

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**

[1st To 8th Semester]

THIS IS THE FINAL VERSION OF THE SYLLABUS AS
RATIFIED AND APPROVED BY THE ACADEMIC COUNCIL
OF THE COLLEGE IN THE MEETINGS HELD ON 7/7/2012,
1/6/2013 & 12/4/2014

DEAN(ACAD)

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.

**REGULATIONS FOR UG PROGRAMME (B.E/B.Tech)
CANDIDATE ADMITTED DURING THE ACADEMIC
YEAR 2012 - 2013 AND ONWARDS
[UG Regulation-2012]**

I. 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 examination (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 Anna University as equivalent thereto
(or)
- v) Any other examinations as notified by the Government of Tamilnadu

LATERAL ENTRY ADMISSION (YEAR 2013 - 2014 AND ONWARDS)

Candidate who have passed the Diploma in Engineering / Technology conducted by the State Board of Technical Education and training are eligible for admission to the third semester under lateral entry scheme of the B.E / B.TECH degree programmes.

Any other conditions as notified by the Government of Tamilnadu

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 theory and practical courses such as:
- i) General core courses comprising Mathematics, Basic sciences, Engineering Sciences, Humanities and Engineering.
 - 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, industrial visit, etc.,
 - v) NSS/RRC/ISTE/CISCO/IEEE/YRC/SPORTS 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, examination and project report shall be in English, expect 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 for HSC students and three years for lateral entry students. 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 period specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

5. SYSTEMS OF EXAMINATION

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

Theory

End semester examination 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 60 marks} : 60 marks
- 2) Assignment /Seminar/mini project : 30 marks
 - a) Assignment 2 Nos (or)
 - b) 1 Assignment +1 Seminar (or)
 - c) 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 Performa. The progress of 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 maximum marks for the practical/lab component courses shall be 100, out of which the continues internal assessment will carry 25 marks, while the end semester practical examination will carry 75 marks. If any practical course contains Part A 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 internal and external examiners shall conduct the end semester practical examination and award marks. 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 vivo-voce examination the maximum marks shall be 200 comprising 150 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 150 the project report shall carry a maximum of 50 marks (same mark must be awarded to every student of the project group) while the viva-voce **examination shall carry 100 marks** (awarded to each student of the project group based on the individual performance in the viva-vice examination).

For internal mark:

Work assessed by Guide/Supervisor : 50 % weight
Work assessed by Committee : 50 % weight
(Committee consists of 3 members one among them is the Guide/Supervisor)

6. REQUIREMENTS FOR EXAMINATION AND ATTENDANCE

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

- 6.1 i. A candidate will be permitted to appear for the examination for any semester, only if 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 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 Candidate representing university in State/National/International /Inter University sports events, co and extra-curricular activities, paper or project presentation with prior permission form the head of the institution are given exemption up to 10% of the required attendance and such candidates shall be permitted to appear for the current semester examinations.
 - iii his/her conduct and progress have been certified to be satisfactory by the concerned head of the department.
 - iv Condonation can be allowed only two times during his/her entire course of study.
- 6.2 Candidates 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 go to next semester. They are required to repeat the incomplete semester in the next academic year.

7. PROCEDURE 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 3 times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the department shall affix the signature and date after due verification at the end of the semester. This 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% Weight]

Three tests each carrying sixty (60) marks shall be conducted by the department / Institution. The total marks obtained in all tests put together out of 180, 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 / Seminar / Miniproject [30% weight]

i) Assignment:

Two assignments each carrying 15 marks and requiring work of average 5 to 6 hours of study and written work of average 5 to 6 hours shall be given to be carried out by each student in a separate assignment folder, duly indexed with headings, date of submission, Marks, remarks and signature of faculty with date etc.

ii) Assignment and seminar

A student has to carry out one assignment and one seminar carrying 15 marks each. An assignment normally requires work of average 5 to 6 hours of study and written work of average 5 to 6 hours which has to be submitted in a separate assignment folder, duly indexed with headings, date of submission, Marks, remarks and signature of faculty with date etc.,

The student has to make one technical seminar on current topics related to the specialization. The students are expected to submit a report of his / her presentation. The seminar will be assessed by the course tutor with common parameters as described by the department.

iii) Mini Project

A student has to carry out mini project carrying 30 marks either in hardware or software with the approval of the head of the department. The student has to submit a report before the end of the semester. Mini project will be assessed based on the model presentation and report as decided by the department.

(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 to 2013 and onwards. If a candidate scores a minimum of 50% marks in the end semester examination, after three attempts (first attempt + two more attempts), he / she would be declared as passed in that examination.

iii. Practical Subjects [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 determining 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.

iv. 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 weight	: 50%
Assessment by a three (3)-member internal review committee (Guide will be one of the members of the committee)	: 50%weight

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 a minimum of 50% 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 semester.
 - (b) he/she should be eligible to register for the examination and satisfy rule 8(iii).
 - (c) he/she should have registered for all the examination of the previous semesters.
- (ii) A candidate will be permitted to proceed from one semester to the next higher semester only if he/she has satisfied the regulation for eligibility to appear for the end semester examination in the 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 subject.
- (iii) A candidate should have completed B.E/B.Tech, degree course within a period of SEVEN (or 14 semesters) consecutive academic years (Six consecutive years or 12 semesters for lateral entry students) from 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.

