1. Genbank.
    2. Protein Data Bank.
    3. Uniprot.

4. Sequence Analysis Tools

1. Use of BLAST, FASTA (Nucleic Acids & Protiens).
2. Use of ClustalW.
3. Use of EMBOSS.

5. Phylogenetic Analysis

1. Use of Phyllip.

6. Molecular Modeling

1. Homology Modeling–Swiss modeller.
2. Any Open Source Software.

TOTAL : 45 Periods

12BT57 **MOLECULAR BIOLOGY LABORATORY** **L T P C**
0 0 4 2

AIM

To develop the skills of the students by providing hands on training in Molecular Biology. This will facilitate the students to take up specialized project in Molecular biology and will be a pre-requisite for research work.

OBJECTIVE

At the end of this course, the students would have learnt basic techniques used Molecular Biology and its application. This will be strength for students to undertake research projects in the area of modern biology.

LIST OF EXPERIMENTS

1. Isolation of bacterial DNA
2. Isolation of plant cell and animal cell genomic DNA
3. DNA Extraction from Bovine spleen
4. Restriction enzyme digestion
5. Competent cells preparation and Blue and white selection for recombinants
6. Plating of λ phage
7. O phage lysis of liquid cultures

TOTAL : 45 Periods

12BT61 **BIOPROCESS PRINCIPLES** **L T P C**
3 0 0 3

AIM

To develop skills of the students in the area of Bio process Technology with emphasis a Bioprocess principles. This is a pre-requisite for courses a Bioprocess technology offered in the subsequent semesters.

OBJECTIVES

At the end of the course, the students would have learnt about fermentation processes, Metabolic stoichiometry, Energetics, Kinetics of microbial growth etc. This will serve as an effective course to understand certain specialized electives in Bioprocess related fields.

UNIT I OVERVIEW OF FERMENTATION PROCESSES 6

Overview of fermentation industry, general requirements of fermentation processes, basic configuration of Fermentor and ancillaries, main parameters to be monitored and controlled in fermentation processes.

UNIT II RAW MATERIALS AND MEDIA DESIGN FOR FERMENTATION PROCESS 8

Criteria for good medium, medium requirements for fermentation processes, carbon,

nitrogen, minerals, vitamins and other complex nutrients, oxygen requirements, medium formulation of optimal growth and product formation, examples of simple and complex media, design of various commercial media for industrial fermentations – medium optimization methods

UNIT III STERILIZATION KINETICS 6

Thermal death kinetics of microorganisms, batch and continuous heat sterilization of liquid media, filter sterilization of liquid media, air sterilization and design of sterilization equipment - batch and continuous.

UNIT IV METABOLIC STOICHIOMETRY AND ENERGETICS 12

Stoichiometry of cell growth and product formation, elemental balances, degrees of reduction of substrate and biomass, available electron balances, yield coefficients of biomass and product formation, maintenance coefficients energetic analysis of microbial growth and product formation, oxygen consumption and heat evolution in aerobic cultures, thermodynamic efficiency of growth.

UNIT V KINETICS OF MICROBIAL GROWTH AND PRODUCT FORMATION 13

Modes of operation - batch, fed batch and continuous cultivation. Simple unstructured kinetic models for microbial growth, Monod model, growth of filamentous organisms, product formation kinetics - leudeking-piret models, substrate and product inhibition on cell growth and product formation.

TOTAL: 45 PERIODS

TEXT BOOKS

1.Bailey and Ollis, "Biochemical Engineering Fundamentals", McGraw-Hill (2nd Ed.), 1986.

2. Shule and Kargi, "Bioprocess Engineering", Prentice Hall, 1992.

REFERENCES

1. Pauline Doran, "Bioprocess Engineering Calculation", Blackwell Scientific Publications.

2. Peter F. Stanbury, Stephen J. Hall & A. Whitaker, "Principles of Fermentation Technology", Science & Technology Books.

3. Harvey W. Blanch, Douglas S. Clark, "Biochemical Engineering", Marcel Dekker, Inc.

12BT62 CHEMICAL REACTION ENGINEERING

L	T	P	C
4	0	0	4

AIM

This course aims to develop the skills of the students in the area of chemical reaction engineering. This is a pre-requisite for courses offered in Bioprocess Technology and for designing a reactor.

OBJECTIVES

At the end of the course, the student would have learnt chemical kinetics, various types of reactors, and how they function. This will help the student to takeup PG courses in Bioprocess, Biochemical Engg., and also the project work.

UNIT I SCOPE OF CHEMICAL KINETICS & CHEMICAL REACTION ENGINEERING 12

Broad outline of chemical reactors; rate equations; concentration and temperature dependence; development of rate equations for different homogeneous reactions. Industrial scale reactors.

UNIT II IDEAL REACTORS 12

Isothermal batch, flow, semi-batch reactors; performance equations for single reactors; Multiple reactor systems; multiple reactions.

UNIT III IDEAL FLOW AND NON IDEAL FLOW 12

RTD in non-ideal flow; non-ideal flow models; reactor performance with non-ideal flow.

UNIT IV GAS-SOLID,GAS-LIQUID REACTIONS 12

Resistances and rate equations; heterogeneous catalysis; reactions steps; resistances and rate equations.

UNIT V FIXEDBED AND FLUIDBED REACTORS 12

G/l reactions on solid catalysis; trickle bed, slurry reactors; three phase-fluidized beds; Reactors for fluid-fluid reactions; tank reactors.

TOTAL: 60 PERIODS

TEXT BOOKS

4. Levenspiel O ."Chemical Reaction Engineering", 3rd Edition.JohnWiley.1999
5. Fogler H.S. "Elements of Chemical Reaction Engineering", Prentice Hall India.2002

REFERENCE

1. Missen R.W., Mims C.A., Saville B.A. "Introduction To Chemical Reaction Engineering And Kinetics", John Wiley.1999.

12BT63 IMMUNOLOGY

L	T	P	C
4	0	0	4

AIM

This course aims to develop the skills of the students in Immunotechnology, Proteomics and genomics etc.

OBJECTIVES

At the end of the course students would have learnt about the mechanisms by which a human body interacts with a pathogenic microbe &how it eliminats it. Students, also familiarize themselves with the pathogenesis of diseases like AIDS, Cancer, TB etc.

UNIT I INTRODUCTION 12

Cells of immune system; innate and acquired immunity; primary and secondary lymphoid organs; antigens: chemical and molecular nature; haptens; adjuvants; types of immune responses; theory of clonal selection.

UNIT II CELLULAR RESPONSES 12

Development, maturation, activation and differentiation of T-cells and B-cells; TCR; antibodies: structure and functions; antibodies: genes and generation of diversity; antigen-antibody reactions; monoclonal antibodies: principles and applications; antigen presenting cells; major histo compatibility complex; antigen processing and presentation; regulation of T-cell and B-cell responses.

UNIT III INFECTION AND IMMUNITY 12

Injury and inflammation; immune responses to infections: immunity to viruses, bacteria, fungi and parasites; cytokines; complement; immunosuppression, tolerance; Hypersensitivity; AIDS and Immunodeficiencies; resistance and immunisation; Vaccines.

UNIT IV TRANSPLANTATION AND TUMOR IMMUNOLOGY 12

Transplantation: genetics of transplantation; laws of transplantation, Mechanism and clinical manifestation of Graft rejection, Tumor immunology.

UNIT V AUTOIMMUNITY 12

Autoimmunity, Organ specific and Systemic autoimmune Disorders, Diagnosis and Treatment.

TOTAL: 60 PERIODS

TEXT BOOKS

1. RoittI, Male, Brostoff. Immunology, Mos by Publ., 2002.
2. Kuby J, Immunology, WH Freeman &Co., 2000.

REFERENCE

1. Ashim K. Chakravarthy, Immunology, Tata McGraw-Hill,1998.

12BT64 **GENETIC ENGINEERING**

L	T	P	C
4	0	0	4

AIM

This course aims to develop the skills of the students in Immunotechnology, Proteomics and genomics etc.