B.E /B.Tech. (Full Time)	Minimum Number of Semester	Maximum Number of Semesters
HSC Candidates	8	14
Lateral Entry Candidates	6	12

9. REQUIREMENTS TO APPEAR FOR END SEMESTER EXAMINATION

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

10. PASSING MINIMUM AND CLASSIFICATION OF SUCCESSFUL CANDIDATE

- (i) For each subject the examination 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 marked secured for 100 is converted to 75, minimum 37 marks must be secured for pass. If any programme, during any semester, conducts the laboratory in two parts, say part a A and Part B, a candidate should register and appear for both parts in the end semester practical examination. If a candidate for any reason is absent in any one part of the practical examination, despite his/her presence in the other part, he/she is declared as fail in both parts A and B (marked as absent in end semester examination) and should appear again for both part A and B in the next attempt. For a pass, a candidate should secure a minimum of 50% in each part and final mark secured is the sum of marks secured in Part A and B.
- (ii) A candidate who successfully completes the course requirements and has passed all the prescribed examinations in all the eight semester 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 subject 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 a CGPA of not less than 8.5 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 construed 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 a CGPA of not less than 8.5 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 construed as an 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 examination in all the subject of the course in the semester first to eight within a maximum period of ten consecutive semester after his/her commencement of study in the first semester and secures a CGPA of not less than 6.5 for the entire course shall be declared to have to have passed the examination for the degree in FIRST CLASS. For this purpose, the authorized break of the study will not be counted for the purpose of classifications.
- (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 SHEET

Individual mark sheet for each semester will be issued, through the head of the department concerned, after the publication of the result.

The mark sheet will contain credit, grade, grade point and result status for the course concerned.

12. MALPRACTICE

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

13. REVALUATION

- (i) Copies of answer script for the 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 course and for project work.
- (iii) Re totaling 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 has

- (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 (6 semesters within a maximum period of 6 years for lateral entry candidates) from the commencement of first semester (third semester for lateral entry) 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 the like the "QUALITY CIRCLE" (more commonly used in industries) with the overall goal of improving the 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 course

(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 provided some additional or guidance of 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 3 girls) shall be included in the class committee.

15.5 The chairperson of the class committee any 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 same 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 institutions.

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 students in planning their courses of 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

students 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 of students 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 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. Wherever it is feasible, the course 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 sought. 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 Department and approved by the Head of the Institution.
- (iii) Withdrawal shall not be construed 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 discontinued 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 than 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 of rejoining.
- (iii) The duration specified for passing all the course 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/third 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 (three for lateral entry) 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 CGPA. Student transferred from other institution to P.S.R. Engineering College are not eligible for rank.

21. PROCEDURE FOR USING SCRIBER

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

22. INDUSTRIAL VISIT

Every student is required to undergo one industrial visit, starting from the third semester of the programme. Every teacher shall take the students are least for one industrial visit in a year.

23. PERSONALITY AND CHARACTER DEVELOPMENT

All students shall enroll, on admission, in any one of their personality and character development programmes (NSS/YRC/RRC/ISTE/IEEE/CISCO). The training shall include classes to 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 service 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.
- INSTITUTION OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) will have activities to enhance professional students innovative skill.
- COMPUTER INFORMATION SYSTEM COMPANY (CISCO) will have activities to enhance professional student’s innovative skill with help of 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 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 indiscipline being reported, the principal shall constitute a disciplinary committee consisting of three heads of department of which one should be from the faculty of the student, to inquire into acts in 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 from director of technical education/university.

25. CREDIT SYSTEM

The letter grade and the grade point are awarded base on percentage of marks secure 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 result are declared, grade sheets will be issued to each student which will contain the following details:

- The list of subjects enrolled the semester and the grades scored.
- The grade point average (GPA) for the semester and
- The cumulative grade point average (CGPA) of all subject enrolled from first semester onwards.

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

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

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 course enrolled from first semester, "U", "T", and "W" grades will be excluded for calculating GPA and CGPA.

Each course is normally assigned certain number of credits with 1 credit per lecturer 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).

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.

----- End -----

REGULATION – 2012
B.TECH.BIOTECHNOLOGY
CURRICULUM & SYLLABI (I to VIII Semester)

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	Computing Fundamentals and C 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.	Sub. Code	Subject Name	Internal Marks	Final Exam Marks	Total Marks	Hrs & 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	0	0	3
6	12F2E5	Circuit Theory (For EEE branch only)	25	75	100	3	1	0	4
7	12F2X5	Electric Circuits and Electron Devices (For ECE,CSE,IT branches)	25	75	100	3	1	0	4
8	12F2X6	Basic Civil and Mechanical Engineering (For Circuit branches)	25	75	100	3	1	0	4
9	12F2Y6	Basic Electrical and Electronics Engineering(For Non-Circuit branches)	25	75	100	3	1	0	4

Practical									
10	12F2Z7	Physics and Chemistry Laboratory - II	25	75	100	0	0	3	2
11	12F2X7	Computer Aided Drafting and Modeling Laboratory (For Non Circuit Branches)	25	75	100	0	0	3	2
12	12F2E7	Electrical Circuit Laboratory (For EEE)	25	75	100	0	0	3	2
13	12F2Z8	Computer Practice Laboratory - II	25	75	100	0	0	3	2
14	12F2X8	Electric Circuits and Electron Devices Laboratory (ECE,CSE,IT)	25	75	100	0	0	3	2
Total					900	18	3	9	27

S.N	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	Principals 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	1	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	1	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	12BT5	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	2
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 A	25	75	100	3	0	0	3
6		Elective B	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	0
Total					900	21	0	11	25

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		Elective C	25	75	100	3	0	0	3
5		Elective D	25	75	100	3	0	0	3
6		Elective E	25	75	100	3	0	0	3
Practical									
7	12BT74	Bioprocess Lab	25	75	100	0	0	4	3
8	12BT66	Downstream Processing lab	25	75	100	0	0	0	3
Total					800	21	1	0	28

S NO.	Subject Code	Course Title	Internal Marks	Final Exam Marks	Total Marks	Credits			
						L	T	P	C
SEMESTER VIII									
Theory									
1		Elective F	25	75	100	3	0	0	3
2	12MG71	TOTAL QUALITY MANAGEMENT	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 – A

CODE NO.	COURSE TITLE	L	T	P	C
12BTA1	Marine Biotechnology	3	0	0	3
12BTA2	Stem Cell Technology	3	0	0	3
12BTA3	Molecular Pathogenesis	3	0	0	3

ELECTIVE - B

CODE NO.	COURSE TITLE	L	T	P	C
12BTB1	Principles of Food Processing	3	0	0	3
12BTB2	Bioconjugate Technology	3	0	0	3
12BTB3	Cancer Biology	3	0	0	3

ELECTIVE - C

CODE NO.	COURSE TITLE	L	T	P	C
12BTC1	Plant Biotechnology	3	0	0	3
12BTC2	Biophysics	3	0	0	3
12BTC3	Biological Spectroscopy	3	0	0	3

ELECTIVE -D

CODE NO.	COURSE TITLE	L	T	P	C
12BTD1	Process Instrumentation Dynamics and Control	3	0	0	3
12BTD2	Animal Biotechnology	3	0	0	3
12BTD3	Process Equipments and Plant Design	3	0	0	3

ELECTIVE - E

CODE NO.	COURSE TITLE	L	T	P	C
12BTE1	Biopharmaceutical Technology	3	0	0	3
12BTE2	Molecular Modeling & Drug Design	3	0	0	3
12BTE3	Metabolic Engineering	3	0	0	3

ELECTIVE - F

CODE NO.	COURSE TITLE	L	T	P	C
12BTF1	Proteomics and Genomics				
12BTF2	Immunotechnology	3	0	0	3
12BTF3	Neurobiology and Cognitive Sciences	3	0	0	3
12BTF4	Bioprocess Economics 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= 60PERIODS

TEXT BOOK

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. CambridgeBEC Preliminary 2 Student's Book with Answers: Examination papers from University of Cambridge ESOL 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

12F1Z2	ENGINEERING MATHEMATICS – I	L T P C
	(COMMON TO ALL BRANCHES)	3 1 0 4
UNIT I	MATRICES	12
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	12
Introduction – Sphere - Tangent plane - Plane section of a sphere–Lines - Skew lines – Coplanar lines — Equation of cylinder - Right circular cylinder.		
UNIT III	DIFFERENTIAL CALCULUS	12
Curvature - Radius of curvature - Cartesian and Parametric Coordinates - Circle of Curvature - Involute and Evolute – Envelope - Evolute as Envelope of its normal.		
UNIT IV	FUNCTIONS OF SEVERAL VARIABLES	12
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	12
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= 60PERIODS

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.
4. 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 Company,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
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Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coefficients - 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
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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
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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
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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 Publications Ltd, 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 characterization and 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 – butylRubber, 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 batterie.

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	COMPUTING FUNDAMENTALS AND C 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

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

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 BOOK

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.
7. Publishing Company Limited (2008).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. 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.

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)

REFERENCES

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 EXERCISES

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.

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 CRO.
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= 45PERIODS

REFERENCES

1. K.Jeyachandran, S.Natarajan and S, Balasubramanian, “A Primer on Engineering Practices Laboratory”, Anuradha Publications, (2007).
2. T.Jeyapooan, M.Saravanapandian and S.Pranitha, “Engineering Practices Lab Manual”, Vikas Publishing House Pvt.Ltd, (2006)
3. H.S. Bawa, “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, (2007).
4. A.Rajendra Prasad and P.M.M.S. Sarma, “Workshop Practice”, Sree Sai Publication, (2002).
5. P.Kannaiah and K.L.Narayana, “Manual on Workshop Practice”, Scitech Publications, (1999).