OBJECTIVES

At the end of the course students would have learnt about the mechanisms by which a human body interacts with a pathogenic microbe &how it eliminates it. Students, also familiarize themselves with the pathogenesis of diseases like AIDS, Cancer, TB etc.

UNIT I BASICS OF RECOMBINANT DNA TECHNOLOGY 10

Role of genes within cells, genetic elements that control gene expression, restriction and modifying enzymes, safety guidelines of recombinant DNA research.

UNIT II CREATION OF RECOMBINANT MOLECULES 12

Restriction mapping, design of linkers and adaptors. Characteristics of plasmid and phage vectors, prokaryotic and eukaryotic expression vectors.

UNIT III CONSTRUCTION OF LIBRARIES 14

Construction of cDNA and genomic libraries. Screening of libraries with DNA probes and with antisera.

UNIT IV POLYMERASE CHAIN REACTION 12

Inverse PCR, Nested PCR, Taqman assay, Molecular beacons, RACEPCR, RAPD, site directed mutagenesis, methods of nucleicacid sequencing-Sangers method, (Kunkel's Method).

UNIT V APPLICATIONS OF RECOMBINANT DNA TECHNOLOGY 12

Cloning in plants, Ti plasmid, and transgenic and knockout animals.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Old RW, Primrose SB,"Principles of Gene Manipulation, An Introduction To Genetic Engineering", Blackwell Science Publications, 1993.
2. Ansubel FM, BrentR, Kingston RE, Moore DD, "Current Protocols In Molecular Biology", Greene Publishing Associates, NY,1988.

REFERENCE

1. Berger Sl, Kimmer AR, "MethodsInEnzymology",Vol.152,AcademicPress,1987.

12BT65 **GENETIC ENGINEERING LABORATORY** **L T P C**
0 0 4 2

AIM

To provide hands on training in the DNA manipulation by the designing simple experiments. This is a pre-requisite for Down-stream processing has offered in later semester.

OBJECTIVE

At the end of the course, the student would have learnt about the cloning of genes, how to express them for protein production & subsequent purification of protein. This will be needed for any project work in modern biology.

LIST OF EXPERIMENTS

1. Preparation of plasmid DNA.
2. Elution of DNA from agarose gels.
3. Ligation of DNA into expression vectors.
4. Transformation.
5. Optimisation of inducer concentration for recombinant protein expression.
6. Optimisation of time of inducer for recombinant protein expression.
7. SDS-PAGE, 2DGel, ISO–electric Focussing.
8. Western blotting.
9. Hybridisation with anti-sera.
10. PCR.

TOTAL : 45 Periods

12BT66 **IMMUNOLOGY LABORATORY** **L T P C**
0 0 4 2

AIM

The develop skills of students in Immunology by performing simple experiments in `the laboratory.

OBJECTIVE

At the end of the course the students would have gained knowledge to perform techniques like blood grouping, ELISA, & identification of T-cell, Immuno fluorescence etc. This will be of helping facilitating the students for project work.

LIST OF EXPERIMENTS

1.Handling of animals, immunization and raising antisera
2.Identification of cells in a blood smear
3.Identification of blood group
4.Immunodiffusion
5.immunoelectrophoresis
6.Testing for typhoid antigens by Widal test
7.Enzyme Linked Immunosorbent Assay(ELISA)
8.Isolation of peripheral blood mononuclear cells
9.Isolation of monocytes from blood
10.Immunofluorescence

TOTAL : 45 Periods

		L	T	P	C
12HS61	**English for Employment – II** **(Common to All B.E./B.Tech Branches)**	**0**	**0**	**3**	**1**

AIM

To improve learners Communication Skill in English with the Professional English Examination Module

OBJECTIVES

- To impart Employment skill among the students
- To improve Technical vocabulary related to work place
- T o develop students job prospects through oral communication

LIST OF EXPERIMENTS:

Unit-I **Reading** **10**

1.1 Reading for Gist
1.2 Reading for Structure and detail
1.3 Understanding General Points
1.4 Reading-Vocabulary and Texture
1.5 Structure and Discourse features
1.6 Understanding sentence structure

Unit –II **Writing** **10**

2.1 Describing figure from graphic input
2.2 Deriving conclusion from illustrations
2.3 Writing a Report-Describing/Summarizing
2.4 Explaining a context
2.5 Writing Apologies
2.6 Complaint letter
2.7 Writing for giving assurance

Unit-III **Listening** **10**

3.1 Listening for Specific Information
3.2 Listening to Identify topic
3.3 Listening to a context
3.4 Listening to opinions expressed in a debate
3.5 Listening for Gist
3.6 Listening for making Inferences

Unit-IV **Speaking** **15**

4.1 Introducing yourself
4.2 Have your say
4.3 'Mini-Presentation' on the given topic
4.4 Group Discussion
4.5 Expressing personal opinion about the Social Issues

Text Book:

1. Business Benchmark Advanced Audio Cassettes BEC Higher, Guy Brook-Hart, 2 Audio cassettes, ISBN: 9780521672986.
2. Business Benchmark Upper Intermediate Personal Study Book BEC and BULATS Edition, Guy Brook-Hart, PB, ISBN: 9780521672917.

TOTAL = 45 PERIODS

12BT71 **BIOPROCESS ENGINEERING** **L T P C**
3 1 0 4

AIM

This course aims to develop the skills of the students in the area of Bioprocess Engineering. This will be a pre-requisite for a few elective courses and for project in Bioprocess Technology.

OBJECTIVES

- To study about the modeling stratergies in bioprocess engineering.
- To study the reactor scale up process principles.
- To study the various modeling and stimulation principles.

UNIT I ANALYSIS OF STR 12

Stirred tank reactor - non-ideality, RTD and stability analysis, tanks in series and dispersion models – application to design of continuous sterilizer.

UNIT II ANALYSIS OF OTHER CONFIGURATIONS 12

Packed bed reactor, airlift reactor, fluidized bed reactor bubble column reactors – non- ideality, RTD and stability analysis.

UNIT III BIOREACTOR SCALE – UP 12

Regime analysis of bioreactor processes, oxygen mass transfer in bioreactors - microbial oxygen demands; methods for the determination of mass transfer coefficients; mass transfer correlations. Scale up criteria for bioreactors based on oxygen transfer, power consumption and impeller tip speed.

UNIT IV MODELLING AND SIMULATION OF BIOPROCESSES 12

Study of structured models for analysis of various bioprocess – compartmental models, models of cellular energetics and metabolism, single cell models, plasmid replication and plasmid stability model. Dynamic simulation of batch, fed batch, steady and transient culture metabolism.

UNIT V BIOREACTOR CONSIDERATION IN ENZYME SYSTEMS 12

Analysis of film and pore diffusion effects on kinetics of immobilized enzyme reactions; formulation of dimensionless groups and calculation of effectiveness factors. Design of immobilized enzyme reactors – packed bed, fluidized bed and membrane reactors.

L: 45 TOTAL: 60 PERIODS

TEXT BOOKS

1. Anton Moser, “Bioprocess Technology”, Kinetics and Reactors”, Springer Verlag.
2. James E. Bailey & David F. Ollis, “Biochemical Engineering Fundamentals”, McGraw-Hill.
3. Shuler and Kargl, Bioprocess Engineering, Prentice Hall , 1992.

REFERENCES

1. James M. Lee, “Biochemical Engineering”, PHI, USA.
2. EMT.EL-Mansi. CFA. Bryce, A.L. Demain, AR. Allman: Fermentation Microbiology and Biotechnology, Second Edition 2007.
3. Harvey W. Blanch, Douglas S. Clark, “Biochemical Engineering”, Marcel Decker Inc.

12BT72 **PROTEIN ENGINEERING** **L T P C**
4 0 0 4

AIM

This course aims to deliver students a wide knowledge about structure, basic working, activity of various proteins and their role in the field of biotechnology.

OBJECTIVES

- To study about various structure and behavior of proteins.
- To study the basic building blocks of protein and their bonding nature.
- To study the need & advantage of protein engineering in biotechnology.