12F2Z1

TECHNICAL ENGLISH-II

L T P C

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 and Indirect Speech.

TOTAL= 60PERIODS

TEXT BOOK

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. Cambridge BEC Preliminary 1 : Practice Tests from the University of Cambridge Local Examinations Syndicate, University of Cambridge Local Examinations Syndicate, PB,

ISBN: 9780521753012

7. Cambridge BEC Preliminary 2 Student's Book with Answers : Examination papers from University of Cambridge ESOL Examinations, Cambridge ESOL, PB, ISBN: 9780521544504

12F2Z2 ENGINEERING MATHEMATICS – II L T P C
(COMMON TO ALL BRANCHES) 3 1 0 4

UNIT I LAPLACE TRANSFORM 12

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 12

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 12

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 12

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 12

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 Company, 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 – Clausius – 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) Newdelhi.
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).

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. **(for Internal test / Assignment.)**

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 Coulomb friction – simple contact friction – Rolling resistance – Belt friction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL= 60 PERIODS

TEXT BOOK

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. Hibbeler, 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).

12F2E5 CIRCUIT THEORY L T P C
(For EEE Branch Only) 3 1 0 4

UNIT I BASIC CIRCUITS ANALYSIS 12
 Ohm’s Law – Kirchoff’s laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 12
 Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin’s and Norton’s Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12
 Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC AND AC CIRCUITS 12
 Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSING THREE PHASE CIRCUITS 12
 Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced and un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL= 60 PERIODS

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, Tata McGraw Hill publishers, 6th edition, New Delhi, 2002.
2. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, Tata McGraw Hill, (2007).

REFERENCES

1. Paranjothi SR, “Electric Circuits Analysis,” New Age International Ltd., New Delhi, (1996).
2. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum’s series, Tata McGraw- Hill, New Delhi (2001).
3. Chakrabati A, “Circuits Theory (Analysis and synthesis), Dhanpath Rai and Sons, New Delhi, (1999).
4. Charles K. Alexander, Mathew N.O. Sadik, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, (2003).

12F2X5 ELECTRIC CIRCUITS AND ELECTRON DEVICES L T P C
 (For ECE, CSE and IT Branches) **3 1 0 4**

UNIT I CIRCUIT ANALYSIS TECHNIQUES 12

Kirchoff’s current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 12

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III SEMICONDUCTOR DIODES 12

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV TRANSISTORS 12

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 12

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TOTAL= 60 PERIODS

TEXT BOOKS

1. Joseph A. Edminister, Mahmood, Nahri, “Electric Circuits” – Shaum series, Tata McGraw Hill, (2001)

2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, “Electronic Devices and Circuits”, Tata McGraw Hill, 2nd Edition, (2008).
3. David A. Bell, “Electronic Devices and Circuits”, Oxford University Press, 5th Edition, (2008).

REFERENCES

1. Robert T. Paynter, “Introducing Electronics Devices and Circuits”, Pearson Education, 7th Edition, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmely and Steven M. Durbin, “Engineering Circuit Analysis”, Tata McGraw Hill, 6th Edition, 2002.
3. J. Millman & Halkins, Satyabranta Jit, “Electronic Devices & Circuits”, Tata McGraw Hill, 2nd Edition, 2008.

12F2X6 BASIC CIVIL & MECHANICAL ENGINEERING L T P C
 (For circuit branches) **3 1 0 4**

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

Civil Engineering Materials: Bricks : Properties & uses – Manufacturing, stones:Types, Cement: Manufacturing –Properties-Types of use, concrete: Manufacturing, Sand – steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 15

Components of Building with typical cross section sketch

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – illustrative examples - Types of Bridges and Dams .

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV I C ENGINES 10

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL= 30 PERIODS

REFERENCES

1. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, TMH Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. “Basic Civil Engineering”, Anuradha Agencies, (2005).

4. Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000). Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

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

(Common to branches under Civil, Mechanical and Technology faculty)

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 (Block Diagram Approach only).

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, McC 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.

REFERENCES

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** **L T P C**
LABORATORY **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 mixer, 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

12F2E7	ELECTRICAL CIRCUIT LABORATORY (For EEE only)	L T P C 0 0 3 2
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LIST OF EXPERIMENTS

1. Verification of ohm's laws and Kirchoff's laws.
2. Verification of Thevenin's and Norton's Theorem
3. Verification of Superposition Theorem
4. Verification of Maximum Power Transfer Theorem.
5. Verification of Reciprocity Theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

12F2Z8	COMPUTER PRACTICE LABORATORY-II	L T P C 0 0 3 2
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LIST OF EXERCISES

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

Shell Programs

3. Simple Shell Programs
4. Script using for Loop
5. Script using if loop
6. Script using combination of for and if loop
7. Script using while and until loop
8. Script using combination of while and if loop
9. Script using Switch case
10. String Manipulation
11. 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

SYLLABUS

1. UNIX COMMANDS

Study of UNIX OS - Basic Shell Commands - Unix Editor.