UNIT I AMINO ACIDS AND THEIR CHARACTERISTICS 10

Amino acids (the students should be thorough with three and single letter codes) and their molecular properties (size, solubility, charge, pKa), Chemical reactivity in relation to post-translational modification (involving amino, carboxyl, hydroxyl, thiol, imidazole groups) and peptide synthesis.

UNIT II BONDS AND ENERGIES IN PROTEIN MAKEUP 11

Covalent, Ionic, Hydrogen, Coordinate, hydrophobic and Vander walls interactions in protein structure. Interaction with electromagnetic radiation (radio, micro, infrared, visible, ultraviolet, X-ray) and elucidation of protein structure.

UNIT III PROTEIN ARCHITECTURE 12

Primary structure: peptide mapping, peptide sequencing - automated Edman method & mass-spec. High-throughput protein sequencing setup Secondary structure: Alpha, beta and loop structures and methods to determine Super-secondary structure: Alpha-turn-alpha, beta-turn-beta (hairpin), beta-sheets, alpha-beta-alpha, topology diagrams, up and down & TIM barrel structures Tertiary structure: Domains, folding, denaturation and renaturation, Quaternary structure: Modular nature, formation of complexes.

UNIT IV STRUCTURE-FUNCTION RELATIONSHIP 15

DNA-binding proteins: prokaryotic transcription factors, Helix-turn-Helix motif in DNA binding, Trp repressor, Eucaryotic transcription factors, Zn fingers, helix-turn helix motifs in homeodomain, Leucine zippers, Membrane proteins: General characteristics, Trans- membrane segments, prediction, bacteriorhodopsin and Photosynthetic reaction center, Immunoglobulins: IgG Light chain and heavy chain architecture, abzymes and Enzymes: Serine proteases, understanding catalytic design by engineering trypsin, chymotrypsin and elastase, substrate-assisted catalysis other commercial applications.

UNIT V PROTEIN ENGINEERING 12

Advantages and purpose, overview of methods, underlying principles with specific examples: thermal stability T4-lysozyme, recombinant insulin to reduce aggregation and inactivation, *de novo* protein design.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Voet D. and Voet G., "Biochemistry", Third Edn. John Wiley and Sons, 2001
2. Branden C. and Tooze J., "Introduction to Protein Structured, Second Edition", Garland Publishing, NY, USA, 1999.

REFERENCES

1. Creighton T.E. Proteins, Freeman WH, Second Edition, 1993
2. Moody P.C.E. and Wilkinson A.J. "Protein Engineering", IRL Press, Oxford, UK,1990.

12BT73 **DOWNSTREAM PROCESSING** **L T P C**
4 0 0 4

AIM

Aims to explore students in the field of downstream processing and its application in product recovery.

OBJECTIVES

- To study about the need of various downstream processing with its principle.
- To study the use of various hi grade equipment in product separation and product polishing
- To study the various product isolation techniques.

UNIT I DOWNSTREAM PROCESSING 8+3

Introduction to downstream processing principles characteristics of biomolecules and bioprocesses. Cell disruption for product release–mechanical, enzymatic and chemical methods. Pretreatment and stabilization of bioproducts.

UNIT II PHYSICAL METHODS OF SEPERATION 6+3

Unit operations for solid-liquid separation-filtration and centrifugation

UNIT III ISOLATION OF PRODUCTS 12+3

Adsorption, liquid-liquid extraction, aqueous two-phase extraction, membrane separation – Ultra filtration and reverse osmosis, dialysis, precipitation of proteins by different methods.

UNIT IV PRODUCT PURIFICATION 12+3

Chromatography–principles, instruments and practice, adsorption, reverse phase, ion- exchange, size exclusion, hydrophobic interaction, bio affinity and pseudo affinity chromatographic techniques.

UNIT V FINAL PRODUCT FORMULATION AND FINISHING OPERATIONS 7+3

Crystallization, drying and lyophilization in final product formulation.

TOTAL: 60 PERIODS

TEXT BOOKS

1. P.A. Belter, E.L. Cussler And Wei-Houhu – Bioseparations – Downstream Processing For Biotechnology, Wiley Interscience Pub.(1988).
2. R.O.Jenkins,(Ed.)–ProductRecoveryInBioprocessTechnology–Biotechnology By Open Learning Series, Butterworth-Heinemann (1992).

REFERENCES

1. J.C. Janson And L. Ryden, (Ed.)–Protein Purification–Principles, High Resolution Methods And Applications,VCH Pub. 1989.
2. R.K. Scopes–Protein Purification–Principles And Practice, Narosa Pub.(1994).
3. Roger. G.Harrison, Paul Todd, Scott R. Rudge and Demetri P.Petrides,
4. Bioseperation Science and Engineering, Oxford University Press, Newyork, 2003.

12BT74 **BIOPROCESS ENGINEERING LABORATORY** **L T P C**
0 0 4 2

AIM

This course aims to provide hand on training in the laboratory of Bioprocess Technology by performing simple experiments.

OBJECTIVE

At the end of the course, the student would have learnt about Bioreactors & how to use them for practical applications. This will be beneficial to students to undertake project work in this area.

LIST OF EXPERIMENTS

1. Thermal death kinetics
2. Batch sterilization design
3. Batchcultivation,estimationofkla–dynamicgassingmethod,exhaustgasanalysis –carbon balancing, gas balancing
4. Batch and Fed batch cultivation ,exhaust gas analysis–carbon balancing, gas balancing
5. Total cell retention cultivation, exhaust gas analysis – carbon balancing, gas balancing
6. Estimation of kla–sulphite oxidation method
7. Estimation of kla–power correlation method
8. Residence time distribution
9. Estimation of overall heat transfer coefficient
10. Continuous cultivation–x-diagram, pulse and shift method, evaluation of kinetic parameters, exhaust gas analysis–carbon balancing ,gas balancing.
11. Enzyme kinetics– micheiesmenton parameters.
12. Enzyme immobilization–gel entrapment & cross linking methods.

TOTAL : 45 Periods

12BT75 **DOWNSTREAM PROCESSING LABORATORY** **L T P C**
0 0 4 2

AIM

To provide hands on training in Downstream processing by through simple experimentation in the laboratory. This will be a pre-requisite for project work.

OBJECTIVE

At the end of the course, the student has gained the knowledge toper form various techniques used in Down Stream Processing and how to make a finished product.

LIST OF EXPERIMENTS

1.Solidliquidseparation–centrifugation,microfiltration

2.Cell disruption techniques–ultra sonication, French pressure cell

3.Cell disruption techniques–Enzyme and chemical method

4.Precipitation–ammoniumsulphiteprecipitation

5.Ultrafiltrationseparation

6.Aqueoustwophaseextractionofbiologicals

7.Highresolutionpurification–affinitychromatography

8.Highresolutionpurification–ionexchangechromatography

9.Productpolishing–gelfiltrationchromatography

10.Product polishing spray drying freeze drying.

TOTAL : 45 Periods

12MG71	**TOTAL QUALITY MANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

AIM

This course aims to develop skills of the students in the field of management techniques and its need in biotechnology.

OBJECTIVES

- To study about the basic laws and agreements involved in product marketing.
- To study the use of management techniques in product marketing.
- To study the various certification and terms.