2. SHELL PROGRAMMING

Simple Shell program - Conditional Statements - Testing and Loops.

3. C PROGRAMMING ON UNIX

Dynamic Storage Allocation-Pointers-Functions-File Handling.

12F2X8	CIRCUITS AND DEVICES LABORATORY	L	T	P	C
		0	0	3	2

LIST OF EXERCISES

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac.
12. Characteristics of Photodiode and Phototransistor.

12MA31	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
	(Common to all B.E. / B.Tech Degree Programmes)	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: 45 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)aquatic ecosystems(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. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).
2. P. Meenakshi, "Elements of Environmental science and Engineering", Prentice 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. I and II, 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, New Delhi, 2007.
5. Rajagopalan, R, 'Environmental Studies-From Crisis to 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, Ca²⁺ 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, Lodish H, Baltimore D, "Molecular Cell Biology", W.H. Freeman;
2. Kimball T.W., "Cell Biology", Wesley Publishers;

REFERENCES

1. De Robertis & De Robertis, "Cell Biology".
James D. Watson, "Molecular Biology of the 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, Bioseparation etc.

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 active site and energetics of enzyme substrate complex formation; specificity of enzyme action; Stereochemistry—R,S notation—re-
sifaces—e, zisomerism—conformers—ethane—cyclohexane—reactivates mechanisms of sn_1 sn_2 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 9
OF ENZYME STRUCTURE AND MECHANISM

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 Michaelis—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
AIM		3 0 0 3

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 biomolecular and relevance to clinical conductors.
- To correlate biochemical processes with biotechnology applications.

UNIT I INTRODUCTION TO BIOMOLECULES 5
 Classification of enzymes. Mechanisms of enzyme action; concept of active site and energetics of Basic principles of organic chemistry, types of functional groups, biomolecules, chemical nature, water, pH and biological buffers.

UNIT II STRUCTURE AND PROPERTIES 9
 Structure and properties of Important Biomolecules.
Carbohydrates(mono, di, oligo & polysaccharides) Proteoglycans, glucosaminoglycans. Mutarotation, glycosidic bond, reactions of monosaccharides, reducing sugars.
Lipids: fatty acids, 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, TCA cycle, gluconeogenesis, pentose phosphate shunt, glyoxalate shunt, fatty acid 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. and M.M. Cox, "Lehninger's Principles of Biochemistry", 4th Edition, W.H. Freeman & Co., 2005.
2. Stryer, L., "Biochemistry", 4th Edition, W.H. Freeman & Co., 2000.
3. Voet, D. and Voet, J.G., "Biochemistry", 3rd Edition, John Wiley & Sons Inc., 2004.
4. Murray, R.K., et al "Harper's Biochemistry", 23rd Edition, Prentice Hall International, 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 AlliumCepa (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 1 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 BOOK

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

REFERENCES

- Robert H.Tamarin, "Principles of Genetics" 7 ed., Tata McGraw Hill, 2002.
- 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. Geankoplis C.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 RELIABILITY 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 McGrawHill, 4th edition, 2007.(For units 1 and 2)

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 andScientists”,SeventhEdition,PearsonsEducation,Delhi,2002.
2. Navidi,W,“StatisticsforEngineersand Scientists”,SpecialIndianEdition,Tata McGraw-Hill Publishing CompanyLtd,NewDelhi,2008.
3. SpiegelM.R,SchillerJandAluSrinivasanR,“Schaum’sOutlinesProbabilityand Statistics”, TataMcGraw-Hill PublishingCompanyLtd.NewDelhi,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 10

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., Van Ness 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. "Chemical And Engineering Thermodynamics" John Wiley, 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

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

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 quantitate 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,TalaronA,Casita,Pelczar And Reid.FoundationsInMicrobiology, 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 METHODS OF ANALYSIS LABORATORY **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 KMnO_4
2. Finding the molar absorptivity and stoichiometry of the $\text{Fe}(1,10\text{phenanthroline})_3$ Using absorption spectrometry.
3. Finding the pKa of 4-nitrophenol 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 nucleicacids.
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
2. Pressure drop in pipes and packed columns
3. Fluidization
4. Filtration
5. Heat exchanger
6. Simple and steam distillation
7. Distillation in packed column
8. Liquid-liquid equilibria in extraction
9. Adsorption equilibrium

12HS41 PROFESSIONAL ENGLISH-II **L T P C**
0 0 1 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–Africa 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 INDUSTRIAL BIOTECHNOLOGY	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, phenylalanine, 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 (xanthan gum, 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. Casida Jr, L.E., "Industrial Microbiology", New Age International (P) Ltd.
2. Prescott, 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 10

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 6

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 10

Biosynthesis of nucleotides, denovo and salvage pathways for purines and pyrimidines, Biosynthesis and degradation of starch and glycogen, Biosynthesis an degradationof 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 9

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

UNIT V STRUCTURAL PROTEINS AND CYTOSKELETON 10

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: 45 PERIODS

TEXT BOOKS

- 1.Lehninger'sPrinciplesofBiochemistrybyDavid L.NelsonandMichaelMcox,MacmillanWorthPublisher
2. LubertStryer,Biochemistry, 4thEdition,WHFreeman&Co.,2000.