UNIT I INTRODUCTION 9

Introduction- Need for quality- Evolution of quality-Definition of quality-Dimensions of manufacturing and service quality-Basic concepts of TQM-Definition of TQM–TQM Framework-Contributions of Deming , Juran and Cros by–Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention- Employee involvement–Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal-Continuous process improvement–PDS Acycle, 5s, Kaizen-Supplier partnership–Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUESI 9

The seven traditional tools of quality –New management tools– Six-sigma: Concepts, methodology, applications to manufacturing ,service sector including IT–Benchmarking –Reason to bench mark, Bench marking process–FMEA–Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles–Quality Function Deployment (QFD)–Taguchi quality loss function– TPM–Concepts, improvement needs–Cost of Quality–Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO9000-ISO9000-2000 Quality System–Elements, Documentation, Quality auditing-QS9000–ISO14000–Concepts, Requirements and Benefits–Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 PERIODS

TEXT BOOKS

1.DaleH.Besterfiled,etat.,"Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM–Text with Cases", Butterworth–Heinemann Ltd., Oxford, Third Edition (2003).
3. Suganthi,LandAnandSamuel,"TotalQualityManagement",PrenticeHall(India) Pvt. Ltd. (2006)
4. Janakiraman, B and Gopal, R.K, "Total Quality Management–Text and Cases", Prentice Hall (India) Pvt. Ltd. (2006)

12BT6A **BIOPHYSICS** **L T P C 3 0 0 3**

AIM

To familiarize with the conjugational study between physics and biology in its structural and working principle.

OBJECTIVES

- To study about the various molecular structural of biomolecule.
- To study the potent cellular transport mechanisms with its working molecular principle.
- To study the energetic and dynamics of biological systems.

UNIT I MOLECULAR STRUCTURE OF BIOLOGICAL SYSTEMS 9

Intramolecular bonds–covalent–ionic and hydrogen bonds–biological structures- genera features–water structure–hydration–interficial phenomena and membranes– self assembly and molecular structure of membranes.

UNIT II CONFORMATION OF NUCLEICACIDS 9

Primary structure–the bases–sugars and the phosphodiester bonds-double helical structure– the a, band z forms–properties of circular DNA–topology–polymorphism and flexibility of DNA structure of ribonucleic acids–hydration of nucleic acids.

UNIT III CONFORMATION OF PROTEINS 9

Conformation of the peptide bond–secondary structures–ramachandran plots–use of potential functions–tertiary structure–folding–hydration of proteins–hydropathy index.

UNIT IV CELLULAR PERMEABILITY AND ION– TRANSPORT 9

Ionic conductivity–transport across ion channels–mechanism-ion pumps-proton transfer –nerve conduction–techniques of studying ion transport and models.

UNIT V ENERGETICS & DYNAMICS OF BIOLOGICAL SYSTEMS 9

Concepts in thermodynamics–force and motion–entropy and stability–analyze so fluxes– diffusion potential–basic properties of fluids and biomaterials–laminar and turbulent.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Biophysics; R. Glaser, Springer Verlag, 2000.
2. Biophysics: Molecules In Motion; R. Duane. Academic Press, 1999.

REFERENCES

1. Voet and voet, biochemistry, 2ndedition, John Wiley and Sons Inc., 1995.
2. Lehninger' sprinciples of biochemistry David L .Nelson and Micheal Mcox, Macmillon worthpublications,4thedition 2007.

12BT6B **BIOLOGICAL SPECTROSCOPY** **L T P C**
3 0 0 3

AIM

To develop the skills of the students in the area of Biological spectroscopy with a clear knowledge in High grade optical instruments to view and characterize biological molecules.

OBJECTIVES

- To study about the various instruments with its working principle for biological molecules imaging.
- To study the application of these equipments in biotechnology in molecules imaging, tracing biomolecules, etc.

UNIT I OPTICAL ROTATORY DISPERSION 9

Polarized light–optical rotation–circular dichroism–circular dichroism of nucleic acids and proteins.

UNIT II NUCLEAR MAGNETIC RESONANCE 9

Chemical shifts–spin–spin coupling– relaxation mechanisms–nuclear over hauser effect–multi dimensional NMR spectroscopy–determination of macromolecular structure by NMR–magnetic resonance imaging.

UNIT III MASS SPECTROMETRY 9

Ion sources sample introduction– mass analyzers and ion detectors– bio molecule mass spectrometry–peptide and protein analysis–carbohydrates and small molecules– specific applications.

UNIT IV X-RAY DIFFRACTION 9

Scattering by x-rays–diffraction by a crystal–measuring diffraction pattern–bragg reflection–unit cell–phase problem–anomalous diffraction–determination of crystal structure–electron and neutron diffraction.

UNIT V SPECIAL TOPICS AND APPLICATIONS 9

Electron microscopy – transmission and scanning electron microscopy – scanning tunneling and atomic for cemicroscopy–combinatorial chemistry and high throughput screening methods.

TOTAL: 45 PERIODS

TEXT BOOKS

1. CampbellI. D and Dwek R.A., "Biological Spectroscopy", Benjami Cummins and Company, 1986.
2. Atkins P.W. "Physical Chemistry", Oxford IV Edition, 1990.

12BT6C **BIOPHARMACEUTICAL TECHNOLOGY** **L T P C**
3 0 0 3

AIM

To familiarize with the biopharmaceutical technology, drug designing, drug formulation, harmako kinetics and pharmaco dynamics. To understand the application of biopharmaceutical technology in

OBJECTIVES

- To study about the drug formulation, designing and action on living system.
- To study the active ingredients like incipient and excipients.
- To study the application of biopharmaceuticals in industries.

UNIT I INTRODUCTION 9

Pharmaceutical industry & development of drugs; types of therapeutic agents and their uses; economics and regulatory aspects.

UNIT II DRUGACTION,METABOLISM AND PHARMACOKINETICS 9

Mechanism of drug action; physico-chemical principles of drug metabolism; radioactivity;

Pharmacokinetics.

UNIT III MANUFACTURE OF DRUGS, PROCESS AND APPLICATIONS 9

Types of reaction process and special requirements for bulk drug manufacture.

UNIT IV PRINCIPLESOFDRUGMANUFACTURE 9

Compressed tablets; dry and wet granulation; slugging or direct compression; tablet presses; coating of tablets; capsule preparation; oval liquids–vegetable drugs–topical applications; preservation of drugs; analytical methods and other tests used in drug manufacture; packing techniques; quality management; gmp.

UNIT V BIOPHARMACEUTICALS 9

Various categories of therapeutics like vitamins, laxatives, analgesics, contraceptives, antibiotics, hormones and biological.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Gareth Thomas. Medicinal Chemistry.Anintroduction.JohnWiley.2000.
2. Katzung B.G. Basic and Clinical Pharmacology, Prentice Hall ofIntl.1995.

12BT6D PRINCIPLES OF FOOD PROCESSING

L	T	P	C
3	0	0	3

AIM

To develop the skills of the students in the area of need of Food Process Technology and its applications.

OBJECTIVES

- To study about the various components potent role in food processing.
- To study the various food additives used to enhance food quality.
- To study the various process involved in food processing and preservation.

UNIT I FOOD AND ENERGY 9

Constituents of food–carbohydrates, lipids, proteins, water, vitamins and minerals, dietary sources, role and functional properties in food, contribution to organoleptic and textural characteristics.

UNIT II FOOD ADDITIVES 9

Classification, intentional and non-intentional additives, functional role in food processing and preservation; food colourants–natural and artificial; food flavours; enzymes as food processing aids.

UNIT III MICROORGANISMS ASSOCIATED WITH FOOD 9

Bacteria, yeasts and molds – sources, types and species of importance in food processing and preservation; fermented foods and food chemicals, single cell protein.

UNIT IV FOOD BORNE DISEASES 9

Classification – food infections – bacterial and other types; food intoxications and poisonings – bacterial and non-bacterial; food spoilage–factors responsible for Spoilage, spoilage of vegetable, fruit, meat, poultry, beverage and other food products.

UNIT V FOOD PRESERVATION 9

Principles involved in the use of sterilization, pasteurization and blanching, thermal death curves of microorganisms, canning; frozen storage-freezing characteristics of foods, microbial activity at low temperatures, factors affecting quality of foods in frozen storage; irradiation preservation of foods.

TOTAL: 45 PERIODS

TEXT BOOKS

1. T.P. Coultate–Food–The Chemistry of Its Components, 2nd Edn. Royal Society, London, 1992.
2. B. Sivasanker –Food Processing and Preservation, Prentice Hall of India Pvt. Ltd. New Delhi 2002.