REFERENCES

1. VoetandVoet,Biochemistry,2nd Edition,JohnWiley&SonsInc.,1995.
- 2.Murray,R.K., Granner,B.K., Mayes,P.A., Rodwell.V.W.,Harper's Biochemistry, PrenticeHall International.
3. Creighton. T.E., Proteins, Structure and Molecular Properties, 2nd Edition, W.H. Freeman and Co.,1993.
4. Salway,J.G.,MetabolismataGlance,2nd Edition,Blackwell ScienceLtd.,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	9
Molecular diffusion in fluids and solids; Inter phase Mass Transfer; Mass Transfer coefficients; Analogies in Transport Phenomenon		
UNIT II	GAS LIQUID OPERATIONS	9
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	9
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	9
L-L equilibria, Staged and continuous extraction, Solid-liquid equilibria, Leaching Principles.		
UNIT V	SOLID FLUID OPERATIONS	9
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.MassTransfer Operations.3rdedition.McGraw-Hill,1981.
2. GeankoplisC.J.TransportProcessesandUnitOperations.3rdedition,PrenticeHall ofIndia,2002.

REFERENCES

1. CoulsonandRichardson’sChemicalEngineering.Vol.I&II,AsianBooksPvt.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	10
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	8
In prokaryotes and eukaryotes, features of promoters and enhancers, transcription factors, nuclear RNA splicing, ribozyme.		
UNIT III	TRANSLATION	10
Elucidation of genetic code, mechanism, codon usage, suppressor mutation		
UNIT IV	REGULATION OF PROKARYOTE GENE EXPRESSION	9

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

UNIT V REGULATION OF EUKARYOTE GENE EXPRESSION AND REPAIR 8
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
(Common to All B.E./B.Tech)

L	T	P	C
0	0	3	2

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	4	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.

1. 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 & Proteins).
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 genomicDNA
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 an Bioprocess principles. This is a pre-requisite for courses an 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 take up PG courses in Bioprocess, Biochemical Engg., and also the project work.

UNIT I SCOPE OF CHEMICAL KINETICS & CHEMICAL REACTION ENGINEERING 8

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 10

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

UNIT III IDEAL FLOW AND NON IDEAL FLOW 10
RTD in non-ideal flow; non-ideal flow models; reactor performance with non-ideal flow.

UNIT IV GAS-SOLID,GAS-LIQUID REACTIONS 9
Resistances and rate equations; heterogeneous catalysis; reactions steps; resistances and rate equations.

UNIT V FIXEDBED AND FLUIDBED REACTORS 8
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

2. Levenspiel O. "Chemical Reaction Engineering", 3rd Edition. John Wiley. 1999
3. 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 eliminates it. Students, also familiarize themselves with the pathogenesis of diseases like AIDS, Cancer, TB etc.

UNIT I INTRODUCTION 9

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 9

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 histocompatibility complex; antigen processing and presentation; regulation of T-cell and B-cell responses.

UNIT III INFECTION AND IMMUNITY 9

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 9

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

UNIT V AUTOIMMUNITY 9

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

TOTAL: 60 PERIODS

TEXT BOOKS

1. RoittI, Male, Brostoff. Immunology, MosbyPubl.,2002.
2. KubyJ, Immunology, WHFreeman &Co.,2000.

REFERENCE

1. Ashim K.Chakravathy, Immunology, TataMcGraw-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 4

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 10

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

UNIT III CONSTRUCTION OF LIBRARIES 15

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

UNIT IV POLYMERASE CHAIN REACTION 10

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

UNIT V APPLICATIONS OF RECOMBINANT DNA TECHNOLOGY 6

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. Anselm FM, Brent R, Kingston RE, Moore DD, "Current Protocols In Molecular Biology", Greene Publishing Associates, NY, 1988.

REFERENCE

1. Berger SL, Kimmer AR, "Methods In Enzymology", Vol. 152, Academic Press, 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, 2D Gel, 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

12HS61	English for Employment – II	TOTAL : 45 Periods			
	(Common to All B.E./B.Tech Branches)	L	T	P	C
		0	0	3	2

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
- To 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

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 higrade equipments in product seperation 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: 45 PERIODS

TEXT BOOKS

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

REFERENCES

1. J.C.JansonAndL.Ryden,(Ed.)–Protein Purification–Principles,HighResolution MethodsAndApplications,VCHPub.1989.
2. R.K.Scopes–ProteinPurification–PrinciplesAndPractice,NarosaPub.(1994).
3. Roger. G.Harrison, Paul Todd, ScottR. Rudge and Demetri P.Petrides,
4. Bioseperation Science and Engineering, OxfordUniversityPress,Newyork,2003.

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 Crosby- 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– PDCA cycle, 5s, Kaizen- Supplier partnership– Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality –New management tools– Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT– Benchmarking –Reason to benchmark, Benchmarking 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. Dale H. Besterfield, et al., “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, L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd. (2006)
4. Janakiraman, Band Gopal, R.K., “Total Quality Management–Text and Cases”, Prentice Hall (India) Pvt. Ltd. (2006)

12BT74

BIOPROCESS ENGINEERING LABORATORY

L	T	P	C
0	0	4	3

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,estimationofk_{la}–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 k_{la}–sulphite oxidation method
7. Estimation of k_{la}–power correlation method
8. Residence time distribution
9. Estimation of overall heat transfer coefficient
10. Continuous cultivation–x-ddiagram,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	0	3

AIM

To provide hands on training in Down stream 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–ammonium sulphite precipitation
5. Ultrafiltration separation
6. Aqueous two phase extraction of biologicals
7. High resolution purification–affinity chromatography
8. High resolution purification–ion exchange chromatography
9. Product polishing–gel filtration chromatography
10. Product polishing spray drying freeze drying.

TOTAL : 45 Periods

12BTA1

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–interfacial phenomena and membranes– self assembly and molecular structure of membranes.

UNIT II CONFORMATION OF NUCLEIC ACIDS 9

Primary structure–the bases–sugars and the phosphodiester bonds–double helical structure– the α , β and γ 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

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, 2nd edition, John Wiley and Sons Inc., 1995.
2. Lehninger's principles of biochemistry David L. Nelson and Michael Cox, Macmillan worth publications, 4th edition 2007.

12BTA2

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 force microscopy–combinatorial chemistry and high throughput screening methods.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Campbell I. D and Dwek R. A., “Biological Spectroscopy”, Benjamin Cummings and Company, 1986.
2. Atkins P. W. “Physical Chemistry”, Oxford IV Edition, 1990.

12BTA3 **BIOPHARMACEUTICAL TECHNOLOGY** **L T P C**
3 0 0 3

AIM

To familiarize with the biopharmaceutical technology, drug designing, drug formulation, pharmacokinetics and pharmacodynamics. 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 ingredients 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 DRUG ACTION, 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 PRINCIPLES OF DRUG MANUFACTURE 9

Compressed tablets; dry and wet granulation; slugging or direct compression; tablet presses; coating of tablets; capsule preparation; oral 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. An introduction. John Wiley. 2000.
2. Katzung B.G. Basic and Clinical Pharmacology, Prentice Hall of Intl. 1995.

12BTB1	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—Food Microbiology, 4th Ed., McGraw-Hill Book Co., New York 1988.
2. J.M.Jay—Modern Food Microbiology, CBS Pub. New Delhi, 1987.

12BTB2 **MARINE BIOTECHNOLOGY** **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 biology–biochemical 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–aquafarm design and construction.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Recent advances in marine biotechnology volume 3 – M.Fingerman , R .Nagabhusanam Mary–FrancesThomson.
2. Recent advances marine biotechnology volume2 –M.Fingerman ,R. Nagabhusanam Mary–FrancesThomson

12BTB3 **CANCER BIOLOGY** **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 tumour 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", IRL 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 To Cellular And Molecular Biology of Cancer" j Oxford Medical Publications, 1991.

12BTC1	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 ACTIVE 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 and probes.

UNIT IV ENZYME AND NUCLEIC ACID 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 APPLICATIONS 9

Preparation of Hapten-carrier Immunogen conjugates - antibody modification and conjugation – immunotoxin conjugation techniques – liposome conjugated and derivatives- Colloidal–gold-labeled proteins–modification with synthetic polymers.

TOTAL: 45 PERIODS

TEXT BOOKS

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

12BTC2	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, pluripotency, self – maintenance 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–particularly 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–Fcells.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Stem cells–Elsevier :CSPotten.

12BTC3 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, Enteroggregative *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 moleculargenetics 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 (WITH SPECIFIC EXAMPLES) 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; Enterohaemorrhagic *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, cytotoxic effects. Criteria & tests in 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 in entry, 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; An introduction; 4th Edition, Thomson Publication.
3. Peter Williams, Julian Ketley & George Salmond, "Methods in Microbiology: Bacterial Pathogenesis, Vol. 27", Academic Press, 1998.
4. Bacterial Pathogenesis – A molecular approach, Abigali A. Salyers and Dixie D. Whitt, Second Edition, 2002, ASM Press, Washington.

REFERENCES

1. Recent reviews in Infect. Immun., Mol. Microbiol., Biochem. J., EMBO etc.
2. Nester, Anderson, Roberts, Pearsall, Nester, "Microbiology: A Human Perspective", McGraw-Hill, 3rd Edition, 2001.

**12BTD1 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, measurements of temperature, pressure, fluid flow, liquid weight and weight flow rate, 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. Coughnowrand Koppel, "Process Systems Analysis and Control", McGraw-Hill, New York, 1986.
2. George Stephanopoulos, "Chemical Process Control", Prentice-Hall of India Pvt. Ltd., New Delhi, 1990.
3. Patranabis. D, Principles of Process control, II edition, Tata McGraw-Hill Publishing 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

12BTD2 **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, continuous flow 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; gene therapy 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; stem cell cultures in the production of transgenic animals.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Ranga M.M. Animal Biotechnology. Agrobios India Limited, 2002
2. Ramadass P, Meera Rani S. Text Book Of Animal Biotechnology. Akshara Printers, 1997.
3. R. Ian Freshney Culture of Animal Cells, A Manual of Basic Techniques 4th Edition 2002.