REFERENCES

1. W.C. Frazier and D.C. Westhoff –FoodMicrobiology,4th Ed., McGraw-Hill BookCo.,NewYork1988.
2. J.M. Jay–Modern Food Microbiology, CBS Pub. New Delhi, 1987.

12BT6E **MARINEBIOTECHNOLOGY** **L T P C 3 0 0 3**

AIM

To study the field of biotechnology in marine environment and its potent application in pharmacology, aqua culture etc.

OBJECTIVES

- To explore the marine environment and its wide spread resource.
- To study the application in the field of pharmacology.
- To know about the of aquaculture design, resource, culture conditions etc.

UNIT I INTRODUCTION TO MARINE ENVIRONMENT 9

World ocean sans seas–ocean currents–physical and chemical properties of sea water–abiotic and biotic factors of the sea–ecological divisions of the sea–history of marine bilogy – bioeco chemical cycles–food chain and food web**.**

UNIT II IMPORTANT MARINE ORGANISMS 9

Phytoplankton's–zooplanktons–nektons–benthos–marine mammals–marine algae–mangroves–coral reefs–deep sea animals and adaptation–intertidal zone–fauna and flora.

UNIT III MARINE ENVIRONMENTAL BIOTECHNOLOGY 9

Marine pollution – biology indicators (marine micro, algae) – biodegradation & bioremediation–marine fouling and corrosion.

UNIT IV MARINE PHARMACOLOGY 9

Medicinal compound from marine flora and fauna – marine toxins, antiviral and antimicrobial agents.

UNIT V AQUACULTURE TECHNOLOGY 9

Important of coastal aquaculture–marine fishery resources–common fishing crafts and gears–aqua farm design and construction.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Recent advances in marine biotechnology volume 3 – M.Fingerman , R . Nagabhushanam Mary–Frances Thomson.
2. Recent advances marine biotechnology volume2 –M. Fingerman , R. Nagabhushanam Mary–Frances Thomson

12BT6F **CANCERBIOLOGY** **L T P C**
3 0 0 3

AIM

To explore about the molecular base of cancer, various stages of cancer, various carcinogens and advanced molecular treatment established for cancer.

OBJECTIVES

- To explore the basic molecular pathway of cancer infection.
- To study about various stages of cancer (carcinogenesis, metastasis, etc.)
- To know about various carcinogens and treatment for cancer.

UNIT I FUNDAMENTALS OF CANCER BIOLOGY 9

Regulation of cell cycle, mutations that cause changes in signal molecules, effects on receptor, signal switches, tumour suppressor genes, modulation of cell cycle in cancer, different forms of cancers, diet and cancer. Cancer screening and early detection, Detection using biochemical assays, tumor markers, molecular tools for early diagnosis of cancer.

UNIT II PRINCIPLES OF CARCINOGENESIS 9

Theory of carcinogenesis, Chemical carcinogenesis, metabolism of carcinogenesis, principles of physical carcinogenesis, x-ray radiation-mechanisms of radiation carcinogenesis.

UNIT III PRINCIPLES OF MOLECULAR CELL BIOLOGY OF CANCER 9

Signal targets and cancer, activation of kinases; Oncogenes, identification of Oncogenes, retroviruses and Oncogenes, detection of Oncogenes. Oncogenes/proto oncogene activity. Growth factors related to transformation.

UNIT IV PRINCIPLES OF CANCER METASTASIS 9

Clinical significances of invasion, heterogeneity of metastatic phenotype, metastatic cascade, basement membrane disruption, three step theory of invasion, proteinases and tumor cell invasion.

UNIT V NEW MOLECULES FOR CANCER THERAPY 9

Different forms of therapy, chemotherapy, radiation therapy, detection of cancers, prediction of aggressiveness of cancer, advances in cancer detection. Use of signal targets towards therapy of cancer; Gene therapy.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Maly B.W.J, "Virology A Practical Approach", IRLl Press, Oxford, 1987.
2. Dun mock N.J And Primrose S.B., "Introduction to Modern Virology", Blackwell Scientific Publications, Oxford, 1988.

REFERENCES

1. "An Introduction Top Cellular And Molecular Biology of Cancer" Oxford Medical Publications,1991.

12BT6G **METABOLIC ENGINEERING** **L T P C**
3 0 0 3

AIM

To develop skills of the students in the area of Metabolic Engineering principle & its application in bioprocess, molecular therapeutics & genetic engineering etc

OBJECTIVES

At the end of the course, the student would have learnt about Biosynthesis of primary & secondary metabolites, Bioconversion etc. and its relevance to Industrial applications.

UNIT I INTRODUCTION 9

Induction-jacob monod model, catabolite regulation, glucose effect, campd eficiency, feedback regulation, regulation in branched pathways, differential regulation by isoenzymes, concerted feedback regulation, cumulative feedback regulation, amnio acid regulation of rna synthesis,energ y charge, regulation, aminoacid regulation of rna synthesis, energy charge, regulation, premeability control passive diffusion, active transport group transportation.

UNIT II SYNTHESIS OF PRIMARY METABOLITES 9

Alteration of feedback regulation, limiting accumulation of end products, feedback, resistant mutants, alteration of permeability, metabolites.

UNIT III BIOSYNTHESIS OF SECONDARY METABOLITES 9

Precursor effects prophophase, idiophase relationship, enzyme induction, feedback regulation, catabolite regulation bypassing control of secondary metabolism, producers of secondary metabolites.

UNIT IV BIOCONVERSIONS 9

Advantages of bioconversions, specificity, yields, factors important to bioconversion, regulation of enzyme synthesis, mutation, permeability, co-metabolism, avoidance of product inhibition, mixed or sequential bioconversions, conversion of insoluble substances.

UNIT V REGULATION OF ENZYME PRODUCTION 9

Strain selection, improving fermentation, recognizing growth cycle peak, induction, feed back repression, catabolite repression, mutants resistant to repression, gene dosage.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Wang D.I.C., Cooney C.L., Demain A.L., Dunnil. P., Humphery A.E., Lilly M.D., “Fermentation And Enzyme Technology”, John Wiley And Sons., 1980.
2.StanburyP.F.,AndWhitakerA.,“Principles of Fermentation Technology”, Pergamon Press,1984

REFERENCES

1. Zubay G.," Biochemistry",MacmillanPublishers,1989.

12BT7A **BIOCONJUGATE TECHNOLOGY** **L T P C**
3 0 0 3

AIM

To develop the skills of the Student in the field of Bioconjugate technology and its industrial applications.

OBJECTIVES

At the end of the course, the student would have learnt about enzymes, nucleic acids And how to modify them for target specificity. Student also gets familiarized with the Industrial applications of this technology.

UNIT I FUNCTIONAL TARGETS 9

Modification of Amino Acids, Peptides and Proteins – Modification of sugars, polysaccharides and glycoconjugates –modification of nucleic acids and oligonucleotides.

UNIT II CHEMISTRY OF ACIVE GROUPS 9

Amine reactive chemical reactions– Thiol reactive chemical reactions–carboxylate reactive chemical reactions – hydroxyl reactive chemical reactions –aldehyde and ketone reactive chemical reactions– Photo reactive chemical reactions.

UNIT III BIOCONJUGATE REAGENTS 9

Zero length cross linkers–Homo bifunctional cross linkers–Hetero bifunctional cross linkers– Trifunctional cross linkers– Cleavable reagent systems–tag sand probes.

UNIT IV ENZYME AND NUCLEICACID MODIFICATION AND CONJUGATION 9

Properties of common enzymes– Activated enzymes for conjugation –biotinylated enzymes – chemical modification of nucleic acids–biotin labeling of DNA-enzyme conjugation to DNA– Fluorescent of DNA.

UNIT V BIOCONJUGATE APLICATIONS 9

Preparation of Hapten-carrier Immunogen conjugates - antibody modification and conjugation – immunotoxin conjugation techniques – liposome conjugated and derivatives- Colloidal–gold-labeledproteins–modificationwithsyntheticpolymers.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Bioconjugate Techniques, G.T.Hermanson, Academic Press,1999.

12BT7B **STEM CELL TECHNOLOGY** **L T P C**
3 0 0 3

AIM

To explore the basic molecular principles and emerging trends in stem cell technology and its application in various modern therapies.

OBJECTIVES

- To understand stem cell, molecular principle of stem cell technology.
- To explore its use in animal & plant biotechnology.
- To know its potent use in various molecular therapies.

UNIT I STEM CELLS AND CELLULAR PEDIGREES 9

Scope of stem cells–definition of stem cells–concepts of stem cells–differentiation, maturation ,proliferation, pluripolericy, self – maintainance and self – renewal– problems in measuring stem cells–preservation protocols.

UNIT II STEM CELL CONCEPT IN PLANTS 9

Stem cell and founder zones in plants–particulary their roots–stem cells of shoot meristems of higher plants.

UNIT III STEMCELLCONCEPTIN ANIMALS 9

Skeletal muscle stemcell–Mammary stem cells–intestinal stem cells–keratinocyte stem cells of cornea–skinand hair follicles–fumour stem cells-factors influencing proliferation and differentiation of stem cells–hormone role in differentiation.

UNIT IV HAEMOPOIETIC STEM CELL 9

Biology–growth factors and the regulation of haemopoietic stem cells.

UNIT V POTENTIAL USES OF STEM CELLS 9

Cellulartherapies–vaccines–genetherapy–immunotherapy–tissueengineering– Blood and bone marrow–Fccells.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Stem cells–Elsevier: CS Potten.

12BT7C **MOLECULAR PATHOGENESIS** **L T P C**
3 0 0 3

AIM

To develop the skills of the students in the area of molecular principles of Molecular Pathogenesis

OBJECTIVES

- To understand pathogenesis.
- To explore its various defence mechanisoms, various infection control statergies.
- To know the mechanism of bloody diarrhoea and Hemolytic Uremic Syndrome, Enteroaggregative *E.coli* (EAEC). Shigella: Entry, macrophage apoptosis, induction of macropinocytosis etc.

UNIT I OVERVIEW 9

Historical perspective-discovery of microscope, Louis Pasteur's contributions, Robert Koch's postulates, early discoveries of microbial toxins, toxic assays, vaccines, antibiotics and birth of molecular genetics and modern molecular pathogenesis studies, Various pathogen types and modes of entry.

UNIT II HOST-DEFENSE AGAINST PATHOGENS AND PATHOGENIC STRATEGIES 9

Attributes & components of microbial pathogenesis, Host defense: skin, mucosa, cilia, secretions, physical movements, limitation of free iron, antimicrobial compounds, mechanism of killing by humoral and cellular defense mechanisms, complements, inflammation process, general disease symptoms, Pathogenic adaptations to overcome the above defenses.

UNIT III MOLECULAR PATHOGENESIS (WITHSPECIFICEXAMPLES) 9

Virulence, virulence factors, virulence-associated factors and virulence life style factors, molecular genetics and gene regulation in virulence of pathogens, Vibrio Cholerae: Cholera toxin, co-regulated pili, filamentous phage, survival*E.coli* pathogens: Enterotoxigenic *E.coli*(ETEC),labile & stable toxins, Entero-pathogenic *E.coli*(EPEC), type III secretion, cytoskeletal changes, intimate attachment; Enterohaemerrohogic *E.coli* (EHEC), mechanism of bloody diarrhoea and Hemolytic Uremic Syndrome, Enteroaggregative *E.coli* (EAEC).Shigella: Entry, macrophage apoptosis, induction of macro pinocytosis, uptake by epithelial cells, intracellular spread, inflammatory response, tissue damage Plasmodium: Life cycle, erythrocyte stages, transport mechanism and processes to support the rapidly growing schizont, parasitiparous vacuoles, and knob Virulence assays:adherence,invasion,cytopathic,cytotoxiceffects.Criteria&testsin identifying virulence factors, attenuated mutants, molecular characterization of virulence factors, signal transduction &host responses Protein transport, Antimalarials based on transport processes. Influenza virus: Intracellular stages, Neuraminidase & Haemagglutinin inentry,M1& M2 proteins in assembly and disassembly, action of amantidine.

UNIT IV EXPERIMENTAL STUDIES ON HOST-PATHOGEN INTERACTIONS 9

Virulence assays: adherence, invasion, cytopathic, cytotoxic effects. Criteria & tests in identifying virulence factors, attenuated mutants, molecular characterization of virulence factors, signal transduction & host responses

UNIT V MODERN APPROACHES TO CONTROL PATHOGENS 9

Classical approaches based on serotyping. Modern diagnosis based on highly conserved virulence factors, immuno & DNA-based techniques. New therapeutic strategies based on recent findings on molecular pathogenesis of a variety of pathogens, Vaccines- DNA, subunit and cocktail vaccines.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Eduardo A. Groisman, Principles of Bacterial Pathogenesis, Academic Press, 2001.
2. Tizard: Immunology;Anintroduction;4th Edition,ThomsonPublication.
3. PeterWilliams,JulianKetley&GeorgeSalmond,"MethodsinMicrobiology:Bacterial Pathogenesis, Vol. 27",AcademicPress,1998.
4. Bacterial Pathogenesis–A molecular Approach, Abigali A. Salyers and Dixie D. Whitt, Second Edition, 2002, ASM Press,Washington.

REFERENCES

1. RecentreviewsinInfect.Immun., Mol.Microbiol, Biochem.J., EMBOetc.
2. Nester, Anderson, Roberts, Pearsall, Nester,"Microbiology:AHumanPerspective", McGraw-Hill,3rd Edition,2001.

12BT7D **PLANT BIOTECHNOLOGY** **L T P C**
3 0 0 3

AIM

To develop the skills of the students in the area of Plant Biotechnology and its application in modern world.

OBJECTIVES

At the end of the course the student would have learnt about the applications of Genetic Engineering in Plant and how to develop Transgenic plants. This will Facilitate the student to take up project work in this area.

UNIT I ORGANIZATION OF GENETIC MATERIAL 9

Genetic material of plant cells–nucleosome structure and its biological significance; Junk and repeat sequences; outline of transcription and translation.

UNIT II CHLOROPLAST &MITOCHONDRIA 9

Structure, function and genetic material; rubisco synthesis and assembly, coordination, regulation and transport of proteins. Mitochondria: Genome, cytoplasmic male sterility and import of proteins.

UNIT III NITROGEN FIXATION 9

Nitrogenase activity, nod genes, nif genes, bacteroids.

UNIT IV AGROBACTERIUM & VIRAL VECTORS 9

Pathogenesis, crown gall disease, genes involved in the pathogenesis, Ti plasmid–t- DNA, importance in genetic engineering. Viral Vectors: Geminivirus, cauliflower mosaic virus, viral vectors and its benefits.

UNIT V APPLICATION OF PLANT BIOTECHNOLOGY 9

Outline of plant tissue culture, transgenic plants, herbicide and pest resistant plants, molecular pharming, therapeutic products.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Gamburg OL, Philips GC, Plant Tissue &Organ Culture fundamental Methods, NarosaPublications.1995.
2. SinghBD. Text Book of Biotechnology, Kalyani Publishers. 1998

REFERENCES

1. Heldt HW .Plant Biochemistry & Molecular Biology, OxfordUniversityPress.1997.
2. Ignacimuthu.S, Applied Plant Biotechnology, TataMcGraw-Hill.1996.