REFERENCES

1. Masters J.R.W. Animal Cell Culture: Practical Approach. Oxford University Press, 2000

12BTD3	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, ISICodes, 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, PLANT LAYOUT AND DESIGN 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., Young E.H., Chemical Plant Design, 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.

12BTE1	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 Culturefundamental Methods, NarosaPublications.1995.
2. SinghBD.TextBookofBiotechnology,KalyaniPublishers. 1998

REFERENCES

1. HeldtHW.PlantBiochemistry&Molecular Biology,OxfordUniversityPress.1997.
2. Ignacimuthu.S,AppliedPlantBiotechnology,TataMcGraw-Hill.1996.

12BTE2 **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 chemistrix–inputs–outputs–uses.

TOTAL: 45 PERIODS

TEXT BOOKS

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

REFERENCES

1. GROMOSHandbook

12BTE3	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 efficiency, feed back regulation, regulation in branched pathways, differential regulation by isoenzymes, concerted feedback regulation, cumulative feed back regulation, amnio acid regulation of rna synthesis,energy 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 feed back regulation, limiting accumulation of end products, feedback, resistant mutants, alteration of permeability, metabolites.

UNIT III BIOSYNTHESIS OF SECONDARY METABOLITES 9

Precursor effects prophopase, 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 seqencial 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., "FermentationAndEnzymeTechnology",JohnWileyAndSons., 1980.
- 2.StanburyP.F.,AndWhitakerA.,"PrinciplesOfFermentationTechnology",Pergamon Press,1984

REFERENCES

1. ZubayG., "Biochemistry",MacmillanPublishers,1989.

12BTF1	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 & how to use them. This will facilitate the students to undertake projects 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 prediction; Subtractive DNA library screening; differential display and representational difference analysis; SAGE; TOGA

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 to 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.

12BTF2	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 be 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 tumours, topics as identified from time to time.

TOTAL: 45 PERIODS

TEXT BOOKS

- 1.TalwarG.P.,andGuptaS.K.,“Ahandbookofpracticalandclinicalimmunology” Vol.1&2,CBSPublications,1992.
2. Weir D.M.,Practical Immunology,Blackwell ScientificPublications,Oxford,1990.

REFERENCES

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

12BTF3	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 & nuurophaemacology. 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,2ndedition,Blackwell Science,UK, 2000.

12BTF4	BIOPROCESS ECONOMICS AND PLANT DESIGN	L	T	P	C
		3	0	0	3

AIM

To develop skills of the students in the area of Bioprocess Economics and PlantDesign

OBJECTIVES

At the end of the course, the student would have learnt about Business organizations, project design and development, Economics of plant Design and Quality control requirements

UNIT I PROCESS ECONOMICS AND BUSINESS ORGANIZATIONS 9

Definition of BioProcess, BioProcess Economics, Importance of various M-inputs- Globalization concept-Competition by Dumping- It's effect on Plant size- Status of India with adjoining ASEAN countries (Singapore, Malaysia, Indonesia etc)-Project profile concept-details; Structure and Types of Organizations; Simple Management Principles.

UNIT II PROJECT DESIGN AND DEVELOPMENT 9

Choosing a Project, Market Survey, Importance of Techno-Economic-Viability Studies, Sourcing of Processes, Process alternatives, Fixing most economic processes, Technology-Scanning, Plant Location Principles, Plant Layout, Process Flowsheets, Preparation of Budgetary investment and production costs.

UNIT III COST ESTIMATION, PROFITABILITY AND ACCOUNTING 9

Capital investment, Concept of time-Value of money, Source Sink concept of Profitability, Capital

Costs, Depreciation, Estimation of Capital costs, Manufacturing Costs, Working Capital; Profitability Standards, Project profitability evaluation, Alternative investments and Replacements; Annual reports, BalanceSheets, Performance Analysis.

UNIT IV PROCESS OPTIMIZATION TECHNIQUES 9

Optimum design-Design Strategy, Economic-Balance, Different unit-Operations with Single and Multiple Variables.

UNIT V QUALITY AND QUALITY CONTROL 9

Current good manufacturing practices. Concepts of Quality Control in 20th century; Elements of quality control envisaged by ISI since 1947; Emergence of Statistical Process Control(SPC), Simple SPC concept details, Fundamentals Concepts of ISO 9000 Quality System and the various requirements for ISO certification.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Peters M.S., Klaus D. Plant Design and Economics for Chemical Engineers. McGraw-Hill International Edition, Chemical Engineering series, 1991.
2. Senapathy R. Text Book of Principles of Management and Industrial Psychology. Lakshmi Publications, 2001.

REFERENCES

1. Rudd and Watson. Strategy for Process Engineering, Wiley Publications. 1987.