12BT7E INDUSTRIAL SAFETY MANAGEMENT L T P C
3 0 0 3

PRE-REQUISITE: Fundamental concepts and basic knowledge in science and engineering

OBJECTIVE: This Course aims to import and improve the knowledge of students in Safety Management, Occupational Health Hazards and make them aware of National & International

Safety Regulations

LEARNING OUTCOME: Students are able to identify all forms of hazards in their work environment. They can prevent the accidents with Safety Management Techniques & Safety Regulations

UNIT- I SAFETY MANAGEMENT & REGULATIONS 8

Safety concept – Safety policy – safety organization – line and staff functions – safety committee – budgeting for safety – Incident Recall Technique – Disaster control – Job safety Analysis – Safety survey – Safety Inspection – safety sampling – safety audit – Factories act – Environmental Act – Safety Data Sheet

UNIT – II HUMAN BEHAVIOUR IN SAFETY 8

Human behavior: Individual Differences, behavior as function of self and situation, perception of danger and acceptance of risk, knowledge and responsibility - Theories of motivation – Role of supervisors – Conflict and frustration: identification and management – BBS Program – Factors impeding safety - Personal protective equipments – Instructions and trainings

UNIT – III CONCEPTS OF ACCIDENT AND PREVENTION 12

Accidents - Reportable and non-reportable – unsafe act and condition – cost of accident - Principles of Accident preventions - Fire safety: Fire triangle – Principles of fire extinguishing – Active and passive fire production systems - classes of fire – types of fire extinguishers – fire rescue operations and fire drills – first aid for burns – Electrical safety and first aid methods – Road safety: accidents due to drivers and pedestrians – factors improving safety on roads – driver safety programme – relaxation and pause – speed and fuel conservation – emergency planning

UNIT – IV OCCUPATIONAL HEALTH & HAZARD MANAGEMENT 9

Definitions - Hazards- Toxicity – Reorganization and Evaluations of Hazards -Local and Systemic Effect – Occupational health – Concept and spectrum of health – Industrial Toxicology - Physical, Chemical and Biological Hazards – Toxic and Radioactive waste – Dilutions – Standards and Restrictions in Toxic waste disposal

UNIT – V BIOSAFETY CONCEPTS 8

Need for Bioethics and Biosafety – Issues and safety in GMO – Aims of NIH in Biosafety - Guidelines for Industries and research organizations – Release of GMOs in Environment – Environmental Impacts - Containment levels - Hazardous waste from biological industries –

Total Hours = 45

TEXT BOOKS:

1. John V Grimaldi and Rollin H Simonds, *Safety Management*, All India Travelers Book Seller, New Delhi, 1989
2. *Occupational Safety Manual*, BHEL, 2002

REFERENCE

1. *Bio Ethics and Biosafety*, M.K. Sateesh, I. K. International Pvt Ltd, 2010

2. John Ridley & John Channing, *Safety at Work*, Butterworth Heinemann, 1983

3. Lees, F.P., *Loss Prevention in Process Industries*, Butterworths, New Delhi, 1986

12BT8A **GENOMICS AND PROTEOMICS** **L T P C**
3 0 0 3

AIM

This course aims to develop the skills of the students in Proteomics and Genomics. This is a prerequisite for certain elective courses offered in the subsequent semesters & for project work.

OBJECTIVES

At the end of this course, the students would have learnt about tools used in Proteomics and Genomics&howtousethem.Thiswillfacilitatethestudentstoundertakeprojects in the modern biology.

UNIT I INTRODUCTION 9

Overview of Genomes of Bacteria, Archae and Eukaryota.

UNIT II PHYSICAL MAPPING TECHNIQUES 9

Top down and bottom up approach; linking and jumping of clones; genome sequencing: placing small fragments on map: STS assembly; gap closure; pooling strategies; cytogenetic mapping techniques

UNIT III FUNCTIONAL GENOMICS 9

Gene finding; annotation ; ORF and functional predication; Subtractive DNA library screening; differential display and representational difference analysis; SAGE;TOG

UNIT IV PROTEOMICS TECHNIQUES 9

Protein level estimation; Edman protein micro sequencing; protein cleavage; 2 D gel electrophoresis; metabolic labeling; detection of proteins on SDS gels; pattern analysis;
Mass spectrometry – principles of MALDI-TOF; tandem MS-MS; Peptide mass fingerprinting.

UNIT V STRUCTURE FUNCTION RELATIONSHIP OF PROTEINS 9

Post translation modification; protein –protein interactions; glycoprotein analysis; phosphoprotein analysis, NMR and Crystallography of protein of elucidate protein structure, protein structure by modally.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Cantor, C.R and Smith, C.L "Geneomics", John Wiley & Sons,1999.
2. Pennington, S.R. and Dunn, M.J."Proteomics: from Protein Sequence to Function", viva books publishers, 2002.
3. Liebler, D.L. " Introduction to Proteomics : Tools for the new Biology", Humana press, 2002.
4. Hunt , S.P. and Livesey, F.L. " functional genomics ", oxford university Press ,2000.

12BT8B **ANIMAL BIOTECHNOLOGY** **L T P C**
3 0 0 3

AIM

To develop the skills of the students in the area of animal biotechnology and its applications.

OBJECTIVES

At the end of the course, the student would have learnt about animal cell culture, molecular diagnostic of animal diseases and Transgenic animal production. This will facilitate the student to undertake project work in this area.

UNIT I ANIMAL CELL CULTURE 9

Introduction to basic tissue culture techniques; chemically defined and serum free media; animal cell cultures, their maintenance and preservation; various types of cultures- suspension cultures, continuousflow cultures, immobilized cultures; somatic cell fusion; cell cultures as a source of valuable products; organ cultures.

UNIT II ANIMAL DISEASES AND THEIR DIAGNOSIS 9

Bacterial and viral diseases in animals; monoclonal antibodies and their use in diagnosis; molecular diagnostic techniques like PCR, *in-situ* hybridization; northern and southern blotting; RFLP.

UNIT III THERAPY OF ANIMAL DISEASES 9

Recombinant cytokines and their use in the treatment of animal infections; monoclonal antibodies in therapy; vaccines and their applications in animal infections; genetherapy for animal diseases.

UNIT IV MICROMANIPULATION OF EMBRYO'S 9

What is micromanipulation technology; equipments used in micromanipulation; enrichment of x and y bearing sperms from semen samples of animals; artificial insemination and germ cell manipulations; in vitro fertilization and embryo transfer; micromanipulation technology and breeding of farm animals.

UNIT V TRANSGENIC ANIMALS 9

Concepts of transgenic animal technology; strategies for the production of transgenic animals and their importance in biotechnology; stemcell cultures in the production of transgenic animals.

TOTAL: 45 PERIODS

TEXT BOOKS

1. RangaM.M. Animal Biotechnology. AgrobiosIndiaLimited,2002
2. RamadassP, MeeraRani S.TextBook of Animal Biotechnology. Akshara Printers,1997.
3. R.Ian Freshney Culture of Animal cells, A Manual of basic technique 4th Edition2002.

REFERENCES

1. MastersJ.R.W.AnimalCellCulture:PracticalApproach.OxfordUniversityPress, 2000

12BT8C IMMUNOTECHNOLOGY

L	T	P	C
3	0	0	3

AIM

To develop the skills of the students in the area of Immunotechnology pre-requisite for PG studies in biotechnology & related fields.

OBJECTIVES

At the end of the course, the student would have learnt various techniques like Developing diagnostic tests, characterization of lymphocytes, purification of antigens, Antibody Engineering etc. This knowledge will beneficial for Industrial applications.

UNIT I ANTIGENS 9

Types of antigens, their structure, preparation of antigens for raising antibodies, handling of animals, adjuvants and their mode of action.

UNIT II ANTIBODIES& IMMUNODIAGNOSIS 9

Monoclonal and polyclonal antibodies–their production and characterization, western blot analysis, immune electrophoresis, SDS-PAGE, purification and synthesis of antigens, ELISA-principle and applications, radio immunoassay(RIA) principles and applications, non isotopic methods of detection of antigens-enhanced chem. Luminescence assay.

UNIT III ASSEMENT OF CELL MEDIATED IMMUNITY 9

Identification of lymphocytes based on CD markers, Tcell activation parameters, cytokine Bioassay, macrophages activation, macrophage microbicidal assays, FACS, HLA typing.

UNIT IV VACCINE TECHNOLOGY 9

Basic principles of vaccine development, protein based vaccines, DNA vaccines, Plant based vaccines, Recombinant antigens as vaccines, Reverse Vaccinology

UNIT V DEVELOPMENT OF IMMUNOTHERAPEUTICS 9

Engineered antibodies, catalytic antibodies, production of idiotypic and antidiotypic antibodies, combinatorial libraries for antibody isolation.

UNIT VI CURRENT TOPICS IN IMMUNOLOGY

Trends in Immunology of infectious diseases and tumors, topics as identified from time to time.

TOTAL: 45 PERIODS

TEXT BOOKS

1.Talwar G.P. and Gupta S.K.,"Ahandbookofpracticalandclinicalimmunology" Vol.1&2, CBS Publications, 1992.

2. Weir D.M.,Practical Immunology, Blackwell ScientificPublications,Oxford,1990.

REFERENCES

1.AustinJ.M.and WoodK.J.,Principle of cellular and molecular immunology, Oxford universitypress,Oxford,1993.

12BT8D MOLECULAR MODELING & DRUGDESIGN L T P C 3 0 0 3

AIM

To develop skills of students in the area of Molecular modeling. Pre requisite for courses on Drug Design

OBJECTIVES

At the end of the course the student would have learnt Classical &Statistical mechanics, and Quantum mechanics and its applications.

UNIT I INTRODUCTION TO CLASSICAL MECHANICS 9

Newtons laws of motion–time intervals-algorithms

UNIT II INTRODUCTION TO STATISTICAL MECHANICS 9

Boltzman's Equation–Ensembles–Distribution law for non interacting molecules– Statistical mechanics of fluids.

UNIT III QUANTUM MECHANICS 9

Photoelectric effect–De Broglies hypothesis– Uncertainty principle–Schrodingers time independent equation–particle in a one-dimensional box.

UNIT IV GROMOS,GROMACS,AMBER&DOCK 9

Energy minization, application of Fourier transformer – force fields – principal components analysis–RMSD calculation–applications–dynamics of a molecule– concepts of parallezing work.

UNIT V GAUSSIAN98 9

Methods–Basic sets–Model chemiststrix–inputs–outputs–uses.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Statistical Mechanics; D. McQuarrie, Narosa, 1999.
2. Quantum Mechanics; D. McQuarrie, Narosa,1999.

REFERENCES

1. GROMOS Handbook

12BT8E **NEUROBIOLOGY AND COGNITIVE SCIENCES** **L T P C**
3 0 0 3

AIM

To develop the skills of students in the area of macrobiology and cognitive sciences.

OBJECTIVES

At the end of the course, the student would have learnt about the human nervous system, neurophysiology & neuropharmacology. The student also gains knowledge in the mechanisms of neurological behaviour.

UNIT I NEUROANATOMY 9

What are central and peripheral nervous systems; Structure and function of neurons; types of neurons; Synapses; Glial cells; myelination; Blood Brain barrier; Neuronal differentiation; Characterization of neuronal cells; Meninges and Cerebrospinal fluid; Spinal Cord.

UNIT II NEUROPHYSIOLOGY 9

Resting and action potentials; Mechanism of action potential conduction; Voltage dependent channels; nodes of Ranvier; Chemical and electrical synaptic transmission; information representation and coding by neurons.

UNIT III NEUROPHARMACOLOGY 9

Synaptic transmission, neurotransmitters and their release; fast and slow neurotransmission; characteristics of neurites; hormones and their effect on neuronal function.

UNIT IV APPLIED NEUROBIOLOGY 9

Basic mechanisms of sensations like touch, pain, smell and taste; neurological mechanisms of vision and audition; skeletal muscle contraction.

UNIT V BEHAVIOURSCIENCE 9

Basic mechanisms associated with motivation; control of feeding, sleep, hearing and memory; Disorders associated with the nervous system.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Mathews G.G.Neurobiology,2nd edition, Blackwell Science, UK, 2000.

12BT8F	PROCESS INSTRUMENTATION DYNAMICS AND CONTROL	L	T	P	C
		3	0	0	3

AIM

To introduce control equipments used to control the production process of a chemical factory and to introduce the control mechanism through automation and computers.

OBJECTIVES

Gains knowledge in designing a control system and identifying the alternative control configuration for a given process plant or entire plant. He will be familiar with the control mechanism before attempting to tackle process control problems.

UNIT I **9**

Laplace transformation, transform of standard functions, derivatives and integrals, inversion, theorems in Laplace transformation, application .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, transfer function for chemical reactors and dynamics.

UNIT II **9**

Closed loop control systems, development of block diagram for feed-back control systems, servo and regulator 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 **9**

Introduction to frequency response of closed-loop systems, control system design by frequency, Bode diagram, stability criterion, Nyquist diagram; Tuning of controller settings.

UNIT IV **9**

Controller mechanism, introduction to advanced control systems, cascade control, feed forward control, control of distillation towers and heat exchangers, introduction to microprocessors and computer control of chemical processes.

UNIT V **9**

Principles of measurements and classification of process control instruments, measurementsoftemperature,pressure,fluidflow,liquidweightandweightflowrate, viscosity and consistency, pH, concentration, electrical and thermal conductivity, humidity of gases, composition by physical and chemical properties and spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS

1. CoughnowrandKoppel,"ProcessSystemsAnalysisandControl",McGraw-Hill,New York,1986.
2. George Stephanopolous,"Chemical Process Control", Prentice-Hall of India Pvt. Ltd., NewDelhi,1990.
3. Patranabis.D,PrinciplesofProcesscontrol,IIedition,TataMcGraw-HillPublishing Co.Ltd.,1981.

REFERENE

1. Thomas, E. Marlin, Process Control, 2nd Edn, McGraw-Hills International Edn. 2000.
2. George Stephanopoulos, Chemical Process Control, Prentice Hall of India 2003.
3. Norman H.CEAGLSKE, Automatic process control for chemical engineers, John Wiley & Sons, Japan.
4. Emenule, S.Savas, "Computer Control of Industrial Processes", McGraw-Hill, London, 1965.
5. Eckman, D.P., "Industrial Instrumentation",Wiley,1978

12BT8G **PROCESS EQUIPMENTS AND PLANTDESIGN** **L T P C**
3 0 0 3

AIM

To develop the skills of the students in the area of process equipment and Design.This is a pre-requisite for higher PG studies in Biotechnology.

OBJECTIVES

At the end of the course, the student would have learnt about various types of process equipment, principles involved in their function, and its industrial applications.

UNIT I HEAT EXCHANGERS, CONDENSERS, EVAPORATORS 9

Single and multiprocess exchangers, double pipe, U tube heat exchangers, combustion details supporting structure. Single and vertical tube evaporation, Single and multi effect evaporators, forced circulation evaporators

UNIT II STORAGE VESSEL FOR VOLATILE AND NONVOLATILE FLUIDS, PRESSUREVESSEL STRUCTURE 9

Design of the following equipments as per ASME, ISI codes, drawing according to scale; Monoblock and multiplayer vessels, combustion details and supporting structure.

UNIT III EXTRACTOR, DISTILLATION AND ABSORPTION TOWER 9

Construction details and assembly drawing; Plate and Packed Extraction Towers; Plate and Packed absorption Towers; Plate and Packed Distillation Towers.

UNIT IV PUMPS, MECHANICAL SEALS, VALVES AND SWITCHES 9

Various types of pumps, Principle of working, construction, usages, advantages and disadvantages; Various types of seals, effectiveness, usages; Pneumatic Seals; Gate, Globe and Butterfly Valves, their material of construction; Pneumatically Controlled Valves.

UNIT V PIPING,PLANTLAYOUTANDDESIGN 9

Various types of Piping, material of construction, their usage; Pipe layout; Modern Plant Design and case Studies.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Brownbell I.E.,YoungE.H.,ChemicalPlantDesign,1985
2. Kern D.Q. “Heat Transfer”, McGraw-Hill,1985.

REFERENCES

1. McCabe W.L., Smith J.C. “Unit Operations in Chemical Engineering”, McGraw-Hill, 1976.